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Marlene Wiedorn, BA

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Peter Nemes, BA

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Table of Contents

List of Figures

List of Tables

1. Introduction (Marlene Wiedorn, Peter Nemes)

All that changes is fascinating, and also the high technology industry. The branch can be characterized as instable and unpredictable, but at the same time the initiator of significant innovations. Hence trying to illustrate the internationalization process of firms that are active in this field is obviously no straightforward task. It is more an exciting challenge to analyze this strategy from the perspective of a highly innovative industry.

As if that isn't sufficient for a challenging diploma thesis topic, the authors also take this to the next level. How does the internationalization process look like if the focus lies on undeveloped and new firms within an instable and innovative industry? Many studies that analyze the high technology industry are observed from the point of view of multinational firms. This thesis focuses on the contrary, on new established and not yet developed enterprises that were founded a few years ago. The so-called start-up companies.

When putting together these two characteristics, namely high-tech and start-ups, it is obvious that literature might be rare, and if available, maybe outdated or far from applicable in practical experience. Therefore two case analyses shed light on the validity of the theoretical internationalization process. Based on these mentioned factors the diploma title "market entry of start-up companies – a case analysis of Austrian and Hungarian high-tech firms" was formed.

1.1. Approach and Aim of Thesis

This thesis tries to frame a picture of the prerequisites and arguments of international market entry strategy especially for start-up companies active in the high technology industry. In order to reach an empirical result it is necessary to outline the theoretical approaches of international market entry strategy first. These theoretical concepts are enriched by arguments and reasons especially for start-up companies involved in the internationalization process.

The reason for deciding to analyze the high technology industry is because of the unique characteristics these branches have. As for instance Datar et al. (1997) describe this industry as a fundamental "trigger" of global competiveness, innovativeness and employment creation. Besides examining an international market entry of high-tech firms present a challenge, due to the complexity of this dynamic industry and its products and services. All these factors increased the attractiveness to undertake the thesis in perspective of the high technology branch.

By conducting case study analyses in the high-tech-sector of Austrian and Hungarian companies, which internationalized during their start-up phase, this thesis tries to illustrate to which extent theoretical statements are valid in practice for these two markets. The previous theoretical investigation, which was conducted before starting to work on this thesis, points out that there are deficits of empirical studies especially for smaller markets like Austria and Hungary. As the authors are both native speakers in the investigated markets they have the advantage to avoid misunderstandings and misinterpretations, which is decisive for drawing conclusions from empirical results.

The main reason for choosing the method of in-depth interviews in the practical investigation is that the research area (high-tech enterprises which went international in an early phase) is hardly explored. As a consequence it is essential to gain a deeper insight into this segment.

1.1.1. Research Questions

Based on a general theoretical framework that tries to disclose the strategies of high-tech start-up companies when they decide to go international, a practical investigation is conducted that further examines the international market strategy of Austrian and Hungarian high-tech firms. Hence the *main research questions* this thesis tries to answer are:

- What is the *efficient* internationalization strategy for a high-tech start-up from a theoretical perspective?
- What is the *practical* conducted internationalization strategy of the interviewed and therefore analyzed high-tech firms during the start-up phase?
- Is there a *fit of* theoretical *arguments* to the practical investigation?
- And if so, to which extent do the theoretical statements apply to the practical investigation? What are the *differences* and *consistencies*?
- Which entry modes are preferred/declined theoretically compared to the practical investigation?

1.2. Thesis' Structure

This thesis is divided into five main topics, each treated in separate chapters. First, in *chapter two* main definitions are explained on which the later thesis is based on. The main terms international market entry, start-up company, the high-tech sector and the high-tech start-up are described here precisely.

Chapter three is concerned with international market entry theories, focusing on several approaches that are of importance in the case of high-tech start-ups. This part of the thesis also delivers a critical view concerning the included theories. Limitations of those approaches are included in this section.

In the next main part of this thesis various internationalization theories are discussed. The international market entry strategy of high-tech start-ups is examined from a theoretical perspective in detail. C*hapter four* is based on various studies by different authors treating international market entry in general and in aspect to the high-technology industry. Authors are included that focus on high-tech start-ups with regard to international market entry strategy. This internationalization process is divided into three major steps, each examined from different perspectives.
First the question of the adequate foreign market location is answered. Afterwards the different entry modes are discussed and followed by the accurate foreign market entry time for a high-tech start-up. Also motives and risks of the high-tech start-up's internationalization purpose are treated here precisely.

After this extensive flow of information *chapter five* includes an aggregated table that combines the most important data from chapter three and four clearly and demonstratively. In this chapter all the aforementioned is included and most of the important information for high-technology based start-ups is summarized.

Chapter six involves the practical part of this thesis where a case study analysis based on two high technology firms was conducted. The Austrian firm Anagnostics Bioanalysis GmbH and the Hungarian company Thor Medical Systems Kft were questioned for this analysis. These two start-ups are active in the medical engineering industry. The results of the in-depth interviews are presented, evaluated and compared to the theoretical part, which is described in chapter three to five.

Chapter seven summarizes the results of the theoretical and practical investigation, discloses limitations and future research recommendations.

2. Definitions

Chapter two defines the terms this thesis is based on. If these definitions are used below, characteristics and limitations of the terms are valid, which are described in the following subchapters. Chapter two interprets the following definitions:

- International Market Entry
- International Market Entry Strategy
- Start-up Company
- High-Tech Sector
- High-Tech Start-up

2.1. International Market Entry (Peter Nemes)

In the scientific literature on international management numerous approaches are available that attempt to explain the activities of companies in foreign markets. The historic starting point is developed in the economic theory of trade theories, which examine the desirability of cross-border exchange of goods at internationally immobile factors of production. (Welge & Holtbrügge, 2006, p 53)

International market entry describes the action of entering a market abroad. A firm is able to take this step when previously an internationalization strategy has been formulated. Hence an international market entry requires fundamental considerations about the internationalization strategy as a whole.

Besides this definition there are several motives that describe the desirability of companies deciding on an international market entry in general. Glowik (2008, p. 72) cites following points:

- small and/or mature local markets force the company to enter markets abroad
- foreign market attractiveness (size, high purchasing power)
- expanded sales volumes provide economies of scale effects

- unique technology, product, service with attractive potentials in foreign markets
- access to rare or desired recourses (for example technology, natural recourses, labor)
- seasonable fluctuations of product sales
- better customer proximity
- risk diversification (increased number of country markets)
- investment benefit
- cognitive preferences towards internationalization of the entrepreneur/management
- necessity to follow a strategically important customer abroad

Summing up, international market entry mainly represents the reasons for internationalization of companies. Here it is attempted to answer the question why internationalization happens.

2.1.1. International Market Entry Strategy

At this point the question is asked, how, when and where internationalization happens.

A company that is trying to enter a foreign market needs to make an important strategic decision about which market, entry mode and entry time to choose as part of its internationalization strategy. The selection of a specific entry mode, location and accurate timing are decisive and very important decisions as they involve not only financial resource commitments but also considerable time efforts. (Agarwal Sanjeev, 1992, p. 2)

Besides this general definition Porter defines strategy as the creation of a unique and valuable position, involving a different set of activities. (Porter, 1996, p 68) He states that the essence of strategy is choosing what not to do. The significance of uniqueness especially in the case of high-tech start-ups is very important, as illustrated later in this thesis.

Passing Porter´s opinion on market entry strategies this thesis tries to identify the risks, chances and challenges when high-tech start-ups enter foreign markets. This specific strategic decision process is very complex and the outcome normally has a fundamental impact on a company's future destiny. (Glowik, 2008, p.72)

To sum it up Hynes (2010, p. 87) defines internationalization strategy as a "series of interrelated activities that should be embedded as part of the overall growth strategy of the firm." In the following theoretical part this thesis tries to identify these different and interrelated factors that influence the choice of a high-tech start-up's international entry strategy.

2.2. Start-up Company (Marlene Wiedorn)

During the dot-com bubble in 2000 the concept of a start-up became widespread throughout the world. Therefore a start-up company is generally associated with high growth and technology oriented firms. But in fact a start-up could originate from every industry sector. The literature describes the term start-up company often in a distinctive way. This thesis is based on and restricted to the following definitions and illustrations.

The term start-up (Answers) itself is defined through:
1. The act or process of setting into operation or motion.
2. A business or an undertaking that has recently begun operation: grew from a tiny start-up to a multimillion-dollar corporation.

In Gabler's encyclopedia of economics 2009, a start-up company is defined as a young and not yet established company, which is founded for the reason of realizing an innovative business idea, reaching this goal with few seed capital. Generally start-ups start soon with business expansion and try to strengthen their equity base by raising of venture capital (optionally through Business Angels) or by going public. (Winter, Mosena, & Roberts, 2009)

Keppler (2001) describes this type of organization, as follows "Start-ups are the classical entrepreneurial companies whose founders have no previous employment ties

to other firms in the industry." For this thesis Keppler's perspective is too simplified and often not valid, as illustrated later.

Hayn (1998, p. 16) delivers a more complete definition of a start-up company. This type of firm can be seen as a young, dynamic and disproportionately growing company. The term "young" describes the company's factual duration of its economic existence. In general the faster an enterprise is able to become established in its market and branch, the shorter the period is, in which the company is described as young. Hence young can be equated with not established.

The second characteristic of a start-up firm is "dynamic". This results out of the need for continuous adaption to an instable environment. Therefore almost every firm can be described as dynamic, which will not be liquidated in the near future. However the drive of young enterprises is characterized, beside the adaption enforcement caused by dynamic business environment, additionally by an inherent dynamic.
(Hayn, 1998, p. 17)

Compared to established firms, start-ups construct the environment by its own initiative, by seeking innovations and benefitting from opportunities, which others do not recognize or simply overlook. (Hayn, 1998, p. 22) In general start-ups differentiate from established firms by for example seeking and serving niches.

The final characteristic of newly established enterprises relates to its disproportionate growth. The crucial factor is not the already occurred increase, it is more the disproportionate growth expected in the future. (Hayn, 1998, p. 22) This leads to a considerable demand for capital, not only for developing investments in the start-up phase, but also for continuous and reflationary expansion investments. The amount of available equity or capital resources determines decisively the rate of development process. (Hayn, 1998, p. 30) To ensure a continuous and disproportionate growth, a critical saturation limit, caused by shortage in financial resources, has to be overcome. (Hayn, 1998, p.10)

More general guidelines for start-up company qualifications (by Alberta Ingenuity Fund) are the following ones:

- A new company in product development mode
- Time in business does not exceed 4 years
- No public offering
- Annual sales do not exceed $1,000,000
- A minimum of one full-time employee and no more than 12.

As mentioned in the beginning, the most widespread kind of a start-up company, especially at the end of the 1990s, was a dotcom enterprise. The reason therefore is simple: Obtaining financial resources was not one of the most complex and lengthy processes for such a dotcom company. Quite the contrary was the case, many investors wanted to speculate on the emergence of these new established businesses, therefore one thing these start-ups had easily access to: venture capital.

Unfortunately, by the end of the boom it soon became apparent that these companies were not able to fulfill the profit expectations the investors envisioned. The main reasons were that these firms had not focused enough on their business plans or on obtaining sustainable revenue. By the year 2000 many of these start-up companies went bankrupt, just a few still exist today, some of them are successful, as the Internet bookseller Amazon.com and the Internet auction portal eBay.

The following subchapters deal with some general chances and challenges start-ups have to face during their existence. This is carried out more broadly for being able to apply this information on any type of start-up company.

2.2.1. Challenges and limitations start-ups deal with in general

Starting with probably the most considerable challenge or constraint, demonstrates the situation of a start-up company in more detail. One of the major limitations such a company has to deal with results from the *constraints in capital*. In general a start-up does not have access to an ongoing stream of cash flow; in fact these companies have a

hard time to convince potential investors of the future value and earnings of its business. Most start-ups in fact do not even provide assets that a financier would consider as precious and therefore worth investing in. So the question where the start capital derives from still remains and illustrates one of the major challenges start-up companies have to deal with. (Bhidé, 2000)

This restriction of funds leads to another limitation start-ups are confronted with, namely the available *human capital*. Human resources are very limited due to the missing financial capabilities and probably the absent attractiveness for potential employees. (Bhidé, 2000)

Another restriction a start-up in general has to cope with is the *lack of* a deeper business or industry *experience* of the entrepreneur. This limitation is connected to the above described ones, as an entrepreneur does not start with a great deal of business experience, this deficiency often renders impossible the raising of capital from investors. (Bhidé, 2000, p. 52) The factor experience is a further decisive criterion in the development of a start-up business, and hence will be discussed in more detail later. In general this thesis does not entirely share the opinion of Bhidé (2000). Later in the thesis this issue is discussed in more detail as a lack of experience is not always the case in start-ups.

Bhidé (2000, p. 59) notes some additional challenges for start-up enterprises in general. They are facing *uncertainty* and this factor encircles the start-up in every decision it takes, as in deciding on which market to enter or on estimations of potential demand and competition. Moreover, the ability to satisfy customers wants cannot objectively be estimated. Uncertainty demonstrates another major challenge a start-up has to learn to cope with because there is no possibility available to eliminate this criterion completely. General alternatives exist to limit uncertainty like conducting research or analyses. It is important to add here that not only start-ups have to deal with uncertainty, but also multinationals are exposed to this factor. However the latter have the therefore necessary resources available for surviving a crisis, for conducting analyses or for engaging a consulting service.

This list of arguments is not exhaustive; it should rather deliver a first very general impression for being able to classify a start-up business. This thesis treats limitations and challenges in more depth later, adapted to the chosen branch of high technology based start-up companies. Furthermore it is interesting how these general challenges and limitations differ when analyzing some start-ups that are active in the high technology branch.

2.2.2. Opportunities start-ups afford in general

It is obvious that a start-up enterprise is not merely confronted with restrictions; this type of business offers many chances due to its unique characteristics. One major advantage, and therefore a chance is its *flexibility*.
This chapter presents a first overview of some opportunities, divided into internal and external chances. (Unterkofler, 1989,p. 110)

Internal Opportunities

- Direct responsibility of employees' tasks may lead to achievement of higher quality.
- Marginal developed corporate hierarchy results in individual and direct management style.
- No daily routine, which maintains flexibility.
- Motivated founder generates above-average job performance.
- Due to the start-up's size a direct and open communication is practicable.
- Start-up firm is rather under constraint being innovative and creative.

External Opportunities

- Start-up firm is able to serve markets a large-scale enterprise would not consider as attractive due to lack of profitability.
- Various customers prefer a start-up company due to for example a more private support which they can offer.

This list is again not exhaustive; rather more a thought-provoking impulse to understand some general opportunities of newly established firms.
Regarding productivity Acs and Audretsch (1990) investigated start-ups concerning innovations. The result discloses that start-up enterprises invest in total less on R&D compared to established companies, but they are twice as productive.

But in relative terms these R&D expenditures lead to a totally converse picture, here the high-tech start-ups clearly outperform established firms. The proportional higher expenditures on R&D might be one reason why new established firms are often seen as *drivers of radical innovations*. (Almeida and Kogut, 1997)

Based on the possibility to receive funding for investigating in rather unexplored and new technological fields, start-ups concentrate on those more often than established companies do. This again explains why newly established firms have the opportunity of being innovative and creative as Unterkofler (1989) describes. (Almeida and Kogut, 1997, p. 22) Another explanation why start-ups tend to be more inventive than larger firms can be based on the fact that innovations are characterized as being of regional origin. These firms rely more on local networks. As an illustrative example Silicon Valley in the United States can be mentioned. (Almeida and Kogut, 1997, p. 23)

This thesis treats opportunities and challenges of start-ups later more precisely, the reasons described here are presented in a generally admitted way for familiarizing with the topic.

2.3. High-Tech Sector (Peter Nemes)

As the term start-up is defined in chapter 2.2., here this supplementary definition limits the scope of research to companies in the high-tech sector.
High technology by definition is difficult to specify, as there are no explicit attributes associated with this term. According to some researchers there is a lack of agreement in the literature about the specific criteria to be used in deciding which companies should be included in this category and in classifying companies according to their technology level. (Amir Grinstein, 2006)

Koberg (1996) describes this situation as “definitional Tower of Babel” highlighting the weaknesses of available definitions. Several definitions from various researchers were listed in a research paper conducted by Grinstein and Goldman (2006), which tries to point out the limitations and the missing validity of definitions and characteristics. The first table shows definitions of technology firms and their limitations.

Authors	Definitions	Limitations
Glasmeier et al. (1983) Harpaz and Meshoulam (2004)	Employing engineers, scientists and academics in higher numbers	A single perspective of the technology firm is used (e.g. human resources)
Maidique and Hayes (1984), Medcof (1999)	Investing at least 3% of revenues in R&D activities	A single measure is used
MacDonald (1985)	Developing complex products	Based on vague, undefined constructs
Rogers and Larsen (1985), Nijkamp et al. (1990)	Having a fast rate of growth and a worldwide market for their products	Non-exclusive, associated with industries or firms that are not necessarily technology ones

Table 1: Examples of definitions of technology firms and their limitations

(Amir Grinstein, 2006, p. 125)

Despite these various definitions, R&D expenditures as a percentage of total sales and R&D employees as a percentage of total employees have become the most frequently used definition in empirical research. These indicators represent reasonable approximations to identify technology intensive or knowledge intensive organizations. (Bürgel, 2000, p. 81)

In addition to these common definitions high-tech companies are assigned to additional characteristics. These are often diverse and very descriptive and are not suitable to be termed as “high-tech”. As a consequence these attributes are less adequate for identifying companies. They have a descriptive nature and there is a necessity for further argumentation.

Grinstein and Goldman (2006) list specific characteristics explicitly mentioned in publications that are used to delineate and/or classify these firms. The authors state that this list of characteristics cannot be effectively used to perform this task because the list is very extensive and the interrelations among the characteristics have not been established. The following table includes definitions, which are sorted by year.

Example source	**Characteristics**	**Brief description**
Goldman (1982)	Products with a short life cycle	A firm's products are characterized by a short life cycle
Balkin and Gomez-Mejia (1984)	Incentive and group-based reward systems	A firm frequently uses incentive and group-based reward systems
Shanklin and Ryans (1987)	Relative number of R&D personnel	A firm's emphasis on employing R&D personnel
Shanklin and Ryans (1987)	Management commitment to R&D	Top management commitment to, and involvement in R&D activity
Shanklin and Ryans (1987)	Ill-Defined market needs	A firm's market needs are not well-defined , are specified in general terms or are not stable
Shanklin and Ryans (1987)	R&D personnel movement	A firm enables R&D personnel movement across various organizational units
Von- Gilnow and Mohrmann (1990)	Management attitude towards change	A firm faces continuous changes and engages in adaptations to these changes
Von-Gilnow and Mohrman (1990)	Lateral career paths	A firm frequently uses lateral-technological career paths
Von-Gilnow and Mohrman (1990)	Decentralization of decision-making processes	A firm's decision-making processes are highly decentralized
Dvir and Shenhar (1990)	Focus on innovative R&D	Innovativeness as an objective of the R&D activity
Shankiln and Higgins (1992)	Technology-driven customers	A firm faces customers which actively search for, and easily adopt technology-based innovative products
Mohrmann et al. (1992)	Flat organizational structure	A firm maintains an organizational structure characterized by a small number of hierarchies and enables employees to communicate directly with

		anyone relevant for accomplishing their tasks
Mohrmann et al. (1992)	Use of cross-functional teams in R&D	A firm frequently uses cross functional teams in R&D activities
Easingwood and Beard (1996)	Product-driven competition	A firm faces competition which is product based
Easingwood and Bear (1996)	Management attitude towards risk	A firm undertakes risky projects and initiatives
Bowonder and Yadav (1999)	Relative R&D investment level	A firm's basic commitment to technological activity through its R&D expenses
Howells (1999)	Outsourcing R&D	A firm's emphasis on conducting R&D in-house rather than outsourcing it
Deeds et al. (2000)	Number of new products and their innovativeness	A firm's emphasis on continually introducing to the market new and innovative products

Table 2: The characteristics authors associate with technology firms (Amir Grinstein, 2006, p. 26)

In the search of high-technology start-ups several characteristics and definitions are used to identify some relevant companies in this thesis. As the emphasis lies on a qualitative investigation it is not necessary to have a broad base of study objects. Rather the goal is to carry out a comparative analysis of similar examples where it is more important to identify similar companies in the same branch with homogenous properties and with a comparable starting point.

The list of characteristics is important in this thesis as it helps to identify the properties of high tech start-ups. Moreover it supports the process of qualitative research and it is administrable in the creation of qualitative questionnaires.

2.4. High-Tech Start-up (Marlene Wiedorn)

After defining a start-up company with its challenges and opportunities in general, and restraining the branch high-tech to fit this study, the next step is to declare what is meant by a high-tech start-up. Elucidating this term is essential due to the reason that the later theoretical part and case analysis is centered to high-tech start-ups.

Bürgel (2000) explains that the demand for investigating such high-technology-based enterprises has its beginning in the United States, with famous companies such as eBay, Microsoft or Amazon. These firms illustrate two things very demonstratively: Firstly, they all expanded within a few years to dominant global players in their branch, and secondly, this rapid growth can be ascribed to the fact that these former start-up companies focused on technologic progress and research.
They are known for generating additional benefit, workplaces, innovation and also for being a source of structural adjustment. (Bürgel, 2000, p. 5)

Jones (2001, p. 207) notes that high-tech start-ups can be described as firms that explore recent and originating technologies and generally internationalize rapidly or instantly. A reason for this rapid internationalization is that start-ups that are technologically innovative face considerable drive to launch products, services or intellectual property onto foreign markets because they soon recognize that the home market does not offer sufficient possibilities in terms of sales, growth and development. That is also why high-tech start-ups generally are not in the position to gradually develop a domestic presence because of the persistent pressure to internationalize. (Crick and Jones, 2000, p. 63)

Further high-technology start-ups are in many cases managed by researchers, technologists or engineers who have notable competence in the certain field of business. (Jones, 2001, p. 207) This statement is treated critically in more detail later.

Aside from the technological know-how the head of the company holds, this person often lacks business competence and experience. (Oakey and Mukhtar, 1999) This lack leads to a higher risk for the company failing in more general business activities such as

for instance the protection of the firm's technology. Hence if the leader of the start-up lacks general business knowledge, the company has to consult assistance. (Jones, 2001, p. 208) This thesis doesn't follow the approach by Oakey and Mukhtar (1999) exactly, surely a high-tech start-up lacks experience and know-how, but later in this thesis it is explained how these limitations can be simply overcome.

Due to Crick and Jones (2000, p. 65) high-tech start-ups are further characterized as innovative, qualified for being part of a technological imposition and able to generate recent technological prospects. Certainly innovative firms exist in different industries too, but high-tech companies have a higher proportion of research and development and generally initiate more radical innovations compared to other industry branches.

As all major definitions used in this thesis are described the following chapter introduces the main internationalization theories. The structure follows a top down approach by introducing the reader into the theoretical basics of internationalization. This establishes the basis for further strategic and practical insights.

3. Internationalization Theories (Peter Nemes)

In the following part five main internationalization theories are described. The subject of high tech start-ups is examined in the context of these theories in order to identify relevant peculiarities of these special companies. As a by-product the shortcomings of internationalization theories are discussed.

The existing theories contribute largely to models, which try to explain why companies internationalize and hardly offer models for real decision making. Managers can hardly derive recommendations from existing internationalization theories as the relationships between the determinants either remain open or are very vague. These theories include a list of explanatory variables, which can have a relevant impact on the process of internationalization.

Many approaches are bi-national and give no answers to questions as in how many countries a company should have operations and how the operational network should look like. Additionally almost all approaches consider businesses as one single unit. For example looking at an entire multiproduct enterprise can be problematic when different products have a different level of internationalization.
Furthermore most theories are static and do not consider the process of internationalization.

Despite this criticism, theories of internationalization if seen holistically provide basic mental material for the development of strengths and weaknesses.

By working out particularities for high-tech start-ups in these theories a basic requirement for an own eclectic model for decision-making is laid. This is investigated and enriched by empirical results in the practical part of the thesis. (Perlitz, 2000, p. 133)

By narrowing the investigation on high-tech start-ups some deeper insights in entry mode decision-making and more practical implications for managers can be gained.

Amongst others this research strategy is recommended by Zhao and Decker (2005) who try to outline emerging trends in market entry mode theory and try to develop starting points for further research.

3.1. The Stage Development Model

The stage of development (SD) model, also called learning theory of internationalization or Uppsala model was proposed by Johanson and Paul (1975) while studying internationalization strategies of small and medium sized enterprises. They argue that the major driver for international operations is an organizational learning process.

The starting point of the considerations is the assumption that companies with no foreign experience prefer exports as the lowest risk form of internationalization. Only with increased knowledge and experience of the opportunities and challenges of international expansion higher risk forms will be chosen. While a company has very small market knowledge in the first stage of internationalization process it gains more information about local market conditions and extends market specific knowledge. With increasing market knowledge enterprises spend more resources abroad and tend to choose entry forms, which are characterized by higher risk. Furthermore it argues that firms start their foreign operations from culturally and/or geographically close countries and move gradually to culturally and geographically more distant countries.

The main message of the internationalization process research is that the internationalization of companies takes place by means of the so-called Establishment Chain and the Physic Distance Chain. Through permanent interaction of static and dynamic factors the company develops incrementally through learning and increases its international focus.

The original approach was enhanced by several studies. For example Pedersen and Shaver (2000, p. 21) state that the process of internationalization can also be a discontinuous process where there is one, big, first, step. Furthermore Millington and Bayliss (1990, p. 15) state that there are various influencing factors depending on the

degree of internationalization. These have an influence on the internationalization of a company. According to them, companies with more international experience can skip some steps in the internationalization process as they can use their knowledge from other markets.

The model argues that the internationalization is a long, slow and incremental process with two dimensions. The geographical dimension, the cultural expansion and the commitment. The discussion about the adequate market entry timing for high-tech start-ups is treated later in this thesis more precisely, especially in chapter 4.5.

Despite many studies confirming the learning theory some restrictions need to be considered. Its validity is widely restricted to the initial stages of internationalization where missing international experience is one major restriction for internationalization. Here it can be argued that this theory can have relevant implications for high-tech start-ups as it has less international experience as an organization.

In recent years however there is an increase in creation of so-called born global companies that are founded by experienced entrepreneurs. These born globals have shortly after or already at the time of establishment significant exposure to international partners. With this method they demonstrate that they are capable of skipping several steps in the establishment chain (Holtbrügge and Enßlinger, 2004). In chapter 4.3.1. the special case of born globals and high-tech start-ups is discussed in more detail.

Due to the fact that this theory is not capable of explaining why a newly established firm starts with wholly owned venture or other higher risk entry forms the SD model does not dominate in existent literature. (Zhao and Decker, 2005, p. 5)

3.2. The Transaction Cost Analysis model

The transaction cost theory is based on transaction cost economies initiated by Williamson (1975 and 1985) as a tool to explain economic problems where asset specifity, behavioral- and environmental uncertainties play an important role. (Zhao and Decker, 2005, p. 5)

The TCA framework has been widely extended and examined by researchers. For example by Nakos and Brouthers (2002), who try to show the implications of the TCA model for SMEs. The TCA model has been used extensively for MNE companies to demonstrate its robustness and its applicability but has barely been used for smaller companies like start ups or SMEs. (Brouthers and Nakos, 2002, p. 1)

As SMEs have similar properties and characteristics as high-tech start-ups their arguments will be applied similarly and adapted to high-tech start-ups.

The TCA model suggests that organizational structure and design are determined by minimizing transaction costs. In other words this means that companies choose a specific mode of market entry that maximizes the long-term risk adjusted efficiency. These transaction costs are made up of two main costs namely market transaction costs and control costs. (Brouthers and Nakos, 2002)

As an example it can be said that only when internal organizational costs are lower than market costs it will be efficient for a company to organize itself in a hierarchy. (Hennart, 1988)

The two costs are mainly influenced by asset specifity, behavioral uncertainties and environmental uncertainties. These three factors will be explained in the following.

Asset Specifity

According to Williamson (1986) transaction-specific assets are non-redeployable investments that are specialized and unique to a task. Asset specifity refers to the extent to which a party is linked into a business relationship.

Williamson (1983) identified four dimensions of asset specifity, which are following:

- Site specifity (e.g. natural resources at a specific geographic location which can barely be moved)
- Physical specifity (e.g. specialized machinery or tools which are designed for a single purpose)
- Human asset specifity (e.g. highly specialized human knowledge which can be hardly externalized)
- Dedicated assets (isolated investment into specific machinery which cannot be used for other purposes)

Researchers have extended these specifities by time specifity (Malone et al., 1987) and procedural asset specifity (Zaheer and Venkatraman, 1994) that are described as following:

- Time specifity (e.g. if a product needs to be delivered in a short specified period of time)
- Procedural asset specifity (e.g. refers to the degree of individualization and customizations of business workflows and processes to utilize the partners' capabilities)

Applying asset specifity to high-tech start-ups it can be argued that the occurrence of physical, human are very high for high-tech companies. Assuming that high-tech firms

can have very specialized and sophisticated instruments and machinery which can only be operated by highly skilled and specialized individuals for particular purposes.
Time specifity applies rather less to high-tech products, as they cannot be copied as easily and have a lower turnover ratio as low-tech products.

For instance Osborne (1996) found that New Zealand SMEs that possessed a higher ability to develop complex technically differentiated products showed a tendency to use equity entry modes, while companies selling undifferentiated commodities used non-equity modes. This tendency is also shown in Bürgel and Murray (2000) who found a positive relationship between R&D intensity and the use of equity modes for a sample of UK high tech start-ups companies.

These findings would suggest that high-tech start-ups would tend to prefer equity entry modes if asset specifity is high but only if asset specifity was the major factor for decision makers. As specific assets require extensive training and investment it could be argued that it could be problematic for start-ups to prefer equity entry modes as they have major financial and human resource restrictions.

Behavioral Uncertainties
These uncertainties result from the inability of a company to predict the behavior of individuals in a foreign country, which may lead to opportunistic or dishonest behavior. Companies need to establish internal control mechanisms to reduce these uncertainties. One option may be hierarchical ownership that gives the owning party the legal rights to control foreign-based employees. (Klein et al. 1990)

As this control function requires special managerial skills, controlling systems and processes it can be argued that high-tech start-ups need international control related experience. This factor may discourage high-tech start-ups from organizing in a hierarchical form as start-ups have less developed controlling systems and processes. This argument can only be supported if it is assumed that the founders and management team of high-tech start-ups are inexperienced and this not appropriate for every start-up as described later in chapter 4.3.1. Born Globals. According to Reuber (1997) a more

internationally experienced top management will use foreign strategic partnerships to a greater extent, which will promote the internationalization of the firm. The relevance of managerial experience is elaborated in more detail in the chapter 4.3.1. concerning born globals.

Environmental uncertainties

All uncertainties created by the target market environment associated with the host market like political or legal risk can be subsumed under environmental uncertainties (Williamson, 1985). In countries with high environmental uncertainty it can be argued that high-tech start-ups would prefer low-investment entry modes, as they need to stay flexible if environmental conditions change. In a highly uncertain surrounding the proprietary knowledge of high-tech start-ups may be less protected by regulations and patent laws, for instance as they have fewer resources to control patent infringements and assert their claims in a court of law these considerations need to be regarded.

Patenting is treated in chapter 4. These considerations have parallels to the Stage Development Model from chapter 3.1. where the Physic Distance Chain has similar implications as it describes the internationalization as an incremental process where the Distance Chain also refers to cultural differences.

To reinforce the argument of low-investment entry modes Oviatt (2000) found that US high-tech companies entering into markets with higher risk potential tend to select non-equity modes of entry. On the other hand Bürgel and Murray (2000) found no significant relationship between country risk and entry mode for UK high-tech start-ups.

Although theoretical findings provide strong support for applying the transactions cost model to international entry mode choice (Brouthers and Nakos, 2004) there are clear weaknesses in practice, for example the transaction cost framework has a limited explanation power when it comes to explain multinational choices:

According to Zhao and Decker (2005) it neglects government regulations, which generally define the feasible sets of entry modes and production. Furthermore it fails to

include the larger strategic and competitive context and excludes non-transaction benefits. For instance it could be argued that high-tech start-ups internationalize in order to take advantage of synergies with international research partners. In this context the TCA model alleges that the only objective is profit maximization. Furthermore it can be reasoned that transaction costs can hardly be measured prior to a transaction.

Summing up it can be said that transaction cost theory if used in market entry mode decisions can help decision makers to make better entry decisions, but in practice the model is hardly usable. As start-ups have limited resources that restrict search and analysis activities many tend to prefer non-equity modes of entry although TCA models would suggest equity modes.

Here it needs to be stated that organizational capacity restrictions are also neglected. This demonstrates the shortcomings of the TCA theory and creates demand for a more complete model that also includes capability and strategic factors. These shortcomings are addressed in the Organizational Capacity Model in chapter 3.4.

3.3. The Ownership-Location-Internalization Model

The nature and extent of internationalization cannot be attributed to a single cause but is dependent on various factors. According to Dunning (1988) particularly, three factors are relevant, referred to as advantage categories. (Welge, 2006, p. 76) This eclectic OLI framework suggests that companies will select their entry mode structure by considering three factors, which are ownership advantages, location advantages and internationalization advantages. Dunning's eclectic framework represents an improvement over transaction cost theory by adding locational owner-specific as well as transaction cost variables (Brouthers, 2002, p. 32).

In the following these three variables will be described in detail and applied to the context of high-tech start-ups.

Ownership advantages

These advantages are specific to the nature and nationality of the owner and are necessary to compete with host country companies in their own markets. In order to do this these companies must possess superior assets and skills that can earn higher economic rents to meet the higher cost of serving a foreign market. (Agarwal and Ramaswami, 1992, p. 4) For example several ownership advantages can be classified like management-know-how, access to resources, registered patent and governmental preferences.

There are also advantages, which result out of the multi-nationality of the investing company like currency management or synergies and economies of scale in procurement. These advantages might not be that relevant for start-ups as they do not poses the resources and capabilities to exploit these advantages.

According to Agarwal (1992) a firm's asset power is reflected by its size, multinational experience, and its skills to develop differentiated products. Correspondingly they state that the impact of the firm size and its multinational experience is positive on foreign direct investment and the propensity to enter foreign markets in general. Accordingly higher international experience leads to prefer equity modes of entry. In the context of

high-tech start-ups it can be said that small firms have traditionally been advised by scientific literature to pursue differentiation as a means of competing against larger competitors. This differentiation can be reached by relying on product innovation or by higher relative product quality and an increased emphasis on service. (Shrader, Oviatt, McDougall, 2000 p. 1233-1234) For high tech start-ups high asset power can be implied as they have the skills to develop differentiated products. Additionally it may be possible that founders and a managerial team possess multinational experience.

Location advantages

These advantages arise from the fact that different locations feature different recourses, cultures, institutions and different regulations.

These properties also reflect the investment risk in a host country. There can be changes in government policies that could be more restrictive like repatriation of earnings or in the worst case could lead to expropriation of assets. Additionally the market potential, which is determined by the market size and the growth, can also play an important role as all these factors influence the revenue and the cost of production.

One argument by Dunning (1995) is also that companies seek growth in international markets when growth in their home market stagnates or declines. As high-tech start-ups have a very unique product portfolio the potential market size is small from the beginning of their operations. As a consequence their opportunities are unavoidably international and it can be argued that they are constrained to go international as the market potential is only given in foreign countries. According to Agarwal and Ramaswami (1992) for example in high market potential countries investment modes are expected to provide greater long term profitability compared to non investment modes as the company may obtain the opportunity to establish long term market presence even if economies of scale are not that significant. This argument would imply that also high-tech start-ups, which have fewer chances to exploit economies of scale, should make use of investment modes.

Internationalization advantages

These advantages refer to ones that arise from transferring ownership advantages across national boundaries within the own organization. (Zhao and Decker, 2005) Internationalization advantages arise if transactions are carried out cheaper within the organization than if they are arranged externally on the market. (Welge, 2006, p. 76) This factor has its origins within the transaction cost theory that is already described in chapter 3.2.

Low control modes would be considered to be advantageous as a company can benefit from scale economies of the market without encountering the disadvantage of an extensive integration. However low control modes have the same drawbacks and obstacles as described in the transaction cost theory. Asset specifity, behavioral- and environmental uncertainties can make the creation and enforcement of contracts that specify every eventuality and response too expensive to stay with low control modes. For high-tech start-ups the same arguments that were discussed in chapter 3.2. can be applied.

Implications

The more OLI advantages a company possesses the greater is the propensity of adopting a high control entry mode. In the following illustration the interrelation between the three OLI advantages is shown.

Figure 1: Decision Tree for foreign market development from Dunning (Welge, 2006, p. 77)

Dunning's (1995) framework has been applied and is supported in various empirical studies to explain entry mode decisions. It was updated several times by Dunning who argued that competitive advantages, market failure and collaboration as well as dynamic environments should also be integrated when decisions on international productions are made. Although Brouthers (1999) found that the OLI framework does well at predicting entry mode choice and has a normative validity with its great explaining power Zhao and Decker (2005) state that it is still a static model. As it neglects strategic factors, characteristics and situational contingency surrounding of the decision maker and competition. (Zhao and Decker, 2005, p. 8)

3.4. The Organizational Capability Model

The OC model is based on organization theory and regards a company as a bundle of capabilities and knowledge where individual skills, organization and technology are inextricably woven together. (Nelson and Winter, 1982) The coordination- and deployment function of capabilities and knowledge is merged into the term capability management.

According to Madhok (1998) capability management is a dynamic process where the information management attributes of the firm are critical. These are the companies' abilities to acquire, evaluate, assimilate, integrate, diffuse, deploy and exploit knowledge. The term capability management refers to processes and routines by which a company's knowledge base is developed and integrated into the functioning of an organization, enhanced through new combinations and subsequently deployed in order to exploit new sales opportunities. (Madhok, 1998)

The OC model argues that entry mode decision is a capability related one and it is made under a calculus governed by considerations related to the development and deployment of company's capabilities.

The OC model was developed by the authors Auklah/Kotabe (1997) and Madhok (1998). In the study "The nature of multinational firm boundaries: Transaction costs, firm capabilities and foreign market entry mode" Madhok tries to shift the main focus of research attention away from market failure, resulting out of high transaction costs to capability related issues. It is the first time that organization capacity is taken into consideration and shifts away the main research focus from market failure considerations. It puts an emphasis on the nature and pattern of a companies' experience and information management abilities.

Madhok (1998) argues that in the global economy of today companies need to trade off transaction cost-related concerns against capability related ones. Madhok states that ownership mode decisions seem to be more influenced by issues related to companies'

capabilities rather than transaction costs. He further states that the nature of competition has become much more intense and technology has become highly complex and dynamic. In these surroundings where multiple pressures need to be managed transaction cost considerations may become less important and capability considerations become more significant in shaping the companies behavior. (Madhok, 1998) This argument shows the importance of this model for high-tech start-ups. There are few arguments especially for high-tech start-ups as they attracted little interest from researchers concerning their organizational capabilities

According to Madhok (1998) the TC theory does not address the larger strategic and competitive context within which the firm operates. As companies compete not on the basis of cost alone companies need to conduct analysis of their own capabilities in order to assess the appropriate mode of market participation.

In the context of high technology based start-up companies it needs to be stated that Madhok's and Auklah's research was mainly conducted with large and internationally-experienced companies, (Madhok, 1998). Auklah and Kotabe (1997) based their study on Fortune 500 companies. This means that both research papers have a strong bias towards multinational companies. This makes these studies less applicable for the context of start-ups. Here it can be stated that there is a lack of research in the area of high-tech start-ups when trying to apply this model.

Nevertheless some arguments may be important for the context of high technological start-up firms. Also because Auklah and Madhok enriched internationalization theories, which were mainly restricted to transaction specific factors, with organizational capability factors. Auklah and Kotabe show this in their conceptual model illustrated below. (Auklah/Kotabe,1997, p. 150)

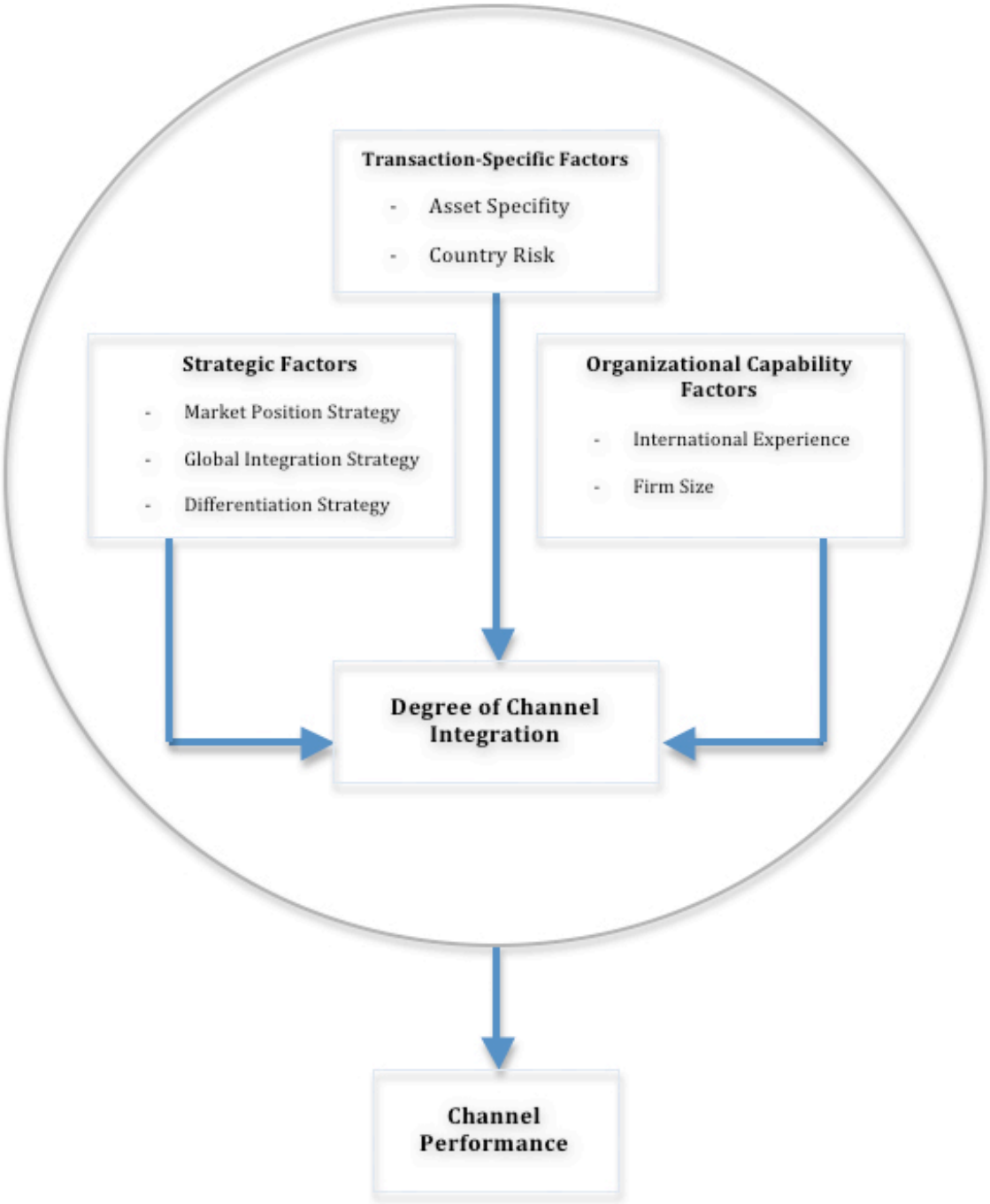

Figure 2: Conceptual Model (Auklah and Kotabe, 1997, p. 150)

Transaction-specific factors have already been explained in chapter 3.2. These TC factors have been enriched by strategic factors and organizational capability factors. This extends Dunning's eclectic framework, which has the disadvantage that it neglects strategic factors.

Furthermore it establishes ties to more strategic views and offers a more holistic approach to internationalization. As already mentioned internationalization models hardly offer support for real decision-making. It is believed that this model can improve this situation by bringing the various factors into a more coherent framework.

After all, this model has also limitations as it ignores some factors as for example organizational efficiency. Zhao and Decker (2005) state that in the context of the model, measures for organizational efficiency have to be developed. This is necessary to enhance the applicability of the model. They state that, although collaborative agreements may change capacity and capabilities in a very positive way, efficiency related decisions are significantly influenced, for example the coordination effort in collaborations may increase dramatically which could decrease the organizational efficiency.

Additionally Zhao and Decker state that the OC model neglects the impact of decision makers as well as sociological and political factors. Here it also needs to be added that Auklah and Kotabe (1997) point out that the three strategic variables which are considered in the model are not sufficient and do not utilize all possible strategic goals of companies.

These limitations again confirm the difficulty of developing a holistic and universally valid internationalization model especially for high technological based start-ups.

3.5. The Stage Development Model

According to Zhao and Decker the decision making process model suggests that the entry mode choice should be treated as a multistage decision making process. In the course of this decision-making several factors are taken into account. These are mainly the objectives of the intended market entry, the environment, and associated risks and costs. (Zhao, Decker, 2005).

The major difference to the other internationalization models is that it focuses primarily on optimizing the decision making process. It does not further explore and extend possible factors for internationalization. According to Zhao and Decker this model was proposed by Root (1994) and further developed by Young et al. (1989) Kumar Subramaniam (1997), Pan, Tse (2000) and Eicher and Kang (2002). These papers were analyzed with the concentration on the context of high tech start-ups. In the paper "A contingency framework for the mode of entry decision" by Kumar and Subramaniam (1997) some context specific findings were identified. Therefore the following arguments are mainly based on this research paper.

Kumar and Subramaniam present a contingency framework in their paper accommodating alternative decision strategies that result in a hierarchical model for entry mode decision. According to them this hierarchical model is predominately relevant for small and midsized companies. This is the main reason to mention it in this thesis. Aside from this reason, the authors state that most literature and research assumes that managers have enough time and resources to make an informed and rational entry choice. In their research they try to address this gap and consider alternative strategies for decision making by developing a contingency model.

The "contingency model of decision making" consists of several stages (Kumar, Subramanmiam) as seen in figure 3 below.

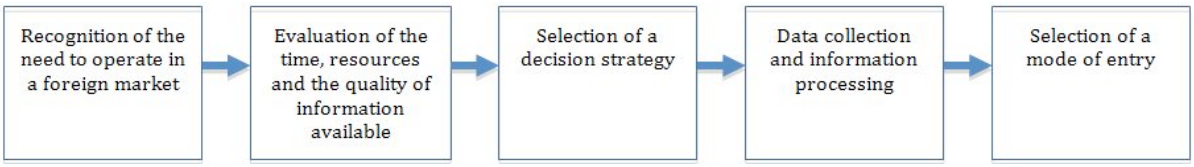

Figure 3: A Contingency Model of Mode of Entry Decision (Kumar and Subramania, 1997)

- The first stage involves recognition of the problem. In the context of high tech start-ups this would imply the need to have a successful operation in a foreign market. If this problem has been identified the decision maker proceeds to the next step.
- In the following stage the manager needs to evaluate the requirements and prerequisites for the entry mode. The manager tries to answer the question, which factors affecting the entry mode need to be considered. In addition it is important to know from where this information can be obtained and at what costs.
- In the following third stage the decision strategy is selected which enables the manager to solve the problem of the market entry mode. These strategies should be selected by assessing the amount of recourses that are required to use these strategies and by evaluating the ability of each strategy to obtain an accurate result. In the context of high tech start-ups this would mean that a manager needs to accurately estimate and value the financial and time resources a strategy incorporates. For start-ups this cost/benefit analysis is of major importance as they especially face constrained circumstances.
- The fourth stage includes collecting and processing information. This process may involve costly and time-consuming activities but could also be based on simple heuristics. According to Kumar and Subramaniam entrepreneurs operating in smaller entities will tend to use less formal and less elaborate strategies like simple heuristics.
- In the final step of the decision process the decision maker decides on which entry mode to use when entering a market.

As mentioned already, decision makers in high-tech start-ups face a very constrained situation for decision-making. Therefore they would tend to use a hierarchical process to reduce the uncertainty and complexity in the decision of entry modes. In the figure four below the natural hierarchy of the various modes is shown.

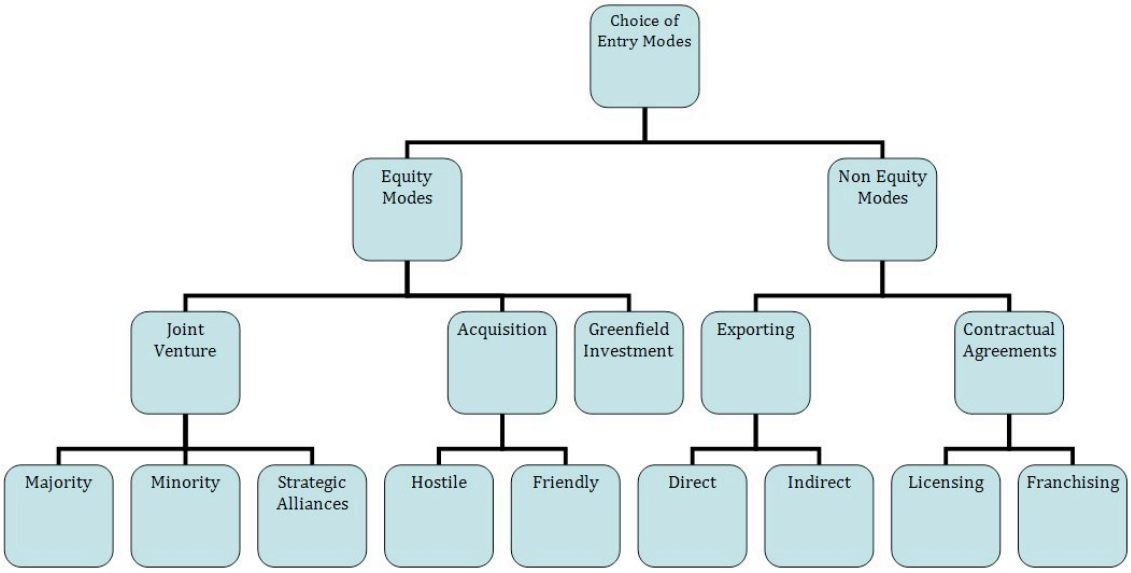

Figure 4: Hierarchical Model of the Mode of Entry Decision (Pan and Tse, 2000)

The modes of entry are classified in the first level of the hierarchy as equity and non-equity modes. The equity modes are modes that require considerably higher resource commitments to enter a market. On the other side non-equity modes require decisively less resource commitment. What is ultimately crucial to this argument is the fact that only very few critical factors need to be considered at this hierarchy level. This implies that at different hierarchy levels different factors need to be considered. At the next hierarchy level other factors are decisive and relevant for the decision maker. As an example the decision between export and a contractual agreement at the second level may depend on factors like product properties or on the international experience of the management team.

As an example if a product requires a high maintenance effort and specific know-how for production, exporting may be the only option for internationalization. On the other hand the factor time-to-market may require a direct presence in the market, which would favor contractual agreements to export.

In addition to this very practical stage process the authors found that a decision made by a decision maker depends not only on external factors but also on the characteristics of the decision maker and the decision task. (These external factors were mentioned already in the previous models).

Zhao and Decker argue that this model might be more practical than the other mentioned models but it would ignore the role of the organization itself and of the decision makers within the decision making process.

This thesis shares this opinion but it is believed that this model could help especially decision makers in high-tech start-ups in their decision process if they use it as a fundamental decision framework and regard and use the different factors accordingly.

As these factors can be derived from the previously mentioned internationalization models it is believed that these models can be of great assistance if they are combined. As an example decision makers may derive various factors from the OLI framework and use a hierarchical decision model to apply these.

3.6. Summary of the Internationalization Theories and Models

Except from the last model most of the existent studies aim to explore and extend factors related to entry mode choice. One of main issues regarding these theories is the fact that the surrounding of internationalization is very complex and dynamic. It is complex because there are various factors and circumstances with various importance. Furthermore every single individual company has different and unique conditions from their birth onwards.

In addition the quality and validity of the models is only true for specific samples. As factors may play a different role in different contexts conflicting results are inevitable. It is hardly possible to have a normative model, which can accurately define and propose a certain entry mode. This makes the generalization of a market entry mode model difficult. Therefore Zhao and Decker recommend to narrow down investigation to

specific type of companies and to specify the associated environment. This might lead to deeper insights and some practical implications for managers (Zhao and Decker, 2005)

This approach is also used in this thesis by concentrating on companies in the medical technology branch. These companies can be characterized as high-tech companies and are expected to have a global market from its birth onwards. The chosen industrial sector will be described in more detail further in the practical part.

In this previous first section three, the main attempt is to explain why high-tech start-ups internationalize. In some further arguments also some factors for the entry mode decisions were discussed by various models.

In the next step this thesis concentrates in more detail on the internationalization strategy of high-tech start-ups by specifying the various factors for market entry modes.

4. International Market Entry of High-Tech Start-Ups

Jones (2001, p. 193) declares that today internationalization is less about entering foreign markets, it is more about enhancing and improving a company's exposure and response to international business influences, opportunities, threats and imperatives. Further the mode of entry a start-up chooses describes the constitution of the entering firm, its disposable resources and its growth target. In addition the determined entry mode is not selected by the start-up alone; rather those decisions are based on the firm's relevance in a market and the dependencies to different enterprises in that certain industry. (Brown and Bell, 2000)

A research study of small British high-technology firms by Jones (2001, p. 201) indentifies that companies tend to initiate internationalization implementing several entry modes, in many cases more than one mode at a time.

An international market entry always poses a challenge for any firm because it is far more than deciding for one single foreign market entry mode. If a start-up company decides for internationalizing its business, this decision presents a strategy, including many decision steps in a long-lasting internationalization process. Therefore this work is subdivided into such decision stages as for instance the market and location decision, possible entry modes and the choice of the accurate market entry point in time.
At the beginning of each chapter these topics are defined broadly, followed by an evaluation and characterization for a high-tech start-up company.

Since international market entry illustrates an integrated process, which means that market entry is made up by a number of interrelated decisions, chapter four follows such a structure by *first* describing motives a firm holds when planning a foreign market entry. *Secondly*, this chapter deals with different categories of risk such an internationalization decision includes. *Thirdly*, the question is tried to answer which market(s) a high-tech start-up should enter. Should the firm enter single countries

stepwise or all at the same time? *Fourthly*, all in this thesis relevant entry modes are explained and analyzed if they are of significance for high-tech start-ups. A critical examination of every market entry mode presents the conclusion of those sub-chapters. *Fifthly* and at the same time the last decision within the internationalization process presents the analysis of the accurate market entry timing for high-tech start-ups.

All in chapter four included theoretical information is integrated in chapter five into an aggregated table, for presenting an overview of the most significant findings in the case of high-tech start-ups. In this diagram model the relevant statements are additionally evaluated in context to the internationalization theories described in chapter three.

4.1. Motives and Stimuli for International Market Entry (Marlene Wiedorn)

This chapter deals with the motives a start-up firm in the technological branch has for entering foreign markets. Which factors lead to the decision for being internationally active? First of all it is interesting if this determination is planned to some extent; therefore part of a company's strategy, or to some extent spontaneous, resulting from miscellaneous circumstances, as restricted sales potential. In the case of a high-tech firm Crick and Jones (2000) tend to the first alternative, international market entry as an essential part of the firm's strategy. The reasons therefore are the unique characteristics a start-up company in the high-tech sector possesses and in certain branches, including the modern technology industry, markets are innately international. Hence an international market entry is part of the high-tech firm's strategy and demonstrates a coherent step in a firm's existence.

4.1.1. Market

A common motive for a start-up company deciding on an international market entry depends on the *market* itself. If the firm operates in a market characterized by international competition, the firm tends to act in a much wider region compared to enterprises settled in markets with more regional nature. (Luostarinen and Hellman, 1994) Hence one motive for an international market entry is the market situation itself.

In addition there are business branches whose sales market is in any case international. This applies to the high-technological sector including all its sub fields.

Due to the fact that decisions for entering a market are not solely based on the individual firm, a broader perspective for entry motives has to be taken into account. Brown and Bell (2000) argue that every step towards internationalization demonstrates a reply to internal and external factors, including the before mentioned foreign market factors. External factors, for instance, include the chambers of commerce, industrial associations, banks, government agencies and other firms. (Summarized by Crick and Chaudhry, 1997) Besides these the business climate and home market's trading prerequisites, domestic size of the market, the location and closeness of the firm to markets abroad are additional environmental factors influencing a start-up company in internationalizing. (Summarized by Crick and Chaudhry, 1997)

4.1.2. Growth

Growth presents another motive for an international market entry, which can be achieved by expanding a firm's business markets. High-tech start-ups recognize the need for growth within the first years of existence, or even on establishment of the company. They are motivated to internationalize due to the limited growth possibilities the home market offers, therefore internationalization represents more a considered strategy than a spontaneous decision. (Crick and Jones, 2000)

Growth can be obtained by developing links with the external environment. External links are for instance the network and contacts the company has access to or simply points of contact with the external environment. High-tech start-ups, which possess restricted resources, but on the other hand have the advantage of being innovative and flexible, mostly grow through links with the external environment. (Jones, 2001, p. 195)

Jones (2001, p. 202) demonstrates in her research study that small high-tech firms hold such links already at the beginning of their internationalization process. About 90% of all firms she investigated had marketing and distribution links when they started to internationalize. These links derive from for example the entrepreneur or the local

network the start-up is active in. These links are essential for the start-up becoming global, which is treated in more detail later.

In order to grow a high-tech start-up has to internationalize its technology rapidly and should also try to enhance the firm's competence and know-how by cooperation with others in this branch or in fields the start-up lacks in skills. (Crick and Jones, 2000, p. 66) The question if and when cooperation is an adequate strategy for a start-up in the case of business internationalization, is answered in the following chapters, dealing with the different market entry modes.

4.1.3. Experience

Maybe the most significant and important factor in start-up companies is the entrepreneur (for example the owner or manager) or the senior management team. These persons are the ones who are responsible for taking a decision within the start-up enterprise. Hence they determine the strategy and future of a firm, based on their personal *experience*. Often one person has the final say in questions how the company starts to internationalize. (Crick and Chaudhry, 1997)

During the phase of internationalization a start-up firm, especially the entrepreneur, gains (additional) experience. Thereby this person might identify the adequate entry location, mode for the start-up. Aside from this and also very important is the experience the entrepreneur brings into the start-up. This already existing experience is an additional motive for business internationalization strategy.

4.1.4. Technological Learning and Performance

Zahra et al. (2000) define technological learning in their study as value-creating knowledge that companies acquire when internationalizing business. Technological knowledge facilitates the progress of skills and competencies that support the enterprise achieving competitive advantage. It is further helpful in differentiating a company's products and in entering markets faster.

In addition technological learning provides a main foundation for the organizational routines that are necessary for strengthening present core capabilities and developing new ones. (Teece et al., 1997) Without it the company's skills become outdated, its products obsolete and the business future insecure.

Especially in the high technology sector an innovative product, a competitive advantage and the creation of organizational and technological know-how are decisive factors for being successful in the long run. All these criteria are developed and supported when firms attain technological knowledge by entering foreign markets. Besides gaining this knowledge, it is necessary to integrate this know-how into business practices and products, to influence the technological performance positively.

In addition the potential for greater breadth and depth of technological learning for a start-up rises by the number of diverse foreign markets entered. The gathered knowledge can be applied to some extent in other markets, thus the benefit of technological learning increases again.

Start-ups profit from technological learning by gaining significant knowledge that can be applied for (Zahra et al., 2000, p. 943):

- Designing and offering greater variety of innovative products
  (breadth of knowledge)
- Offering more differentiated and high-quality products
  (depth of knowledge)
- Launching products to markets faster
  (speed of developing and using knowledge)

All the above described benefits from technological learning should in the long run lead to an improved financial performance and hence motivate a start-up for internationalization.

4.1.5. Government Trade Promotion

A lot of literature is published concerning government trade promotion in the case of business internationalization. The aim of this promotion lies in advancing a company to internationalize its business. Why does trade promotion demonstrate a motive for international market entry? First, it is important to determine what trade promotion incorporates, especially for high-tech start-up companies. Crick and Jones (2000, p. 66) explain that normally such promotion is composed of:

- *Export service programs:* tutorials for potential and prospective exporters, export consultancy, field manuals for export and export financing.
- *Market development programs***:** offering firms the possibility to experience a trade exhibition, assistance and prearrangement of market investigations, newsletters covering subject areas like export.

This listing illustrates exemplarily which services and programs governments offer to start-up companies and to small and medium-sized enterprises. It is interesting that all these actions are oriented to the entry mode of export. Considered from an economical point of view it is comprehensible why governments focus on this single entry mode due to the fact that export demonstrates a foreign entry choice that supports the home country (for example tax receipts remain in the home country, jobs are maintained and created etc.). But from a theoretical perspective this kind of government support clearly distorts the objectivity of a start-up when planning internationalization.

Government trade promotion offers assistance and different programs with the aim to support companies. The main focal point is on small and medium-sized companies and on start-up firms. The latter are supported in increasing ones willingness to enter a foreign market. In addition governments' aims are to diminish competition drawbacks of these kind of businesses compared to large multinationals. Further financial support is granted for start-up consultancy and for more common consulting services such as company management, adjustment to recent and modified competitive conditions and environmental protection. Other support is approved for briefing and training above

company level with the aim of enhancing firm's efficiency or providing information on how to start-up a business. (In BAFA, 2010 by Beutel et al.)

Offering a start-up the possibility attending national and international trade fairs, has been mentioned before and demonstrates another important field of activity conducted by the federal government. For a start-up company having the chance to take part in such a trade fair opens up new prospects such as sales promotion and networking. (In BAFA, 2010 by Beutel et al.)

In many countries there exists a so-called "Technology Participation Program" that in particular is geared to support the financial situation of high-tech start-ups. Governments provide incentives to companies and private persons who are investing in technology-based firms during its development and start-up phase. (BAFA, 2010 by Beutel et al.)

To sum it up government trade promotions motivate high-tech start-ups to internationalize business, due to attractive programs and assistance. At the same time this support leads to a restricted perspective when considering different entry modes. Crick and Jones (2000, p. 77) emphasize the limited government perception in their study.

Firms also identify that government advisors can offer useful assistance in questions of export but they turned out to be less helpful in general issues concerning evaluating the adequate entry modes. In addition the study by Crick and Chaudhry (1997) arrived at the conclusion that government trade promotion overall is rated throughout low by firms and they evaluate it more as a promotion particularly for export.

This listing of motives and stimuli is not complete, but focuses on the most effective ones in high-tech start-up's internationalization planning. Besides these positive reasons for business internationalization risks also exist, which should be considered in a start-up's international approach.

4.2. Categories of Risk in International Market Entry Strategy (Peter Nemes)

Perlitz and Seger (2000, p. 92) deal with the subject of risk categories if a company internationalizes business. This subdivision is considered from a very broad perspective, allowing classification of every mode and entry decision with the help of these categories. When it comes to the implementation of the firm's internationalization strategy, the following categorization supports the high-tech start-up in measuring the accompanying risks beforehand.

- *Political Risks*: governmental measures carrying negative impacts on foreign business operations. This risk category includes compulsory acquisition, discrimination in terms of taxes, trade barriers or military conflicts or strikes.
- *Economical Risks*: Risk of payment, transport and currency.
- *Legitimate Risks*: different legal orders and conceptions can turn out to be problematic in international business activities.
- *Further Risks*: including risks of substitution and market. The former results from expert knowledge diffusion and hence in the long run causing the risk of the company being replaced and driven out of the market by imitators. The market risk comprises every risk going along with the choice and handling of a foreign market. (Grabner-Kräuter, 1992, p. 434 f.)

This categorization presents a very broad subdivision that is applicable for every type of business. In the case of high-tech start-ups such a sub categorization is reasonable due to the unique characteristics such a firm possesses. Start-ups in general are more vulnerable to these risks, as for instance the business processes, structure and aims at this phase are not developed entirely. Hence choosing an entry mode that carries a high proportion of risk in all these mentioned categories could mean the end of the start-up's business or foreign activities. As described in previous chapters that a foreign market entry of a start-up in the high technology sector is indispensable, a considered decision is vital for this type of firm. This is also mentioned in theories of physic and cultural distance as the SD model.

4.3. Market Location Approach (Marlene Wiedorn)

The decision in which market a firm should enter is one major part in the internationalization process. In the case of a high technology based start-up internationalization is necessary for business survival, hence the question in which market to enter as well.

Nordström (1991, p. 30f) argues that the global market increasingly becomes more homogenous referring to national requirements, technical standards and developments in communication, transport and information. Hence markets in general become global characterized by standardized conditions. It is obvious that this change has an impact on the market location approach of a firm.

So which market should a high-tech start-up enter? Is it better to join several countries at once, or is the stepwise process the wiser decision? This chapter treats several questions regarding evaluating the most adequate market location decision for high-tech start-ups. First, more general approaches are discussed, as the "Born Global" phenomena and if this fits high technology based start-up firms. Afterwards concrete advice for entering the right location successfully is given.

4.3.1. "Born Global" phenomena

In chapter 3.1. the Born Global approach is touched upon, here this model is discussed more exactly in matters of high-tech start-up companies. The term Born Global cannot be constrained precisely, neither theoretically nor empirically, Rasmussen and Madsen (2002) describe it as an "umbrella" concept. Therefore all new established firms that are rapidly internationalizing are under this umbrella.

The term Born Global (McKinsey and Co., 1993) is a synonym for International New Ventures (Oviatt & Mc Dougall, 1994), Infant Multinationals (Rasmussen and Madsen, 2002) and also for High Technology Start-ups (Jolly et. al, 1992). Historically

considered this concept is not new, firms simply “leapfrog” (Hedlund and Kverneland, 1985) steps in the conventional stage approach. McKinsey coined the term “Born Global” and describes those companies as “firms that view the world as their marketplace from the outset and see the domestic market as a support for their international business.” (McKinsey and Co., 1993, p. 9) Some authors state that they are convinced that gradual internationalization is dead. (Cavusgil, 1994, p.18)

Now the question remains if it is a realistic and wise approach for a high-tech start-up starting international activities from their birth, by entering several countries at once? The fact that the term Born Global stands for high-tech start-up is not sufficient for an informed decision.

Baronchelli and Cassia (2008) define seven factors that influence a firm in choosing the global approach. These at the same time illustrate why especially high-tech start-ups increasingly become Born Globals.

1. **Drive and unstableness of company’s environment:** many authors state that the changing environment drives firms to become a Born Global. Examples like falling trade barriers, improved information flows, faster communication, global sourcing, shortened life cycles of products, globalizing competitors and competition can be mentioned. (Rasmussen & Madsen, 2002). Internationalization is seen as a strategy for decreasing risk, due to the fact that even international economic factors have an increased effect on the home market. (Andersson et al., 2004) The changed and more open environment makes it easier for firms entering international markets. (Madsen and Servais, 1997)
2. **Domestic market:** especially in the high technology industry the home market’s size is too small for achieving profits or paying off the investments made for the start-up’s product. Financial survival in this industry isn’t feasible without rapid internationalization. (Freeman et al., 2006)
3. **Industry**: companies that are active in high technology based industries are described as having available innovative skills, unique capabilities and resources

that are important in a global approach. (Knight and Cavusgil, 2004) The high-technology industry itself has a high level of globalization, which can be seen as a criterion for a global approach. Hence firms are not able to insulate themselves from foreign competition. (e.g. Andersson et al., 2004)

4. **Knowledge existence**: In the classic stage approach knowledge and experience are evaluated as decisive factors for internationalization. (Johanson and Vahlne, 1977) It is obvious that Born Globals are not able to improve these two factors before going global, as they internationalize from their birth. (Rasmussen & Madsen, 2002). These decisive criteria can be achieved in other ways, through the founder's personal knowledge and experience that this person has developed before the start-ups existence. (Laanti et al., 2007) Further knowledge sharing through cooperation with local and international networks makes it possible for a start-up gaining tacit knowledge that is necessary for internationalization. (Freeman and Cavusgil, 2007)
5. **Entrepreneur and management previous experience**: Often Born Globals are founded by businessmen who have gathered international know-how before. In addition these persons have a wider business network and relationships available. Born Globals have to be observed differently, they "exist" longer than their founding day. Due to the entrepreneur's relationships, experience and knowledge start-ups are able to internationalize from their birth onwards because internationalization qualification is developed before the formation day. (Madsen and Servais, 1997)
6. **Business' innovativeness and innovative skills:** Changing environment (for example global competition) leads to shortened product life cycles and increased innovation intenseness. (Karlsen, 2007) All these raise R&D costs but time for earning returns on investment is shortened too. Hence innovativeness is seen as a decisive factor in internationalization. Unique and qualitative high products and the competence of the high-tech start-up developing these are necessary criteria in a global approach. (Knight and Cavusgil, 2004)
7. **Network links:** Internationalization in isolation is not possible. (Madsen and Servais, 1997) Considering the different international market entry modes it is obvious that internationalization requires a network. For instance strategic

alliances with competitors or exporting with agents develop such a network. This overcomes the lack of resources the high-tech start-up faces and makes a global approach possible.

These seven factors summarized by Baronchelli and Cassia (2008) clearly explain why high-tech start-ups are in the position to internationalize from the beginning. As a consequence the question, which foreign markets a high technology based start-up should enter is answered as well. Their market is a global one.

Beside all the positive aspects of the Born Global approach, it has to be analyzed from a critical perspective as well. Being a Born Global involves many risks for the high-tech start-up; hence this step has to be evaluated accurately, even though the competitors in high technology industry are global.

The next step in the internationalization strategy is determining how to enter these markets and afterwards the corresponding market entry timing has to be defined.

4.4. International Market Entry Modes (Marlene Wiedorn)

In the next step of the internationalization strategy the high-tech start-up can choose between various entry modes, dependent on the degree and type of risks (see chapter 4.2.) a start-up wants to expose itself. Perlitz and Seger (2000, p. 93) display the international market entry modes, which offers a first outline.

<table>
<tr><th colspan="4">International Market Entry Modes</th></tr>
<tr><th>Export</th><th>Contractual Agreements</th><th>Direct Investment</th><th>Other Entry Modes</th></tr>
<tr><td>Indirect</td><td>Licensing</td><td rowspan="4">Wholly Owned Subsidiaries
- Greenfield
- M&A
- Others</td><td>Virtual Corporation</td></tr>
<tr><td>Direct</td><td>Franchising</td><td>Strategic Alliance</td></tr>
<tr><td></td><td>Contract Manufacturing</td><td>Internet</td></tr>
<tr><td></td><td>Management Contracting</td><td></td></tr>
<tr><td></td><td>Turnkey Projects</td><td rowspan="4">Joint Ventures
- Minority JVs
- 50/50 JVs
- Majority JVs</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Table 3: Categorization alternative Market Entry Modes (Perlitz and Seger, 2000, p. 93)

Table 2 provides a definitional differentiation between the possible entry modes a company can choose from. It does not tell anything about its validity for high-tech start-ups. This topic is treated in the following chapters. All of these entry modes are not treated in detail due to the lack of relevance for high-tech start-ups as the entry mode of franchising. Besides this first overview of all possible entry modes, it is interesting what amount of resources is necessary for adopting one of them. As financial resources present a main restricting factor for every high-tech start-up, this classification might be valuable for the further thesis.

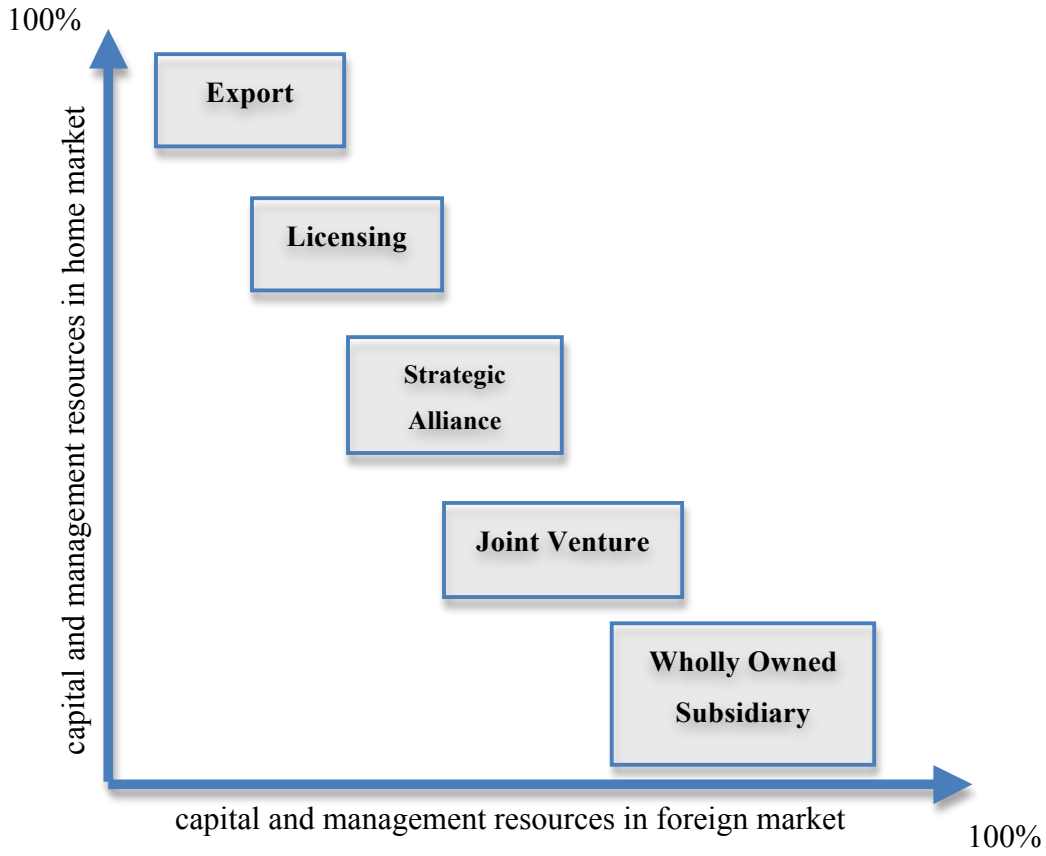

Figure 5: Degree of resources transfer (on the basis of Meissner and Gerber, 1980, p.224)

Considering limited resources as the main characteristic of a start up, the above figure would suggest that export presents the most adequate entry mode for such business types. Export does not require huge resources in capital and management in foreign market, so all activities stay national. At first glance the categorization seems to be conclusive, but constraining the features of a start-up to the one of limited access to resources would treat the strategy of internationalization only superficially. Hence for a start-up company, especially in the high technology branch, a lot more has to be considered before being able to make a rational decision on which entry mode the most efficient might be.

The following chapters try to find an answer to this complex situation by determining the risks of every entry mode for high-tech start-up firm.

4.4.1. Export

The recent constantly increasing interest of firms in getting involved in export can be traced back to several reasons. For instance the intensified competitive environment, deregulation of international markets and the increased interconnectedness of those markets lead to a raised interest level. Hence export and its development, its chances, its promotion possibilities are the big issues in policy and economics. As illustrated in chapter 4.1.5. government trade promotion for instance dedicates its work squarely to supporting high technology start-ups in the range of export. (Crick and Chaudhry, 1997)

Export is described as sales of a company's own products and services into foreign economic territories. (Kutschker and Schmid, 2005, p. 827) A further distinction presents the differentiation between direct and indirect exporting that is treated afterwards. Jones (2001, p. 192) explains export as the first step in the internationalization process by typically moving goods across national borders. (*Note*: when in this thesis the term "product(s)" is written, physical and non-physical products and services are included in this definition.)

Some authors are convinced that exporting demonstrates the only available entry mode for new enterprises going international. (Hodgetts et al., 2006, p. 266) This would mean in this thesis limiting the possible entry modes for start-up firms to the strategy of export, which does not seem to be very reasonable from an objective perspective. It might be the preferred mode of entry for new established enterprises, but surely not the only one available. Smaller firms primarily internationalize through some kind of exporting actions as empirical studies document (e.g. Cavusgil, 1984). The focus of this work lies on the high-tech sector in the start-up phase, which must be analyzed differently due to its unique characteristics that are explained in Chapter 2.3 and 2.4.

4.4.1.1. Motives and Chances of Export

Why do high-tech start-ups decide on export as a market entry? Widely accepted is that start-up companies are trying to avoid risk when starting international market entry, and (especially indirectly) exporting illustrates a *low-risk and low-involvement* possibility. (Jones, 2001, p. 193) Again it is important to notice that exporting presents not the best (see chapter treating risks) entry mode for start-up companies, and surely not the only one available. Jones (2001, p. 207) especially notes this for firms that are active in the technology sector. Crick and Jones (2000, p. 65) hold that high-tech firms go for internationalization very expeditiously and in general not only by implementing the entry mode of export. Those companies decide on several different possibilities to enter a foreign market because the start-up's size does not present a restricting parameter in the technological sector any longer (also described in chapter 4.3.). This can be explained by the fact that the sales market of a high-tech firm is anyway international due to the high-tech company's characteristics.

Additionally in general start-ups are able to perform internationally from their beginning. Therefore exporting, by having the adequate capacity, ability and know-how is a *realistic and resource-friendly mode*. Further Crick and Chaudhry (1997) mention in their study that the chance for long-term profitability, obtainable through market diversification and long-term increase, motivates entrepreneurs starting to export.

Definitely worth mentioning is the fact that export for a start-up presents a great chance for getting in touch with foreign markets without having to raise a lot of capital. Exporting might be the *most straightforward and cost-effective* entry mode a start-up could choose from. Besides the sales market of a high-tech start-up is rather global anyway, exporting presents a possibility to enter a foreign market and learn from the experience gained.

Often (direct) export simply happens in a start-up company by the receipt of an unsolicited order from a client abroad. Crick and Chaudhry (1997) state that such an arrival of an *unsolicited order* does not present the reason for starting to export but it

can be seen as a trigger to begin at that certain moment. The completion of this unrequested order influences the company in further export actions, if settlement conducted rather ineffective, often managers worry about prospective export interest.

According to Olson and Wiedersheim-Paul (1978) there are different factors that all have a favorable impact on export performance. They state the effect of *government stimulation* and the *implication of economic integration* as beneficial factors towards export orientation.

As mentioned above start-ups in the high technology sector invest primarily in R&D activities. Export for this business type presents an effective method for *extending the product life cycle.* Products investigated and developed for the home market might be interesting for foreign countries, even if the technology is outdated on the domestic market. In addition this aspect of extra time reduces dependency of the home market. (Perlitz and Seger, 2000, p. 98) Surely this advantage of temporally lengthening sales opportunity is not restricted to export, but here this advantage can be utilized very flexible and fast.

Formerly studies engaged in exploring internal firm-specific factors that motivate companies to export (summarized by Crick and Chaudhry, 1997):

- *Discriminative company advantages:* this might be a decisive factor why especially high-tech start-ups due to for instance innovativeness' or its innovative skills (e.g. chapter 4.3.1.) are motivated to export.
- *Aggregated unsold stock*: valid for any type of business, therefore also for high technology start-ups. Unsold stock illustrates tied capital for any business.
- *Usable manufacturing capacity:* if the start-up company's capacity is not entirely utilized this might be a suggestive reason for exporting.
- *Savings resulting from additional orders*: referring to economics of scale, for any kind of firm this factor should be taken into consideration. As high-tech start-ups have to invest a lot on R&D, but the time for return on investment is limited, additional orders are vitally important.

In addition to these internal factors and motives for export, there are also external criteria. Describing all these in the case of exporting would go too far, therefore chapter 4.1.1. includes an overview of the most important factors for high-tech start-ups. Besides those factors Katsikeas and Piercy (1993) numerates external factors motivating firms to export:

- Shrinking foreign country regulations
- Availability of foreign market information
- Increased domestic competition
- Profit and growth opportunities abroad
- Export promotion programs
- Unsolicited orders from abroad (as mentioned before)

Apart from the latter two arguments these external factors are formulated very broadly, they describe situations that might lead to international activities of start-ups in general. For this thesis these factors illustrate definite factors that motivate a firm to internationalize business in general. But these factors do not deliver sufficient reasons for solely relying on export. Rather unsolicited orders and special promotion programs would lead to preferring export activities.

Crick and Chaudhry (1997) arrive at the conclusion in their study that certain factors are more motivating to start exporting than others. So-called high rated factors of firms deciding for export as an entry mode are competitive pressures, marketing benefits, chance of enlarging the existent delivery areas and at the same time lowering market-related risk. Further additional sales, economic incentives and the high-tech start-ups inimitable commodities are additional high rated factors of companies deciding for exporting. On the other hand government trade promotions present the other side of the scale, and are low evaluated motives for exporting.

In addition high-technology start-ups go for entering an international market by export *if the chosen market is not given top priority*. Hence markets that are not of high

relevance are often served by exporting from the home country or through agents. This comprises the advantage that the company has access to the market and at the same time less commitment. (Crick and Jones, 2000, p. 76)

4.4.1.2. Risks of Export

Every entry mode is accompanied with chances, dealt with in the chapter before, but also risks are included in an entry decision of a start-up firm. Chapter 4.1.3. deals with the topic of *government trade promotion* that might be one reason, although not the most crucial one, why high-tech companies are choosing export as a mode of entry. Financial and administrative assistance are vitally important for high-tech start-ups due to a number of different reasons.

Start-up companies especially in the high-tech sector have to deal with the risk of deciding for export as an entry mode due to *wrong motives* (like government support). This risk has its roots in the policymakers' attitude towards foreign trade. As they may see that all entry modes, aside from export, as not economically beneficial for the domestic market. Therefore governmental institutions try to pitch export to start-up companies, especially those that are active in the high technology sector.

In addition a start-up should never be rushed to approve and conduct any *unrequested order* without estimating the consequences of such an activity. The firm has to wait for the right moment and has to be ready and able to deal with this chance. Surely such an unsolicited order includes opportunities for a start-up, as it might be the first contact with this type of entry mode triggering internationalization, but it should be investigated if the products and processes are ready for exporting. (Crick and Chaudhry, 1997)

Export presents a very cost-effective entry mode for the start-up but there are situations that can lead to *financial risks* for the company. Kutschker and Schmid (2005, p. 836) state that direct export is *dependent on the exchange rate*. Deteriorations of the currency rate can hit the exporting firm in the start-up phase very hard. The currency appreciation in the home market or in the foreign market, which might be the reason for exporting, can result in a limited competitive position of the exporting start-up.

The *Liability of foreignness* is another risk of (direct) exporting, resulted from the missing acceptance a start-up faces in the foreign market, due to for example lacking presence. In addition the firm reacts with a lag of time to demands on the foreign market. (Kutschker and Schmid, 2005, p. 837)

Choosing export as the first entry mode might not be an incorrect decision for those start-ups, also due to the fact that the risk of capital loss in general is low. But in the long run Kutschker and Schmid (2005, p. 829) state that indirect export is *decreasing the profit* due to continuous market cultivation. This disadvantage is insignificant in the case of direct exporting, that is described in the following chapter.

4.4.1.3. Direct vs. Indirect Export

As different types of export exist it is important when choosing the most appropriate one for a high-tech start-up firm. High technology products can be characterized in general as requiring explanation, and often causes expenditures for the consumer that should not be underestimated. These expenditures are in addition a matter of importance as high technology products often demonstrate innovation and complexity. In the practical section of this thesis the focus lies on the industry of medical engineering. These products perfectly fit to the previous description, as medical machinery and laboratory equipment are complex, expensive and innovative at the same time.

This situation combined with the start-up business type results in the theoretical question which type of export to decide for? For a start-up with limited experience in foreign trade indirect export would enable the firm entering unknown markets with the help of an intermediary that is familiar with different markets. A start-up could enter more markets at the same time despite the lacking foreign market know-how. Entering several markets at once is especially interesting for the Born Global approach, which is the ideal approach for high-tech start-ups in general.

In the case of direct exporting the start-up has to raise more resources and therefore the financial risk might be higher, on the other side the firm retains control over its own

business activities. Direct export enables the start-up being able to analyze competitors more effectively, recognize market trends earlier, which is a decisive criterion in the high technology sector.

Perlitz and Seger (2000, p. 97) advise that firms lacking knowledge in foreign trade should first apply indirect export. But due to the fact that high-tech products require explanation, the start-up should aspire to introduce direct export after gaining some additional experience.

Theoretically it seems to be conclusive, starting with indirect exporting due to lack in foreign sales know-how and afterwards introducing direct exporting. But this consideration misses one very decisive factor, namely the distributor itself, in the case of indirect exporting. Such high-tech start-ups are normally only one of several accounts the distributor has to work with. Therefore the start-up has to face many problems in collaborating with a distributor, as low bargaining power or high projected sales volume. The latter often presents the criterion for exclusion in the case of not achieving the predefined sales volume. As a consequence of this start-up firms that might not be able to fulfill the distributor's requirements have no other alternative than implementing direct exporting. (Bürgel and Murray, 2000, p. 55)

Hence the decision for direct or indirect exporting in the case of a high-tech start-up cannot be described as a simple straightforward one. If the enterprise decides on indirect exporting, the above stated potential problems have to be taken into account. Bürgel and Murray (2000) also described in their study that not the limited resources prevent start-ups from deciding for direct or indirect exporting, but rather the products' characteristics (like degree of customization and innovativeness) and the start-up's existing network and experience influence the choice.

4.4.1.4. Critical Examination of Exporting as International Entry Mode for a high-tech Start-up

In which situation should a high-tech start-up choose export as an entry mode? And if deciding for exporting, in which situation is direct or indirect exporting more

reasonable? Is it advisable to implement both modes at the same time or consecutively? Start-ups favoring export as an international market entry mode due to the fact the high-tech firm normally faces *lack of time and resources* when entering foreign markets.

Exporting demonstrates the quickest and most resource-friendly mode compared to the ones carried out hereafter. Also if time to foreign markets presents an essential criterion for a high-tech start-up this mode might be suitable. Bürgel and Murray (2000) affirm the preference concerning exporting in their study, it presents the entry mode applied most often by high-tech start-ups.

Hence the question remains: Is exporting always an accurate entry mode for not established firms in the high-technology branch? In fact exporting is an effective way for the firm gaining experience in foreign trade. The financial risk is appreciable and experience received is valuable for the start-up. As described in the chapters dealing with the chances and risks of exporting, it is quite obvious that opportunities outweigh the risks when choosing exporting as a foreign market entry mode. Entering a foreign market is indispensable in the high-tech sector therefore exporting offers a low risk, high speed and (in the case of direct exporting) a high control mode for gaining experience.

Bürgel and Murray (2000, p. 35f) engaged in the topic of the adequate entry choice for a start-up firm in the high technology branch. They agree on the fact that those firms favor entry modes that require little resource commitment and are oriented towards commercialization rather than foreign manufacturing. Further, as mentioned in the beginning of this thesis, technology-based firms most likely enter more than one foreign market within a short time period. All these facts support exporting as a market entry mode. Hence an additional remaining question is: Which export type the high-tech start-up should decide for?

Definitely technology-based start-up requires a network and relationships to get access to equipment and resources which they do not have available. It is obvious that indirect exporting would support the start-up towards reaching these requirements, but as

described in the previous chapter, this raises additional problems. A possibility to avoid these challenges when choosing indirect exporting is that the start-up should establish and intensify relationships within its home market from the beginning. These relationships and the thereby gained experience will support the start-up when entering foreign markets by indirect exporting.

For the technology-based start-up orienting towards indirect exporting is relatively important, especially when it faces following circumstances (Bürgel and Murray, 2000):

- Geographic and/or psychical distance and/or completely different market (compared to home market)
- Cultural discrepancies between supplier and buyer.
- Low degree of customization of start-up's products (exception: if distributor offers portfolio of related products)
- Missing reputation of start-up. Firm can utilize the reputation of an established intermediary.
- Lack of relationships, networks and experience in foreign trade.
- Use of indirect exporting on the home market.

It is obvious that this listing is not complete; it rather presents indicators when indirect exporting might be an appropriate entry mode. One decisive criterion deciding for indirect exporting is the existing sales mode the start-up uses in the domestic market. If the company engages for example a distributor for selling its product, the start-up tends to introduce the same mode abroad. (Bürgel and Murray, 2000, p. 54) Madhok (1997) approves that established routines influence the firm in future decisions.

To sum it up, indirect exporting for a high-tech start-up presents an effective entry mode if several of Bürgel and Murray's (2000) determinants are fulfilled. In addition selling via indirect exporting appears to be straightforward due to the non established business processes of start-ups. But in either case potential drawbacks and risks have to be evaluated in advance.

4.4.2. Licensing

Licensing presents a contractual agreement that provides a foreign license holder with intangible property holdings, enabled by the domestic grantor of a license. These intangible property holdings are often technologies, hence licensing is sometimes defined as a technology agreement. Licensing primarily occurs in divisions like research and development, production and sales. (Kutschker and Schmid, 2005, p. 838) On the basis of this description, including and commenting on the entry mode licensing is relevant for this thesis and for the chosen business type, namely high-tech start-ups.

Several different intangible property holdings exist, but in this thesis only patents and utility patent are treated in more detail. The relevance for outlining for example design patent, trademark or copyright is not given. At first starting with a general differentiation by Kutschker and Schmid (2005, p. 839)

- **Patents**: granted by the state or by a community of states that allows making use of an invention unrestrictedly. This right is defined exclusively and restricted temporally. It is a precondition that the invention is new, involved an inventive step, in the field of technology; it has to be commercially usable and sustainable.

- **Utility Patents**: often labeled as “petty patents” describing a working equipment or object of utility, which is given for instance a new design, arrangement, device or circuitry. This remodeling is useful for the intended use and for working purposes. The determining factor is the novelty in these categories and not the novelty per se. Novelty, degree of invention and technical progress aren’t criteria required for an entry as utility patent.

For an international market entry it is important to state that a patent isn’t valid globally, it is restricted to a certain geographic area like country groups, single countries or regions within a territory. So how does the start-up profit from licensing? The licenser demands for the usage of such intangible property holdings lump sums or royalties, the amount depends on various factors such as duration or licensed object.

Besides these conventional charging types in practice there exist further remuneration types (Kutschker and Schmid, 2005, p. 842). *Cross licensing* might be relevant for a start-up company in the high technology sector. Due to its lack in resources and knowledge cross licensing might be a possibility extending a start-up's skills. Here the business partners exchange licenses without demanding any fees. So both companies can benefit from additional intangible property holdings. For a start-up firm this exchange might open new alternatives. Perlitz and Seeger (2000, p. 100) further state that cross licensing delivers access to new technologies.

Needless to say, cross licensing should not be considered by the start-up if the exchange would threaten the economic survival of the firm. It also creates high coordination effort and hence it is questionable if the start-up has available sufficient resources in addition to the day-to-day business. Risks of licensing are treated in more detail afterwards.

A further fee type in licensing presents *capital participation* for the grantor of a license. Mentioning this additional possibility might be relevant for a start-up firm due to the fact that a capital participation in the licensee's firm comprises many advantages such as independence, financial security and improved market position for the start-up. This financial support and security is vital for firms especially for those in the start-up phase.

The question remains if and when licensing is relevant and lucrative for a start-up firm in the high technology sector? Therefore the next chapters deal with the motives and risks when high-tech start-ups are deciding for licensing as an entry mode.

4.4.2.1. Significance of Patents for high-tech Start-ups

To begin with, this part just deals with the significance of applying for a patent; it does not cover the case that a high-tech start-up acquires a patent. This is simply due to the reason that the start-up has not sufficient financial resources to acquire a patent.

In general a high-tech start-up has not sufficient facilities for production or development and misses human resources for achieving economic survival. Hence applying for a

patent and making use of it could enhance the start-ups economic situation. (Motohashi, 2008, p. 1554)

But what is the real value of patents for high-tech start-ups? A generally accepted answer for the entire high technology industry cannot be given; it is proven empirically that there considerable differences exist within. In addition distinctions between countries are confirmed by several studies.

In Europe, United States and Japan the number of applied patents is on the rise. Between 1992 and 2002 this increase turned out to be about forty percent. (EPO, 2007) What are the reasons for this considerable rush on the interest of patents? One of the main reasons therefore is the *growing importance of proprietary knowledge* of today's economy that more and more becomes knowledge-based. Companies independent from its size recognize the significance and economic consequence of protecting their innovations. (Arundel, 2001; EPO, 2007)

Globally considered the number of applied patents has, to some extent, been decreasing since 2008, in some markets, as in the US there was a drop of about 11.35% from 2008 to 2009. 45,790 patents were applied for in the US in 2009. Quite contrary to this trend is Austria with 1,072 patens applied for, which presents an increase of 12.37%. Industries such as medical technology suffered from a drop of 5.8% in 2008. Panasonic Corporation presented the firm with the highest number of applied patents in 2009. The international firm published 1,891 patents in 2009. (WIPO, 2010)

Secondly, the competition itself changed to the challenge of technical innovations. The existing price competition before has been replaced by *competition based on innovation*, especially in knowledge-based industries. This shift explains the upward trend of patent applications. Thirdly, the *emergence of recent technologies* can be used as a potential cause for the growing interest in patents. (Arundel, 2001) All these reasons are of major importance for high-tech start-ups therefore it is interesting to clarify how far these companies can profit from patents.

Positive aspects of patents for high-tech start-ups (e.g. Arundel, 2001; EPO, 2007; Mann, 2007)

- Patents enable start-ups to attract venture capital that is helpful for securing the firm's economic survival and growth.
- Patents are valuable in developing and protecting a start-up's market by independent growth.
- Ability to make economically use of patents (e.g. licensing) and hence allowing start-ups to exploit the expenditures of internal R&D.
- Patents are protecting the start-up's invention (for some period of time) and provide opportunity to advance, extend and augment technological foundation.
- Firms that have applied for patents generally exist for a longer period of time compared to ones without applications.

Negative aspects of patents for high-tech start-ups ups (e.g. Arundel, 2001; EPO, 2007; Mann, 2007)

- Aggressive application of patents (and the further approval) makes it difficult to develop innovations. It might protect innovations but also leads to the establishment of monopolies due to the fact that larger companies can afford a higher number of patents. Start-ups lack financial resources and hence hold a weaker position in acquiring patents and cannot afford monitoring potential violations.
- Decisive knowledge and fundamental inventions are protected excessively, which limits innovations for start-ups with its limited resources.
- For patent application a start-up has to disclose its invention completely, which involves the firm's (most) valuable information and makes it accessible to competitors or imitators. Moreover legal actions against imitators can have impact on the start-up's economic survival. In addition patents allow firms to develop a modified solution.

Patenting involves both advantages and disadvantages for a high-tech start-up, so giving a concise answer to the question of the significance of patents cannot be offered. There are situations when the strategy of secrecy is more appropriate for those companies.

Arundel (2001) treats the significance of secrecy compared to patents in his study and finds out that R&D intensive firms evaluate secrecy as more important and effective than patents. This might be due to the problem of the ease of "inventing around" a patent and due to the issue of disclosing. But Arundel further examines that both, patents and secrecy, are on the rise, which supports the growing importance of proprietary knowledge. He also states that patents are preferred by firms that engage in cooperation, like cooperating in R&D. On the other side companies that focus on internal development rate secrecy higher than patents.

Summing up the decision to apply for a patent or deciding on secrecy might be made on the basis of the start-up's business strategy. If the company plans to cooperate or to raise venture capital, patents enhance the start-up's value and make it less difficult to reach these aims. In these cases patents really make sense.

Secrecy can be applied when the start-up focuses on independence and if disclosing its invention would harm the firm more than not protecting it. But in either case it can happen that the firm's product will be copied or that competitors "invent around" it. It's a moot question whether the start-up could struggle against imitators due to its limited resources. There is no right and universally valid answer to this problem; it depends on the start-up's invention, its planned business strategy, the market situation and the current patent law in various countries.

To sum up patents are essential for high-tech start-ups in protecting the firm's core knowledge. The fact that patents are ignored in certain countries (for example China) has to be ascribed to missing control mechanisms. However, that does not change the fact that patents are necessary for high-tech start-ups for protecting their innovations and large expenditures on R&D. Imitation can happen with or without patents, but

patents simply identify the owner of an innovation and in the high-tech start-up's situation this clarification is of prior significance.

4.4.2.2. Motives and Chances of Licensing

Kutschker and Schmid (2005, p. 842ff) have examined this subject in great detail, but at the same time in a more generally accepted way. This thesis is restricted to the most relevant motives and chances of licensing in the case of a high-tech start-up.

In general licensing is adequate for firms that have just low financial resources available and limited experience in internationalization. Further it is interesting for companies that are developing products at a high quality level. (Perlitz and Seger, 2000, p. 99) Considering these arguments licensing for a high-tech start-up at first glance is relevant in general.

Licensing *requires neither high financial nor personnel resources*. The only costs that arise are for the choice of the right licensee and the formulation of an adequate license agreement, which might be attractive for a start-up firm from an investment perspective. (Perlitz and Seger, 2000, p. 100)

Compared to (direct) exporting licensing offers the start-up *a more extended market access* to different countries. Tariff and non-tariff barriers become less important if the firm decides to enter the market via licensing. In addition a complete foreign market development cannot be reached by for instance exporting, therefore licensing offers access to foreign countries that are not easily accessible because of geographic distance or financial effort. In addition *smaller and fringe markets* are attractive for entering by licensing, if other entry modes are too costly and less attractive. (Perlitz and Seger, 2000, p. 100)

Licensing avoids transportation costs, minimizes exchange rate risks and eliminates the risk of expropriation by the host country's government. Hence licensing motivates start-ups entering foreign markets that are politically and economically instable. (Welge and Holtbrügge, 1998, p. 105)

A further start-up characteristic, as described in previous chapters, presents the lack of knowledge in foreign countries due to rather limited experience of the firm. In this situation licensing offers the start-up the chance to serve markets with the license holder who is well grounded in this market. Besides this advantage for the start-up the company also profits from the established customer relationship the licensee has access to. Therefore licensing enables a *rapid*, *low-risk* and *cost-efficient* market entry with the help of the licensee. By paying license fees the licensee holder contributes to a *faster amortization of the R&D expenditures,* which presents the main cost factor in every high-tech start-up. In consideration of shortened product life cycles and increasing research and development spending, a shorter period of amortization is worthwhile for a high-tech start-up firm. (Perlitz and Seger, 2000, p. 100)

4.4.2.2. Risks of Licensing

At the beginning it is essential to state that licensing and the potential occurrence of the below presented risks are dependent on the form of contract. Hence this chapter should stress the importance of drawing the optimal license contract for the start-up with the aim of avoiding these possible risks.

Probably the most decisive risk of entering a foreign market by deciding on licensing is the problem of know-how drain. In some foreign countries (especially the Asian markets) there the problem exists that often licensees hand these intangible property holdings on to third business companies because law regulates intellectual property in those markets only rudimentary. (Kutschker and Schmid, 2005, p. 845f) Plagiarism can mean the end of the business existence of the start-up firm, due to many reasons as the not established business processes or the lack in human and financial resources. Further start-ups generally generate earnings through some few products, their portfolio at this stage is restricted, and so plagiarism would hit the firm's core.

Asian countries often conduct "reverse engineering", which means that a product is disassembled into its components and afterwards assembled again to its original condition. It is obvious that this risk can occur with every entry mode, some product

groups are affected more than others. The level of this risk shrinks if for copying the product a lot of specific know-how is necessary or if the product is software based. In the case of licensing "reverse engineering" can happen more easily because innovations are disclosed to a certain level.

In addition compared to other market entry modes the revenues generated from license fees are relatively small. Hence when implementing licensing the start-up would not consider this mode first of all due to restricted potential earnings. Further these revenues are limited to a defined length of time. (Hong, 1997)

In the long term the licensee could become the start-up's future competitor, especially in the high technology sector often licensee holders utilize this cooperation for advancing the firm's own technology. Here strong importance should be attached to the license agreement itself, start-ups in such cases could agree on cross licensing avoiding the problem of raising a future competitor. (Hong, 1997, p. 83)

Another potential risk of licensing for the start-up is the restricted influence on and control of the licensee holder and its corporate policy. Insufficient manufacturing quality of the licensed high-tech product could have a negative impact on the image of the start-up. (Welge and Holtbrügge, 1998, p. 105)

4.4.2.3. Critical Examination of Licensing as International Entry Mode for a high-tech Start-up

Again this chapter tries to answer if and when licensing for a high-tech start-up presents an adequate entry mode.

Hsu (2000, p. 204) claims in his study that in general start-ups face many barriers when deciding on licensing. These are summarized as:

- High search expenses for evaluating adequate business partner(s)
- Unidentified reputation of potential business partner(s)

- Disproportionate opportunities to cooperate (e.g. through differences in experience and value, fear of expropriation)
- Start-ups lack in sufficient business development (e.g. difficult finding the adequate business partner)
- Opportunism of partner

Bürgel and Murray (2000, p. 47) identify in their study that licensing only plays a marginal role for start-ups in the internationalization process. Only two percent of 547 market entry decisions by 362 British high-tech start-ups applied licensing as an entry mode. It is obvious in the previous chapters of licensing that the challenges and risks can overweigh the chances of going for licensing in the case of technological-based start-ups. This is ascribed for example in the development stage of these firms and the dependency on a few products, responsible for the further existence of the start-up.

Due to the fact that high-tech start-ups are not focusing on one single market entry mode, licensing could be seen as an additional mode, relevant in certain circumstances as geographic distance or marginal relevance of the chosen entry market.

4.4.3. Contract Manufacturing

Perlitz and Seger (2000, p. 102f) define contract manufacturing as the production of products or parts of goods by a foreign-based manufacturer for a domestic-based (here: high-tech start-up) firm. Contract manufacturers do not post their name on the client's product; hence the brand name remains with the start-up. (Lüthje, 2002, p. 229) The scope and kind of manufacturing varies. These range from manufacturing of parts to the entire production, and are defined in a contract between the involved firms. The distribution of the manufactured goods remains the task of the start-up company, so this differentiates contract manufacturing from licensing. Often the ordering party imports the manufactured goods into the domestic country to supply this market.

Therefore in contract manufacturing primarily the added value divisions of procurement and production are concerned, distributing the products is not regulated in fixed-term contracts. Dealing with contract manufacturing in this thesis is essential due to the

reason that in high-technology industries this method is widely spread. (e.g. Wu et al., 2005) Contract manufacturing might be advantageous if foreign production involves reduction in material and labor costs or if production capacity in the domestic market is exhausted. The latter is of particular importance in start-up firms and is treated in more detail in the following subchapters. But as with the prior described entry modes, there are also downsides of contract manufacturing. However, in the end the question remains if this mode is recommendable for a high-tech start-up.

4.4.3.1. Motives and Chances of Contract Manufacturing

Wu et al. (2005, p. 126) state in their study that especially in the high-tech industry *the management of capacity* is perhaps the most crucial factor for being able to achieve business success in the long run. Particularly for high-tech start-ups coping with capacity problems present a core mission. The high-tech industry is instable which means that demand cannot easily be forecasted. In addition the manufacturing capacity of start-ups is restricted and outsourcing production might be necessary anyway.

Contract manufacturing facilitates the problem of capacity by making the start-up more flexible and therefore capable managing uncertainty in an instable industry. By placing contract manufacturing the start-up is able to manage its innovations more tactically, and introduce the products at the right point in time due to *the manufacturing flexibility*. In high-tech start-ups capacity is commonly a shortfall factor, therefore contract manufacturing could improve that parameter. (Wu et al., 2005, p. 126f)

High-tech start-ups often consider contract manufacturing if the markets, it wants to enter, face *political instability*, *import restrictions* or if the foreign country offers *support programs*. (Kutschker and Schmid, 2005, p. 855f) All these factors could make contract manufacturing additionally attractive for high-tech start-ups.

Contract Manufacturing *brings down direct costs*, also if the high-tech company sells fewer products than it actually has planned for reaching economies of scale and scope. (Arruñada and Vázquez, 2006, p. 3f; Lüthje, 2002, p. 223) This cost reduction results from the fact that often contract manufacturer outputs similar products; from there they

can offer lower prices. (Arruñada and Vázquez, 2006, p. 3f) It is only logical that cost savings also occur if the contract manufacturer only produces part(s) of the entire product.

Besides the savings of expenses contract manufacturing enables the high-tech start-up to concentrate on its core and most remunerative task, namely being able *to focus primarily on R&D*. (Arruñada and Vázquez, 2006, p. 4)

4.4.3.2. Risks of Contract Manufacturing

Apart from the advantages of contract manufacturing for high-tech start-ups, there exist several risks in the case of concluding such a contract. A central issue here is the risk of *knowledge transfer* when the start-up decides that a foreign-based manufacturer produces parts or the entire product. (Perlitz and Seger, 2000, p. 102) *Know-how drain* and the possibility that the *contract manufacturer becomes* a prospective *competitor* present common problems in such agreements. It is obvious that these risks would be fatal for the start-up firm, as it is especially vulnerable at this stage and maybe not established enough for averting e.g. bankruptcy.

Arruñada and Vázquez (2006, p. 3f) claim that the possibility of *knowledge abuse and transfer* in manufacturing contracts is high. This can happen in various ways. As an example the contract manufacturer may produce for several companies and transfer the start-up's know-how to other clients. It has also occurred that the contract manufacturer established an own brand with the help of the client's technology and knowledge. Surely the start-up could protect its innovation through patents, resort to legal dispute or other actions against any abuse. "But none of these is a panacea" as Arruñada and Vázquez (2006) simply determine in their study. Especially if the attacked firm is in its start-up phase and is not able to afford a defense against the contract manufacturer. Another problem is that such a process simply takes too long and technology might be outdated after a trial.

Another risk that should not be underestimated when start-ups are closing a manufacturing contract is the *problem of coordination*. The business partner that

manufactures on behalf of the start-up has to be integrated into the firm's network. This integration presents a temporal effort and needs to be managed efficiently because the adequate market launch in high-technology based industries is a crucial factor. (Kutschker and Schmid, 2005, p. 856) Besides the coordination problem Lüthje (2002, p. 236) illustrates that *manufacturing knowledge cannot be transferred easily to every market*, due to the fact that sometimes certain domestic work, training and technologic tradition is enrooted in the home market.

Furthermore it is not warranted that the contract manufacturer (continuously) produces at the given and needed *quality standards*. Hence permanent quality controls have to be conducted. Besides, in contract manufacturing the start-up is reliant to a certain extent on the manufacturer. This *dependency* involves quality, delivery reliability and accuracy issues. (Perlitz and Seger, 2000, p. 103f) Here it becomes obvious that contract manufacturing can *damage the start-up's image* by not fulfilling the defined standards.

The subsequent critical examination deals with some possible proposals for solution if a high-tech start-up is involved in such a contract.

4.4.3.3. Critical Examination of Contract Manufacturing as International Entry Mode for a high-tech Start-up

Arruñada and Vázquez (2006, p. 1f) describe contract manufacturing as a double-edged sword. On the one hand it provides many advantages.
It is beneficial for achieving economies of scale and scope and is of prior importance when facing capacity problems, as start-ups commonly do. But on the other hand a contract manufacturer can damage the start-up to the core of its business by transferring the clients technological knowledge to other firms or simply profiting from this foreign know-how by establishing an own brand. So contract manufacturing exposes a potential risk on the start-up's intellectual property.

At the same time contract manufacturing might be the only way for a start-up ensuring production capacity to meet demand. As high-tech start-ups face lack of financial resources, they often simply cannot satisfy demand at this business development stage.

Thus the problematic situation of the high-tech start-up becomes apparent: The question arises how to manage this contradictory situation?

First of all the adequate business partner has to be evaluated by the start-up. This might not be a straightforward task, but conducting efficient and prior research and consideration could protect from later problems. Further the start-up always has to manage the relationship with the contract manufacturer in a way that the start-up does not become weak or the contract manufacturer too powerful.
This problem is treated by Arruñada and Vázquez (2006, p. 2) in more detail. The authors define some strategies for reaching this situation. The start-up should be cautious in circulating one's secrets, considering with which partners they do business, maintaining a rational level of intimacy and loyalty with the firm's business partners.

Besides Arruñada and Vázquez (2006, p. 4) state that a start-up should never outsource core competencies or processes the business relies on. If the firm for instance outsources the entire manufacturing it will sooner or later lose most of the production know-how. But at the same time this knowledge is required for controlling the contract manufacturer's work.

In addition a contract has to be defined according to the circumstances the start-up faces. If for instance the product is innovative, new and complex, as it is the case in the high-tech industry, the start-up should arrange a long-term contract with the contract manufacturer. The reasons therefore are for instance that in this circumstance a start-up is normally not able to find a substitute for the chosen contract manufacturer. The manufacturer is bound by the contract and cannot easily abandon the relationship. Long-term contracts additionally legitimate the high costs for establishing such a detailed and complex contract. (Arruñada and Vázquez, 2006, p. 5)

Summing up, contract manufacturing requires a close and trustful relationship with a reliable contract manufacturer in order to reduce the risks described before.
Such a contract requires an ongoing process of monitoring the business relationship, the manufacturer's reliability and the manufactured products' quality. This process has to

be accompanied by constant communication in both directions. Due to the fact that contract manufacturing frequently occurs in high-technology industry and especially in circumstances in which firms are confronted with limited capacity, it is crucial to pay enough attention to the business relationship.

4.4.4. Strategic Alliances

Strategic alliances are defined as a long-term and formalized relationship to one or more firms, with the aim of compensating own weaknesses by the strengths of the alliance partner(s). Thus the competitive situation of the firms within this strategic alliance can be ensured and in the long run improved. (Sydow, 1993, p. 63) A strategic alliance is described as cooperation due to the fact that the collaborating firms stay legally independent and the firm's economic co-operation is arranged by contractual agreements. (Welge and Al-Laham, 2001) Now the question remains if and when strategic alliances are relevant for high-tech start-ups including the chances and risks of this type of collaboration.

For a start-up with its rather limited resources the traditional go-it-alone model, when considering an international market entry, is unrealistic and in general far away from financeable (e.g. setting up a subsidiary as explained later). In particular technology-based start-ups are dependent on cooperation because the necessary investments for economic existence and growth normally cannot be fulfilled by the start-up alone. (Kelly, Schaan and Joncas, 2002, p. 11)

The global "explosion" of alliances over the last twenty years illustrates this necessity for cooperation in the knowledge-based economy. (Contractor and Lorange, 2002, p. 485) Further the classic one-to-one business relationships develop more and more to an extensive network of alliances. Especially in the high-tech sector nearly all incumbents are connected to each other in the form of networks of cooperative settlements. (Duysters et al., 1999, p. 347f)

In short the high-technology sector is characterized by high R&D investments, shorter product life cycles and intensified pressure to remain flexible and respond quickly to market changes and requirements. Hence strategic alliances become central to companies' competitive strategies for achieving these challenges. Careful attention has to be paid when developing such collaborations because this partnership can be defined as a highly sensitive strategic process. However alliances have several advantages for a start-up enterprise, illustrated in the next subchapter. Especially because its importance grows steadily.

4.4.4.1. Motives and Chances of Strategic Alliances

The motives and chances of strategic alliances are widespread, hence focusing on the high-tech start-up for narrowing these statements. It is difficult to determine which of the following motives are of greater importance compared to others. It always depends on the start-up and its situation.

One of the prime motives that at the same time act as a justification for including strategic alliances in this thesis is the reason for *developing new markets* and *accelerating the market entry* with the help of an alliance. (Kutschker and Schmid, 2005, p. 872) The characteristics of high-tech start-ups clearly demonstrate that for an international market entry higher resources are essential. In general more than a single start-up is available. Hence a strategic alliance offers the start-up the chance of growing outside the home market, which is an indispensable criteria for the existence and success of technology-based companies.

Considering this background a further motive for high-tech start-ups to decide on a strategic alliance with for example a competitor is the limited *access to resources and capacities*. Economies of scope and scale can be generated, which a single company could not obtain as easily. (Kutschker and Schmid, 2005, p. 871) As newly established and small technology-based firms need to mobilize external resources for being able to survive and grow, hence strategic alliances are of major interest.
These resources also include *skills and competences* that the start-up misses and which could be generated through the help of a strategic alliance. (Moensted, 2006, p. 19)

Start-ups consider strategic alliances as an effective strategy for *sharing risks, exchanging ideas, gaining professional insight* and *lowering uncertainty* in technology and market. High-tech start-ups face a high level of uncertainty and risk in conducting research and developing products that in the end just possibly have market potential. Hence developing strategic alliances at the stage of product development minimizes the risk of misjudging product and market attractiveness. (Moensted, 2006, p. 15f)

Duysters et al. (1999, p. 346) claim that firms constitute strategic alliances by being prepared for enormous external turbulences that are usual in the technology industry. Thus such cooperation in the end might lead to less uncertainty in the international market entry.

In addition strategic alliances offer a *flexible* collaboration with different business partners. Of course the decisions within such cooperation are defined in several agreements, but these can be adapted to new circumstances or in the worst case terminated. (Kutschker and Schmid, 2005, p. 872) Remaining flexible in the technology industry is of vital importance for a high-tech start-up.

Another decisive criterion for start-ups presents the ability to finance cooperation without putting oneself at risk of bankruptcy or dependency. For a strategic alliance just a *little demand for capital* is required which enables an implementation from a financial perspective.

Often *competitors become collaborators* through the formation of a strategic alliance. Through this market situation and competitors change to a certain extent. (Kutschker and Schmid, 2005, p. 872f) A start-up can profit by for instance *building up credibility* in the case of working together with a reputable industry partner.

4.4.4.2. Risks of Strategic Alliances

Besides the positive aspects of strategic alliances for a high-tech start-up when planning international market entry, there are many risks the firm has to pay attention to. When

the start-up plans to establish a strategic alliance the first problem that arises is the *risk of choosing the wrong partner(s)*. It is obvious that such a wrong decision can happen on both sides, start-ups may *overestimate the capabilities* of their potential business partners. The partner may turn out to be the wrong company for a specific purpose or is simply not willing to mobilize sufficient resources. In both cases the strategic alliance will not fulfill the aim for which it was created. (De Meyer, 1999, p. 327)

In addition one or both partners in the strategic alliance often have a *secret agenda*, a hidden plan that is known only by one part and not shared with the other partner(s). In the majority of alliances there is a difference between the published and agreed aim of the collaboration and the actual objects. Strategies often include parts of secrecy and confidential zones, but this at the same time compromises the success of a strategic alliance. (Nueno, 1999)

Companies also favor strategic alliances for *hiding weaknesses and problems* they are facing. As firms do not have enough insight into the partner's situation, intentions and goals, it may happen that for instance the true financial situation is hidden to a certain extent. (Nueno, 1999, p. 321)

Lack of trust between the partners in strategic alliances is a further common problem and often leads to the failure of such collaborations. Trust presents a key factor in business relationships and has to be built up conjointly from the very first day of planning the development of a strategic alliance together. Trust represents the confidence in the business partner and in the joint undertaking. Early uncertainties, disputes and tensions can precipitate mistrust and lead to an "us versus them" perspective. Hence trust has to be established from the beginning to maintain the collaboration. It can be seen as an enduring process. Especially in international strategic alliances it is extremely challenging to develop and protect trust. (Kelly et al., 2002, p. 11f)

In addition *cultural differences* in international alliances often cause risks in the stability of such collaborations. Differences in culture enhance the possibility of communication

and language barriers that might end in misunderstandings or failure of the strategic alliance. Cultural differences can initiate a broad range of additional costs like time expenses required for establishing the alliance and running it efficiently. (Kelly et al., 2002, p. 16)

Kelly et al. (2000) also states that especially in alliances between small and large technology-based firms *problems in bureaucratic and entrepreneurial culture* arise on a regular basis. Beyond that De Meyer (1999) states that considerable differences in size can be seen as an obstacle to success in a business corporation.

Further *know-how drain* presents another crucial risk in strategic alliances, especially for start-ups that are dependent on few capabilities. In the case of collaborating with a competitor it is possible that this firm easily gets access to fundamental knowledge on which the start-up relies on. (Nueno, 1999, p. 320f) This risk can be (partly) managed by the use of patents.

Besides, strategic alliances are often labeled as *incomplete acquisitions*. If for instance it is not possible to buy the other partner due to financial restrictions. (Nueno, 1999, p. 320f) This buying intention often occurs when there is a huge difference in size and market position of one alliance partner. It is not surprising that this risk of incomplete acquisitions arises often especially when start-ups are involved in a strategic alliance. Sometimes it is in the interest of a start-up being bought by e.g. a partner; hence a strategic alliance might be the logical step towards reaching this acquisition in the future. This is treated in the practical part in more detail.

The *difference in size and market position* also influences the stability of such collaborations. It is not unusual that the predominant partner (e.g. in terms of size, credibility, position in market) puts pressure on the start-up by forcing it to act in a certain way.
This could happen in different ways like forcing the start-up to focus on products and markets they actually would not consider attractive or pushing it to invest into areas of research the start-up has not intended to focus on. (Nueno, 1999, p. 321) Further in

technology-based corporations often the start-up just *gives off its innovative fruits of research* to the more established partner, which is not interested in sharing the success of the final product. (Powell, 1998)

Concluding, the *division of responsibilities* has to be monitored and met by the collaboration partners. Roles have to be defined and assigned carefully in order that no one within the corporation is passed over. Especially start-ups profit from an exact division of tasks and responsibilities, but on the other hand being ignored would have negative impacts on the corporation. (Kelly et al., 2002, p. 16)

Apparently creating a strategic alliance cannot be seen as "making a deal", it is by far more than this. It is a constant process of integration, communication and adaption, which is based on trust and common aims. In the scope of this thesis only the risks for a high-tech start-up are presented, it would go too far giving proposals for a solution.

4.4.4.3. Critical Examination of Strategic Alliances as International Entry Mode for a high-tech Start-up

Evaluating strategic alliances as an international market entry mode is not a straightforward task. The last two chapters highlight both positive and negative aspects of this entry mode for a high-technology based start-up. To begin with, it is discussed that the high-tech industry is a global market, hence entering several foreign markets is necessary. Corporations might be a comprehensible step towards internationalization, but the question remains if it is an adequate decision? Kelly et al. (2002, p. 20) state that strategic alliances increasingly lead to a competitive advantage for companies, but is this valid also for high-tech start-ups?

From a financial perspective establishing a strategic alliance as a high-tech start-up is within the realms of possibility. The lack of resources that the new established firm faces would also welcome this type of flexible collaboration. Sunken costs could be avoided or split between the partners. This seems to be financially rewarding in high-technology businesses as extensive investments for establishing foreign market entries are necessary.

Further in today's economic interfirm corporations are widely used and far from being a rarity, a kind of "explosion" of alliances has occurred over the last years. One possible reason might be that firms consider their internal knowledge as insufficient, especially in the technology industry. In addition companies concentrate more on their "core competence" which again increases the need for external collaborations to fulfill the market demands.

It is quite evident that the existence of strategic alliances and its increasing dissemination is traceable. But this method involves many risks and downsides, especially for high-tech start-ups. Often the aspirations of the partners are greater than the resources they invest in, mostly when a start-up cooperates with a larger, more established firm.

Nueno (1999, p. 321) concludes in his study that a strategic alliance is only meaningful and advisable if the start-up owns sufficient core competencies to differentiate itself from the partner(s). In addition a start-up has to secure that it has enough fundamentals and the required critical mass of resources to maintain its business. If this is not the case, then the start-up has to obtain these immediately because this kind of dependency would not be beneficial in strategic alliances. Quite the contrary, Nueno (1999) further states that it is dangerous being reliant on strategic alliances for gathering basic strategic know-how. In this certain case a start-up should prefer being acquired by another firm.

This study shares the skeptical approach if start-ups consider entering strategic alliances. A win-win collaboration in the long run is challenging to achieve, the start-up is obviously not established enough for entering an equitable corporation.

The positive aspects attract new established companies, but risks in this phase should not be underestimated. Before taking a step towards this entry mode, a comprehensive evaluation of the start-up's business situation, the partner(s) involved, the aims and the reasons for collaboration have to be conducted.

4.4.5. Joint Ventures

If a high-tech start-up decides to enter international markets by establishing a joint venture, it has to set up a new enterprise conjointly with its partner(s). This newly created enterprise is settled in a foreign market in the case of an international joint venture, which is the main focus in this thesis. For this kind of cooperation literature is very comprehensive, as many different types of joint ventures exist. (Kutschker and Schmid, 2005) Here the different alternatives are illustrated:

- The number of cooperation partners often varies within a joint venture.
- The cooperation fields often vary (from a single function to total value chain).
- Location of a joint venture could be in a third country, in the home market of the high-tech start-up or that of the joint venture partner.
- Geographical scope of joint venture varies (from single country to world market).
- Different integration level of joint ventures (horizontal, vertical or conglomerate cooperation).
- The temporal existence of joint ventures may vary (temporary or indefinite).

Besides these different specifications and features, summarized by Kutschker and Schmid (2005, p. 860f), some further special types of joint ventures exist. Due to this high number of different specification possibilities, it is hardly possible to evaluate precisely joint venture as an international market entry mode at all and especially not in the case of high-tech start-ups. Besides, the motives and risks are very similar to those of the strategic alliance. For avoiding repetition, this chapter is based on the most essential criteria of joint ventures, which is the planning and the implementation of this mode especially for high-tech start-ups.

4.4.5.1. Motives and Chances of Joint Ventures

Due to the similarity to strategic alliances and for avoiding repetition this chapter is shortened to the most important information for high-tech start-ups. In some cases a joint venture may be an *alternative for export* if the chosen foreign market is restricted by for example *import bans*. (Börsig and Baumgarten, 2002, p. 555f)

An essential criterion for high-tech start-ups demonstrates the rapidness of foreign market entry. Joint ventures may offer an *accelerated market entry*. If special market knowledge is necessary, this kind of entry mode may have advantages. Sometimes foreign *firms are not accepted* in countries; when cooperating with a local partner the high-tech start-up's products would be accepted faster and more willingly. (Kutschker and Schmid, 2005, p. 863)

In the special case of high-tech start-ups joint ventures make it possible to obtain *economies of scale and scope*, which is hardly or very complicated to reach at an early business development stage. *Expenditures on R&D and the complexity of technology* can be *managed and split* within the joint venture, which might be interesting for start-ups due to its financial and human resource restrictions. (Glowik, 2008, p. 81)

In high-tech industry the required technological expertise for developing products is often beyond a single firm. Hence if companies in the joint venture *bring together their technological know-how*, this could lead to new products, which couldn't be developed by one single firm. Partners may conduct *joint research and development* that stimulates innovation and utilize resources more efficiently. (Glowik, 2008, p. 82)

4.4.5.2. Risks of Joint Ventures

Here again the risks are similar to those of the strategic alliances. Crucial for the success of a joint venture is the *existence of trust* between the partners. This is more a complex process of establishing confidence than a straightforward task. It has to be ensured that partners concentrate on adequate values and inter-organizational relations. (Newburry and Zeira, 1997, p. 96f)

Additionally the *effort to manage a joint venture* should not be underestimated. Here a start-up often faces its limits for being able to fulfill this task due to missing resources. Further the start-up has to be capable of adopting the gathered external know-how from the partner and absorb it into the own organization. (Glowik, 2008, p. 82) This seems to be a logical process but a start-up is often *overwhelmed by the complexity of the processes and tasks*.

Glowik (2008, p. 82) further states that *organizational instability* is a multi-faceted risk in joint ventures, especially if partners are of different size or at unequal levels of development. This results from different situations as for example the position taken by the partner, lack of trust and adequate organizational structures or undetermined decision authority.

Yan and Gray (2001, p. 411f) claim that in joint ventures often the partners do not share the same objectives and motives. The authors further state that this cooperation includes competitive and cooperative perspectives at the same time by participating partners. Yan and Gray (2001, p. 411) define this as a "mixed-motive situation".

Further challenges for the start-up are *problems of evaluating the adequate partner, know-how drain, instability and performance measurement*. (Kutschker and Schmid, 2005, p. 867f)

4.4.5.3. Critical Examination of Joint Ventures as International Entry Mode for a high-tech Start-up

Based on the included information of the chapters treating the motives and risks of joint ventures, it is difficult to give a concrete evaluation whether a high-tech start-up should or should not apply this mode. Several different specifications of joint ventures exist, which make it impossible to narrow down arguments to a precise recommendation.

The critical examination of joint ventures is very similar to the one of strategic alliances, but includes a few decisive distinctions. First, this entry mode is more resource intense compared to strategic alliances. Joint ventures need the appropriate support of management and adequate personnel resources (e.g. expatriate managers). (Kutschker and Schmid, 2005, p. 866) This might be hard to realize as high-tech start-ups at this stage rely on a few and irreplaceable persons. But a key criterion in joint ventures presumes the availability of personnel resources for establishing and maintaining this mode.

In addition, the instability of a joint venture complicates an international market entry enormously. Especially start-ups face inconstancy due to their less established processes. Combining this situation with the establishment of a joint venture would not enhance the economic duration of a high-tech firm. Many authors treat the major problem of instability as Das/Teng (2000).

As described in the critical examination of strategic alliances, know-how drain presents a further risk in joint ventures. Particularly in the high technology industry the developed and gathered knowledge and experience constitutes the core of start-ups. High-tech start-ups in general have just a few core competencies. If this (mostly tacit) know-how and experience is shared with a partner, this could put the smaller entity at high risk. (e.g. Kutschker and Schmid, 2005, p. 869) Furthermore the partner may poach employees from the start-up.

Apart from the downsides of joint ventures, there are also positive aspects for high-tech start-ups considering this entry mode. But a joint venture simply requires certain conditions, which are very difficult to obtain in new firms. A joint venture might accelerate the foreign market entry, would partly split capital demand between partners for R&D. Additionally learning from the cooperation partners is possible. But all these positive aspects assume that the start-up is able to manage this entry mode. Due to the high-tech start-up's less established economic development stage a joint venture might not be the accurate entry mode at this stage of establishment, as it requires circumstances a start-up at this stage cannot provide. When comparing joint ventures to strategic alliances, the latter would be more recommendable, if the preconditions are fulfilled by the high-tech start-up (compare chapter 4.4.4.3.).

4.4.6. Wholly Owned Subsidiaries

Table 3 on page 52 illustrates possible market entry modes in general by Perlitz and Seger (2000, p. 93) and direct investment presents an additional category. This includes on the one hand wholly owned subsidiaries and on the other hand joint ventures (treated in chapter 4.4.5.), both entry modes with possible different specifications. Figure 1 clearly demonstrates that wholly owned subsidiaries and joint ventures require additional capital and management resources, which have to be invested in the chosen foreign market(s). Often at this stage of business development start-ups are not able to enter markets with resource intensive entry modes, but studies exist that claim that both are of importance for high-tech start-ups. Hence including these modes in this study presents a necessity for completeness.

This chapter treats the fourth entry mode that is interesting for high-tech start-ups in more detail. Glowik (2008, p. 86) defines a wholly owned subsidiary as a "firm that owns all capital invested abroad such as procurement, R&D, sales and production facilities." The enterprise can decide between establishing a new affiliate (also called Greenfield) or acquiring an existent company in foreign markets (so called Brownfield). Glowik (2008, p. 87f) and Brouthers and Brouthers (1999, p. 96) rate the possibility higher that small firms, which are active in the field of technology, establish a new

organization (also: Greenfield) compared to acquiring a developed firm. Hence this thesis focuses here on Greenfield investments. When setting up an organization abroad the company usually sends expatriates, whose task is to supervise the progress of business development and also the hiring process of local employees. (Glowik, 2008, p. 87)

4.4.6.1. Motives and Chances of Wholly Owned Subsidiaries

One of the most important motives in general for deciding for a wholly owned subsidiary is the reason of *control*. Those established subsidiaries belong one hundred percent to the firm, hence decision making authority remains within the organization. Control also means that quality can easily be supervised and the firm can react rapidly to market changes and trends. (Glowik, 2008, p. 87f)

Another decisive motive for establishing a wholly owned subsidiary is that the firm has *no expenditures for observing its business partners* like in cooperation modes as strategic alliances. Hence all the risks that are caused by cooperation are not significant in the case of setting up an organization. Cooperation covers several decisive problems, for instance the risk that the partner violates terms of an agreement. (Cannice et al., 2003, p. 171f) Additional risks are described in detail in all chapters that treat entry modes of business cooperation.

The delicate issue of *protecting intellectual property rights* is another motive why firms enter foreign markets by establishing a wholly owned subsidiary. As conducted in chapter 4.4.2.1. more precisely, intellectual property can be evaluated as the core of high-tech start-up's business, hence protecting it is one of the firm's main challenges. Cannice et al. (2003, p. 171) claim that it's a motive for high-technology based firms keeping their technology within their organization. If it becomes publicly accessible the benefit and usefulness drops immediately. As described in the chapter concerning the significance of patents, the risk of violating intellectual property rights cannot be removed totally. Cannice et al. (2003) argue in their study that in markets like China protection of intellectual property, also within wholly owned subsidiaries, remains difficult. Definitely it depends on the type of product if copying is possible or not.

From a structural perspective wholly owned subsidiaries have the advantage of being *integrated rather easily into the entire organization* and its structure.
This is another advantage compared to the Brownfield possibility firms have when deciding for this entry mode because integrating an established entity might be more difficult compared to a new one. From a strategic perspective through the establishment of a wholly owned subsidiary the firm is able to *follow the same business strategy* in the chosen foreign market. (Kutschker and Schmid, 2005, p. 883)

In the case of high-technology based firms it is decisive that *technologies remain up-to-date or can be developed further*. All these can be realized by the set up of a new organization abroad, hence the start-up is able to develop innovations, which is a precondition for business existence. (According to Kutschker and Schmid, 2005, p. 883).

4.4.6.2. Risks of Wholly Owned Subsidiaries

Besides the positive aspects of wholly owned subsidiaries, risks also exist, which are especially of prior importance for start-ups. These problems are treated here in this subchapter.

Welge and Holtbrügge (2006, p. 112) state that wholly owned subsidiaries in foreign markets *require enormous capital expenditures* and involve *high economical and political risk*. Resources are tied up for a long duration and the firm's flexibility is constricted dramatically. All these factors affect the high-tech start-up's business negatively. Furthermore the start-up does not have the access to sufficient financial resources for such a highly resource intensive organization set up.

Besides the problem of excessive financial expenditures the establishment of wholly owned subsidiaries is very *time-consuming*. The start-up phase is a long haul and the actually planned stage of expansion to international markets is not reached before a couple of years. (Kutschker and Schmid, 2005, p. 884) Hence expenditures for the set up of a wholly owned subsidiary incur a long time before the firm has the chance of

making profits and amortizing its expenses. This is especially problematic for start-up firms, as they have to generate returns on investments rather rapidly to be able to grow further. So *economies of scale* cannot be earned before the planned stage of expansion is reached.

4.4.6.3. Critical Examination of Wholly Owned Subsidiaries as International Entry Mode for a high-tech Start-up

Wholly owned subsidiaries as defined in the definition by Glowik (2008, p. 86) are the most risky and long-ranging direct investments a start-up could decide on. This entry mode requires enormous financial resources that a high-tech start-up does not usually have available.

To sum it up, this type presents a high-risk internationalization entry mode especially if the entire value chain is integrated. It should only be considered after gaining experience in lower-risk entry modes as licensing or exporting. (Johanson and Vahlne, 1977) Hence setting up wholly owned subsidiaries at the start-up phase of a firm is not recommendable and also not widespread for an entire production abroad.

Alternatively a start-up could establish an organization abroad that is restricted to some few divisions of value creation. As an example a high-tech start-up could set up solely a sales organization abroad, which is more resource friendly. Further production and process know-how remain in the home market. This option is far more advisable to implement compared to a wholly owned subsidiary, which covers entire production, R&D, procurement and sales. The high-tech start-up should implement an entry option that fits to the actual business development stage of the firm. A sales subsidiary is a more appropriate entry mode at this stage.

4.5. Timing of International Market Entry (Peter Nemes)

This thesis shares the idea of for example Welge and Holtbrügge (2006, p. 135) that the adequate choice of the market entry time is the third and at the same time last decision made within an internationalization strategy. This chapter evaluates the applicability of the two different strategies, namely the first mover and follower strategy, in the case of high-tech start-ups. In addition there is some more general analysis concerning the adequate timing of an international market entry for high-technology based start-up firms.

Starting with the latter topic, Bürgel et al. (2001) state that for high-tech start-ups the question is *not whether* they enter foreign markets, it is more *when* they decide on internationalization. If companies spend a large proportion of their efforts on R&D, then such firms in general prefer rapid internationalization. This statement fits the characteristics of high-tech start-ups, which can be described as industries that are internationalized to a large extent and their competitive environment has a worldwide scope. An additional motive that supports the rather high-speed of internationalization of technological based start-ups is the capability and force of introducing technological innovations. This argumentation is very generally applicable. Of course factors exist that lead to a quicker or rather slow-going market entry.

Bürgel et al. (2001, p. 7f) define in their study drivers that influence the speed and timing of the foreign market entry. The most relevant for high-tech start-ups are listed as follows:

- *Country-specific differences*: Start-ups rapidly enter markets that are similar to the home market, for example Germany and Austria.
- *Industry Effects*: In the high technology industry the own market is often small in size (e.g. medical equipment) hence firms prefer a quick foreign market entry to increase.
- *Firm Size*: larger start-ups enter foreign markets more rapidly compared to smaller ones.

- *Kind of Technology*: R&D intensive firms in general with higher R&D expenditures internationalize quicker than firms with lower expenditures. Technological superiority also increases the speed of foreign market entry.
- *Know*-how *and Experience*: If the start-up's management has access to a personal network, business contacts and international experience, a firm is able to internationalize more rapidly.

It is obvious that the characteristics of start-ups only allow for a limited speed of internationalization. Those businesses face many restrictions in terms of financial and personnel resources. But due to the fact that the timing presents the last step in the internationalization strategy these drawbacks can be reduced by choosing the adequate entry location and mode.

Autio et al. (2000, p. 919) concentrate on the adequate speed of internationalization for a high-technology based start-up. In general entering foreign markets by taking small steps is reasonable because a step-by-step learning approach can be realized. This might be logical but it is theoretically not the most effective procedure for high-tech start-ups. Ideally these firms conduct quick and large steps towards internationalization to avoid missing opportunities. Theoretically this seems to be the ideal case, but at the same time impossible to put it into practice as the start-up faces for instance resource restrictions. Autio et al. recommend start-ups take small and incremental steps that are taken faster than older firms do.

So the question how to internationalize in terms of speed can be answered. Now it is interesting if a high-tech start-up should rather be a first mover or an early and smart follower.

4.5.1. First Mover or an Early and Smart Follower?

Many theorists consider this question differently. Problems arise for instance how to measure the potential first mover advantage. Even some experts state that in fact such a benefit does not exist. This chapter concentrates on how a high-tech start-up in general should enter an already chosen foreign market in terms of time. This is based on the characteristics, limitations and advantages of such business types.

Due to the fact that start-ups have a limited and narrow product portfolio, they rely on few, but at the same time innovative products. Hence it is comprehensible that they cannot wait until a competitor enters the chosen market with the same or a similar technology. Choosing the "wait-and-see-strategy" can put the start-up's survival at risk. Apart from this the competitive situation in a particular high-tech area is in addition questionable (for example existence of competitors) and differs extremely between technology branches.

Surely the first entrant faces higher uncertainty and risk when entering a market. But on the other hand the smaller and more flexible start-up in general enters a foreign market as a pioneer for gaining time advance and for skimming profits from being the first. (Meffert and Pues, 2002, p. 412) Agarwal (1996) claims that in some industries being the first is of greater importance compared to other industries. He further states that in the high technology industry the first mover strategy is decisive for the survival of the firm. Agarwal (1996) is also convinced that the viability rate of high-tech start-ups is higher if they are the first in a market compared to most other industries.

The high-tech start-up profits from a pioneer strategy by acquiring experience and benefits during the *first mover monopoly period*. The duration of the monopoly period cannot be estimated because it is dependent on the market attractiveness of the foreign country. For the competitor the level of difficulty to enter the same market has an impact on the length of the monopoly period. Especially in high technology industries patents can extend this period, which increases the first mover advantage. A first mover

monopoly period is very lucrative for the start-up, as for instance market share and the awareness level can be improved. (Knuutila, 2003)

Knuutila (2003) specifies the determinants favoring a first mover strategy that suit well to the high-technology branch:

- Very few early followers
- Small industry growth rate
- Very high-tech oriented industry
- Very capital-intensive industry
- Short product life cycles
- Low potential for competitors to copy product

This listing in addition confirms the high-tech start-up in choosing the first mover strategy when timing an international market entry.

But it is obvious that the pros and cons of entering a foreign market as a first entrant should be weighed up against the possibility of entering as an early follower. Applying this pioneer strategy does not automatically lead to business and internationalization success in any case; it is also dependent on the qualification of the management. Hamel (2001) states that successful timing relies on whether smart or dumb movers are responsible for the entry.

To sum it up the theoretical consideration of the adequate timing of an international market entry conducted by a high-tech start-up should be earlier and faster compared to older firms. Small, incremental, quick and considered steps in general are recommendable for a new established high-tech firm, combined with a first mover strategy when targeting effective foreign market timing.

5. Synoptical Table (Marlene Wiedorn, Peter Nemes)

The following table includes a summary and overview of all in chapter four presented market entry modes including further arguments of the internationalization theories. The first column demonstrates various conditions that favor the specific entry mode. Furthermore the table illustrates motives, advantages, risks and challenges, which are triggered by a high-tech start-up when choosing a certain entry mode. The table is sorted from low equity entry modes to more resource-intensive ones. Further the table is not exhaustive, it rather presents significant criteria for high-tech start-ups when they internationalize and have to evaluate different entry modes. Hence in this chapter all the before included and most important information for high-technology based start-ups is summarized.

Comparison of foreign market entry modes for high-tech start-up firms

Equity Level	Mode	Conditions favoring	Motives/Advantages	Risks/Challenges/Problems	Theories included	
					theory	argument (+ = for, - = against entry mode)
	Direct Export	- shrinking foreign country regulation	- flexible and fast	- liability of foreignness	- TCA model	- potential misuse of propietary know-how
		- if market not top priority	- low financial risk and involvement	- detoriation of currency		- behaviorial uncertainties; entry mode might lead to oportunistic behaviour
		- government stimulation	- high control	- less information of market conditions		+ inexpirienced start-ups can not deploy hierarchial controlling systems
		- unrequested order	- most straightforward mode			+ in high environmental uncertainty flexibility is more important
		- unsold stock	- cost effective		- SD model	+ missing international experience would favor export because it involves the lowest risk potential
		- usable manufacturing capacity	- capitalizes PLC efficiently			- internationally experienced companies could skip this stage, and use more risky entry modes
		- commercialization orientation	- no know-how drain		- OLI model	- if there are locational advantages companies would prefer equity entry modes
						+ if there are no locational advantages companies would prefer Export as an entry mode
						- enforcement of contracts too expensive to stay with low control modes
			- increases ROI effieciently			
	Indirect Export	- deregulation of international markets	- low financial risk	- low control over e.g. sales activity	- OC model	-/+ degree of international experience has an implication on the channel integration
		- geographic and psychic distance	- low involvment	- little marketability		+ the firm size has an implication on the degree of channel integration
		- government stimulation	- relatively flexible	- dependent on distributor		- as high-tech start-ups follow differantiation strategy the OC model implies a higher channel integration
		- need for relationships/contacts	- partner that is familiar with market	- not fulfilling distributor's requirements		
		- usable manufacturing capacity	- fast (more markets at once)			
		- lack of knowledge in foreign trade	- establish contacts/relationships			
		- cultural discrepancies	- utilize intermediary reputation			
	Licensing	- availability of approved patents	- demanding lump sums/royalties	- choice of right licensee		
		- orientation towards cooperation	- lack of financial resources apart from R&D resources	- formulation of adequate agreement		
		- focus on R&D and not production		- problem of know-how drain		
		- entry of smaller and fringe markets	- tariff/non-tariff barriers less important	- search costs for adequate partner		
		- entry of politically/economically instable markets	- requires neither high financial nor personnel resources	- restricted influence on licensee holder and corporate policy		
		- need for additional entry mode besides others already applied	- additional contribution to faster amortization of R&D expenditures	- possible negative impact on start-up (due to e.g. insufficient quality)		
			- profit from licensee's network	- licensee as future competitor		

Contract Manufacturing	- start-up faces capacity problem	- able to handle instable demand	- problem of knowledge transfer		
	- demand cannot easily be forecasted	- manage capacity restrictions economica	- risk of know-how drain and abuse		
	- foreign market faces political instability, import restrictions, offers support programs	- improves manufacturing flexibility (e.g. manage innovations more tactically)	- contract manufacturer could become prospective competitor (by own brand)		
	- not necessary to outsource start-up's core competencies or processes it relies on	- able to achieve economies of scale and scope more efficiently	- problem to evaluate/find the adequate partner for a long-term contract		
	- manufacturing knowlege is not enrooted in a certain market	- direct costs reduction	- creates dependency (quality, delivery reliability, accuracy issues)		
			- problem to coordinate contract manuf.		
			- partner doesn't produce at arranged quality standards		
Strategic Alliances	- orientation towards long-term and formalized cooperation	- developing new markets and accelerating market entry	- underestimation ongoing effort for maintaining successful collaboration		
	- aim of compensating weaknesses by strengths of alliance partner(s)	- sharing risks and lowering uncertainty in technology and market	- partner(s) hiding weaknesses and problems		
	- if go-it-alone strategy is not financeabl	- less uncertain market entry	- possible secret agenda of partner(s)		
	- limited access to resources and capabilities	- exchange of ideas and gaining profession insight	- difference in size and position of partners could lead to instability		
	- lack of credibility and reputation	- rather flexible collaboration	- overestimation of partner(s) capabilities		
	- availability of sufficient core competencies	- competitors become collaborators	- choice of adequate partner(s)		
			- know-how drain		
			- lack of trust		
			- incomplete acquisition?		

Joint Ventures	- orientation towards long-term cooperation by setting up new enterprise with partners	- expenditures on R&D and technological complexity can be managed and split	- crucial for success is existence of trust between partners	- TCA model	+ greater control over proprietary know-how
	- aim of compensating weaknesses by strengths of alliance partner(s)	- merging technology and know-how and hence new products could be developed	- establishment and maintainance is complex and ongoing process		+ if internal organizational costs are lower than market costs it will be efficient for a company to organize itself in a hierarchy
	- if considered entry market is restricted by import bans	- new products developed that could not be developed by one single firm	- lack of resources for establishing and maintaining JV (personell, financial)		-/+high-tech start-ups need international control related experience to establish control mechanisms
		- joint R&D stimulates innovation	- risk of organizational instability (e.g. if partners are of different size)		
		- utilizing resources more efficiently	- risk of "mixed-motive-situation"	- SD model	+ Only with increased knowledge and experience of the opportunities and challenges of international expansion higher risk forms will be chosen
			- problem of start-up's not established economic development stage		- firms start their foreign operations from culturally and/or geographically close countries and move gradually to culturally and geographically more distant countries
			- problem of know-how drain, instability and performance measurement		- Internationalization takes place according to the Establishment Chain and the Physic Distance Chain
Wholly Owned Subsidaries	- if set up won't put company at risk of bankruptcy or economic survival	- control and decision making authority remains at start-up	- enourmous capital is required hence high economical/political risk involved	- OLI model	+ if there are locational advantages companies would prefer equity entry modes
	- already gained experience in lower-risk entry modes	- able to react rapidly to market changes and trends	- resources are tied up of long duration hence risk of loosing flexibility exists		+ enforcement of contracts too expensive to stay with low control modes
	- organization abroad should only manage few divisions of value creation (e.g. sales)	- no expenditures for observing partner(s	- expenditures for set up incur long before earning profit with WOS	- OC model	-/+ degree of international experience has an implication on the channel integration
	- technologies have to be further developed and new set up should handle this	- can be integrated easily into entire organization	- mode with highest risk if covers entire value chain		- the firm size has an implication on the degree of channel integration
		- reduces know-how drain	- longsome process until WOS is ready		+ as high-tech start-ups follow differantiation strategy the OC model implies a higher channel integration

6. Case Study Methodology

The thesis' practical part is based on case analysis research. Although this methodology faces many criticism, for instance due to the lack of generalizing findings, it is applied in this thesis. Also because there are situations or cases that perfectly fit to this certain methodology. As for example Feagin recommends that if there is need for an integrated and in-depth investigation, qualitative research should be used for analyzing a problem set. (Feagin et al., 1991)

Case study research satisfies three principles of qualitative analysis: Describing, understanding and explaining, which is an essential goal of this thesis. Complex phenomena, as the internationalization, are described by case analysis. Based on that, differences from the theoretical part and explanations therefore can be elaborated. (Locke, 2001, p. 95f)

In addition a comprehensive analysis is necessary due to the complexity of the internationalization process itself. A case study analysis allows for open questions, which is helpful in studying relations and causes.

Case study research uncovers information from respondents' standpoint including different sources of data. This thesis focuses on in-depth interviews with founders and/or entrepreneurs of high-tech companies in the industry of medical engineering.
In addition information from newspaper articles and administrative documents are included. The decision for having involved different types of sources is based on the aim to ensure construct validity (Yin, 1994)

6.1. Case Study's Starting Point: Aim and Research Questions (Marlene Wiedorn, Peter Nemes)

The aim of the case study analysis is to point out if differences exist in internationalization arguments, problems, risks and chances in theory compared to the practical conduction. A lot of literature treating internationalization of SMEs and start-

up companies exist. Some information incorporates in particular high-tech start-ups, but is mostly based on Nordic countries (e.g. Sweden) and on English speaking countries. Smaller European markets like Austria and Hungary are not treated in empirical studies.

Due to the reason that the authors were born and raised in those countries the decision for choosing these familiar markets can be seen as a logic way for avoiding misunderstandings and barriers. In addition these markets are smaller in size; hence studying these could deliver deeper insights and new findings for these countries.

- For a deeper understanding chapter four examines high-tech start-ups' internationalization strategy more precisely.
- The summarized findings of theoretical arguments for the adequate internationalization strategy of high-tech start-ups are described in chapter five.
- This case analysis is based on the gathered theoretical arguments, hence demonstrating the consistence between theoretical and applied investigation is seen as the aim of this study.

The following **research questions** should be answered on the basis of this case study research:

- What are the motives and hurdles of internationalization of high-tech firms practically in comparison to theoretical stimuli? *(Theoretical investigation: chapter 4.1. and 4.2.)*
- Which entry modes are preferred by high-tech start-ups in practice? Hence are the motives therefore the same compared to the ones illustrated by theoretical investigation? *(Theoretical investigation: chapter 4.4.)*
- How does the entrepreneur evaluate the different entry modes concerning chances, risks and the possibility/suggestion applying them in which situation? *(Theoretical investigation: chapter 5 – aggregated table)*
- When and in which market(s) did the interviewed high-tech enterprises internationalize? Did the internationalization process follow the theoretical recommendations? *(Theoretical investigation: chapter 4.3. und 4.5.)*

- How do they evaluate the "Born Global" approach in practice? (*Theoretical investigation: chapter: 4.3.1.)*
- Overall estimation: Is there a general fit of theoretical arguments to the practical investigation?

Subsequently the industry of medical engineering in Austria and Hungary is described more precisely. Afterwards the case study findings for the two firms, namely the Austrian high-tech firm Anagnostics Bioanalysis GmbH and the Hungarian start-up Thor Medical Systems Kft are presented. In the final step there is a conclusion with a comparison between the chosen high-tech firms.

6.2. Industry of Medical Technology in Austria and Hungary (Marlene Wiedorn, Peter Nemes)

This thesis focuses in its practical part on the industry of medical technology, an important sector of the high-tech industry. This branch is an innovative, multifaceted and still growth oriented global industry. Despite the economic and financial crisis this market appears to be rather independent from cyclical fluctuations and from market crises. Due to the actual demographic development, the demand for innovative and technological medical products will rise in the future. The main causes are the increased life expectancy, the extended duration of diseases and the rising need in care resulting from the increasing average age of society. (AWO, 2009)

These factors were decisive for the decision to focus on the sector of medical technology. When analyzing the market situation of medical technology in Austria and Hungary, it quickly turned out that in both markets important born globals are active and successful. To name only a few of such enterprises in Austria: Roche Diagnostics GmbH which focuses on critical care medicine, Philips Ltd. developing Speech Recognition Systems, Greiner Bio-One International AG specializing on preanalytic technology, Akatech GmbH which manufactures for instance optoelectronic full blood analysis devices or Afreeze GmbH that produces cryablation catheters. All these

companies became product specialists in a global niche and their key to success relies very much on internationalization.

Further it is interesting that all mentioned Austrian medical technology companies offer a wide scope of solutions. These include installation of the product or system, consulting and services. They rely on their networks and cooperation with universities. In Austria several medical technology clusters exist such as Ecoplus (Lower Austria), Human Technology Styria, Life Science Austria Vienna Region, Tyrolean Future Foundation and Life Science Cluster, and Upper Austrian Technology and Marketing Company (TMG & Health Technology Cluster). In 2008 about 800 enterprises in Austria offered consulting, engineering or other services in this field of medical technology. (LISA, 2008)

Compared to other markets like Germany, Austria at the moment seems to be far behind looking at the quantity side. In the sector of medical engineering about 110,000 people are employed in Germany, in Austria just around 6,000.

Austrian companies sparsely use the chance of being part in one of the world's most interesting growth markets, with 1.4 % of European's total employees dedicated to this industry. At the moment the global market volume of medical technology is around 200 billion euro. Hence the medical engineering market is an attractive and growing future industry. Some experts are convinced that Austria has the potential to become an important player in this field of industry. According to these experts Austrian companies are used to fulfill high quality standards despite the higher production output levels. These characteristics can be observed in the automotive supply industry in which Austrian companies are very important. (Bauer et al., 2010)

The Hungarian medical technology industry is comparable to the Austrian sector. About 4,250 employees are active in the field of medical technology, 1.0% of total employees in the European Union. According to the Eucomed Member Association about 434,560 employees are engaged in the European Union medical technology up to now.

(Eucomed, 2007) It is obvious that both markets, Austria and Hungary, are rather small players in this global industry.

Compared to Austria in Hungary two important clusters exist, the so-called MediCluster, which is specialized in medical technology, and the Budapest MediPólus Cluster, which focuses on Life Sciences. The former is based on a network of profit and non-profit oriented enterprises and institutions. Further it includes Hungarian key players in the medical technology sector, all owned by Hungarian players with the aim to offer high-quality medical solutions. Budapest MediPólus Cluster in an important network in the life science sector formed in 2008 with domestic and international members active in the health care sector. (ITDH, 2010)

Besides these clusters some important associations exist like the Association of Medical Technology Manufacturers and Suppliers (OSZ). Members of this association are Hungarian and international organizations, mainly the top fifty manufacturers and suppliers in this sector. (IDTH, 2010).

Some economically successful enterprises are for instance the Medicor Group, which manufactures medical equipment, Innomed Medical Zrt., which focuses on the research of cardiology and defibrillator technology. 77 Elektronika Kft. produces reflexive photometers and reagents for measuring blood sugar for the home and professional use. (IDTH, 2010, p. 4f)

The fact that the medical technology sector is rather independent from financial and economic crises is valid for Hungarian medical companies as well. According to IDTH (2010) enterprises in the medical technology sector achieved an increase of more than ten percent in revenue during the last five years. To sum up, both countries have rather small players comparing it to the global medical technology industry.

Despite this deficit both countries have important national and international companies that develop and manufacture innovative medical solutions. But considered from a global perspective are rather lagging behind.

Experts forecast a huge growth potential for this industry, as a consequence profiting from this increase should be the main interest for both markets. One further reason for focusing on companies in the medical technology in this thesis is the huge prospect of sales potential which has not been exploited yet.

6.3. Case Study 1: Anagnostics Bioanalysis GmbH (Austria) (Marlene Wiedorn)

The first company included and analyzed in this study is the Austrian high-tech start-up Anagnostics Bioanalysis GmbH. First there is a company overview and short introduction, followed by the case analysis and comparison to the theoretical part of this thesis. The following information is taken from the personal interview that is included in the appendix, website and press publications.

6.3.1. Company Profile

Anagnostics Bioanalysis GmbH was founded in 2005 in Linz by Dr. Bernhard Ronacher and Mag. Christoph Reschreiter. Dr. Ronacher delivered the product idea and carries the technical know-how and Mag. Reschreiter is business manager with international experience, financial and administrative know-how. At the moment Anagnostics is located in St. Valentin (Upper Austria) and has ten employees. Mag. Markus Jaquemar joined the company in June 2009 and is responsible for sales and marketing. Mag. Jaquemar studied Biology at the University of Vienna and has more than 19 years experience of life science industry and is an internationally experienced sales and marketing professional. The interview was conducted with Mag. Jaquemar who is an expert for questions about business internationalization and commercialization. Dr. Ronacher, Mag. Reschreiter and Mag. Jaquemar together form the management team.

To give a review, at the moment six employees are responsible for R&D with university background of biochemistry, biology and mechatronics. The remaining four are involved in administrative and business tasks. Personnel costs demonstrate the highest

cost factor for Anagnostics, followed by the variable costs of the device itself, which costs 70,000 euro per unit at the moment.

Anagnostics is specialized in developing solutions for two markets, for the clinical in-vitro-diagnostics and life science research market. The firm provides innovative solutions with the focus on nucleic and protein acid tests. This solution includes the product itself, the so called “hyborg”, the self-developed software (“hybwiz”), and in the home market also installation and service. The hyborg is a fully automated and integrated (“all in one device”) device for processing and analyzing cylindrical DNA and protein microarrays, named “Hybcells”. The patented Hybcell presents a cylindrical micro array and is the core of this technology. It measures the affinity of thousands of antibodies at the same time and is especially interesting for drug discovery testing. (WKO, 2010)

There are a lot of different methods available for drug discovery; however the technology Anagnostics developed is unique. The advantages and differentiations of this hybcell technology are the following: (WKO, 2010)

- Efficiency in time, costs and sample material
- Highly flexible test design
- Kinetic measurements
- Simple, fully-automated implementation

The company’s aim is to provide solutions for unmet needs especially in the field of diagnostics and research. Their vision is to establish this innovative hybcell technology in pharmaceutical research and clinical diagnostics. (Anagnostics, 2009)

At the moment Anagnostics clients are hospitals and laboratories for drug discovery. The company develops its technology in cooperation with universities and business partners. In addition the start-up faces capacity problems, so currently they cannot accept further projects or requests, due to the fact that present projects use the whole

capacity available. This is a typical characteristic of high-tech start-ups, as already mentioned in the theoretical part.

6.3.2. Internationalization Strategy and Markets

Anagnostics Bioanalysis is active on two large markets, both global in size. The first market is the clinical in-vitro-diagnostics market with a global market volume of 40 billion euro where the Austrian market volume is around 230 million euro. The second global market Anagnostics operates with its solution is the Life Science research market with a global volume of 30 billion euro. This market is especially global because the products can be offered worldwide without significant adaptation needs.
The in-vitro-diagnostics segment is more complex to internationalize, as different market circumstances require a deeper analysis. It needs to be verified if the market entry into a specific country has advantages and comes with good sales prospects for the company. This analysis is of major importance for prioritizing specific markets as regulations differ massively in this segment.

To sum up it is obvious that for Anagnostics internationalization is essential. Conducting research and development solely for Austria is not sufficient for economic success and survival as the Austrian market is too small in sales potential. Anagnostics was not only established to fulfill the demand from Austrian costumers in the fields of medical technology. Hence internationalization was part of the business strategy from the beginning, supporting the born global approach.

Anagnostics sees itself operating in a global market, but as a start-up it is restricted in all possible resources. Being global from the beginning is not in the realm of possibility. For the firm a considered and stepwise internationalization process is a logical strategy for managing their limited resources. Anagnostics is convinced that they should be born globals, but in practice such a strategy cannot be applied. Hence the theoretically recommended *born global approach* remains hypothetical and can hardly be realized in practice.

However the start-up fulfills many factors that would recommend a born global approach. The restricted size of the domestic market, the innovative industry the firm is active in and the already existent international experience and knowledge of the management team are only few factors which would favor the born global approach. Although Anagnostics is convinced that a born global approach might be the adequate strategy, the restriction of human and financial resources prevents this approach.

Hence Anagnostics started its business in Austria, followed by a market entry in Germany and Switzerland. The next markets the company wants to enter in the future are the Belgian, Netherlands, Luxembourg, Scandinavian and UK markets. This planned future approach supports the stepwise or incremental internationalization approach.

6.3.2.1. Competitive Situation

Anagnostics' solutions at the moment are rather unique; no direct competitor exists for the technology itself. However there is a competition in the field of application. Anagnostics for instance develops drug discovery tests and the market for these tests is defined by many enterprises offering different solutions and technologies in this field. For instance there are rapid tests in drug discovery, which have, from a technological perspective, nothing in common with Anagnostics' solution. So the market for drug discovery is diverse, but the technology Anagnostics developed is unique in its field. The start-up differentiates from its competitors by many factors, as illustrated in the company profile before. A main differentiation Anagnostics holds is the multiplex technology, which allows testing many parameters at once.

Counterfeiting presents one reason why Anagnostics avoids the rapid test drug discovery market. Ninety percent of rapid tests originate in China; due to the low labor costs Chinese companies are able to offer their products at very low prices. However Anagnostics focuses on innovative technology which differentiates from low price solutions. As a consequence the start-up does not estimate counterfeiting as a definitive risk.

6.3.2.2. Evaluation of Patents' Importance

For Anagnostics patents are important in their internationalization strategy. If there is a technology to protect, a patent should be registered and applied. Anagnostics protects its innovation by a patent that is valid in the European Union, Switzerland, United States and in Singapore. However the high-tech firm is convinced that through a patent a firm cannot protect itself from abuse. Their reason to apply for patents is that the company's value increases by registering patents. Especially if the firm has the objective to gain venture capital patents can be seen as a decent method to attract strategic investors as investors see registered patents as an increase in company value. This reason is also mentioned in the theoretical part.

The problem of know-how abuse despite patent registration is treated in the theoretical part in more detail. Arundel (2001) mentions the problem of disclosing a technology when applying for a patent. Anagnostics does not agree with this statement. According to them a firm patents an innovation if the technology is fully developed and therefore other competitors cannot catch up with technology. In addition the patents are formulated very abstractly, but to an extent that it is detailed enough for patent registration. Anagnostics is convinced that at least ninety percent of all registered patents cannot be copied one-to-one. Even if the patent is described in full detail inventions are hard to copy as there is still some tacit knowledge required to copy a product. The firm states that the reason therefore is that know-how in general is rooted in the firm, and a publication in general would not help to create an exact copy of the product.

Summing up, the main reasons for Anagnostics applying for patents is the increased value of the firm, less the idea to protect the company's innovation from abuse. Many authors such as Arundel (2001) or Mann (2007) share a similar perspective, apart from the problem of disclosing technology, which Anagnostics does not estimate as a real risk in the industry of medical technology. Obviously patents are necessary for the entry mode of licensing, which might also be relevant for Anagnostics in the future. Patents are especially important for Anagnostics reaching the aim of becoming attractive for investors.

6.3.3. International Market Entry Modes

After five years of business existence Anagnostics is active on three markets, namely in Austria, Germany and Switzerland. The first order from abroad was triggered by a direct request to Anagnostics. All these countries are served by direct exporting. The reasons therefore are comprehensible from the start-up's perspective. Financial considerations are the main reasons for entering Germany and Switzerland by direct exporting, but also the geographic closeness to Austria is a decisive factor. The complexity and effort serving these markets is within the realms of possibility, even at that stage of business development. This goes along with the theoretical consideration of exporting, as describing it as a straightforward and resource friendly mode.

In addition Anagnostics is convinced that the "going-alone-model" isn't efficient and smart in a global industry, hence cooperation is also important and valuable for them, which is also treated in the theoretical part.
The firm cooperates with different institutions in Austria and abroad, as the University of Applied Science in Hagenberg or the University of Freiburg. Smaller cooperation with universities is attractive due to the fact that the financial burden is rather low. Hence this type of collaboration matches the resources of Anagnostic as a start-up perfectly. Know-how creation is the main reason for such a kind of collaboration, but if possible without time restrictions and pressure. University projects are only possible if they operate without urgency, and therefore are not adequate for every situation and problem.

In addition Anagnostics is involved in projects with industrial partners. This is of importance due to the fact that for smaller firms like Anagnostics it is difficult to offer complete solutions. A product portfolio from hardware, over software to maintenance isn't possible for a start-up in the long run, especially in the case of Anagnostics, as they want to enter additional markets in the near future. Hence a business partner for accelerating commercialization is really necessary. For a start-up company on its own it is a really long and tough way to become international. This again conforms to the

theoretical analysis, as cooperation speeds up internationalization by saving start-up's financial- and personnel resources.

Anagnostics has already applied cooperations for on-site services due to the fact that the devices have to be maintained. This would not be efficient in foreign markets as they do not have sufficient resources. For this reason Anagnostics has tasked a service partner for all maintenance issues. From a theoretical perspective this is a smart decision, as Anagnostics can still focus on the development of its products. As innovative products developed by R&D represents the core competence of Anagnostics this decision is comprehensible and is also reflected in the theoretical part.

6.3.3.1. Evaluation of other Entry Modes

Anagnostics is convinced that business growth is accompanied by additional entry modes. Hence at this stage of development the firm is not able to estimate which entry mode they would decline. Further they state that it would be difficult to prioritize the different entry modes for their company and are also dependent on the chosen market to enter.

The start-up's planned internationalization is a mixture of different entry modes, including the option of *distribution partners and direct selling*. Sales representatives are especially important for the life science market. Commercial agents are necessary, as they know the markets in which they are active in, whereby Anagnostics has no experience.

According to Anagnostics *wholly owned subsidiaries* are a smart strategy for entering key markets. Especially if they require a company to be represented locally and proximity to customers is needed. At the moment this might be out of reach due to financial and organizational resource restrictions, but Anagnostics could imagine to begin with the establishment of a sales subsidiary abroad. This resource friendly alternative is also recommended in the critical examination of wholly owned subsidiaries in the theoretical part.

Further there are some specific markets where access is difficult. For the field of in-vitro-diagnostics the United States would represent such a complicated market. Here the FDA presents an additional problem, which represents another hurdle for small foreign firms in this industry field.

This implies that a partnership in the US is a key criterion, not only for entering this market but also for necessary on-site assistance. Anagnostics would prefer a *Strategic Alliance* when operating within the United States. The same strategy might be applied if entering for instance the Middle East.

The start-up would avoid establishing *Joint Ventures*, due to the fact that they are more resource intensive. Such cooperation presents a rather long and complex process. This goes along with the theoretical evaluation of Joint Ventures, in which Strategic Alliances are more recommendable for high-tech start-ups.

Altogether Anagnostics would not exclude any entry mode due to the reason that the mode must fit perfectly to the market itself and its circumstances. This might be for instance regulations or cultural and geographical distance of the chosen market, which have to be considered when choosing an entry mode.

At the moment Anagnostics has to focus on rather resource friendly entry modes, which are realizable because the entered foreign markets are still geographically and culturally close to the home market. However in the future additional modes have to be applied, which seems to be traceable. In Europe Anagnostics will try to manage German-speaking markets on its own, the following markets by distributors and other types of cooperative modes.

6.3.3.2. Preconditions for International Market Entry

Anagnostics considered the following criteria as preconditions for an international market entry. It is obvious that this listing is not complete; it rather describes the most important requirements for this start-up.

- **Certificates**: General certificates in this industry field are a pre-condition for being allowed to enter foreign markets. For instance quality prerequisites differ from market to market.

- **Experience**: this factor is evaluated by theory as very decisive and also Anagnostics agrees with these findings. The management team comes with long lasting experience in internationalization and foreign markets. But experience alone is not sufficient for being able to apply a global approach from the beginning. Financial restrictions remain even if international networks existed at the foundation of Anagnostics. But experience is helpful in accelerating business internationalization.

- **Trade Fairs:** having the opportunity to join international trade fairs presents a decisive factor in internationalization. Anagnostics is a member of the Austrian institution LISA (Life Science Austria), which organizes a stand for start-ups at important international trade fairs like the MEDICA. This is much valued by Anagnostics, as a trade fair participation incorporates high organizational and financial effort without the help of institutions like LISA.
  In the theoretical analysis the possibility for a start-up taking part at a trade fair is rated as a very motivating and important factor in internationalization, which matches Anagnostics' perspective.

- **Economic Development Scheme**: Anagnostics in general is satisfied with the amount and extent of trade promotion that was granted to the high-tech start-up during the development stage. Anagnostics perceives the amount of support as unequally distributed across the provinces within Austria. For the start-ups phase the economic support was adequate and at the same time really necessary to establish the business further.

6.3.5. Future Aims

Starting from short to long-term goals, Anagnostics' aim until the end of 2010 is to bring further products to the already entered markets. This should increase the cash flow, which is necessary for hiring additional personnel to reduce the actual capacity problems.

Anagnostics isn't averse to any type of cooperation. It is decisive if the collaboration suits all partners and the chosen entry market. The market for Anagnostics' solution is a global one, so the market potential is logically not solely in Austria.

For a global strategy Anagnostics is convinced that this is only possible through cooperation and subsidiaries abroad. Especially for markets that are not as close or the markets Anagnostics planned to enter within the next years. In general the start-up's internationalization strategy could be a mixture of all possible entry modes, depending on external and internal factors.

Further Anagnostics is convinced that in about twenty years the firm will not exist as they exist today. Normally a global player in this industry field in general buys such high-tech start-ups if they are attractive enough (e.g. company value). Hence the firm's overall aim for the next years is that their solution becomes more attractive and marketable. This will be reached by registered patents and an established international market access. From Anagnostics' perspective it is decisive for the future of this start-up to have a flexible and innovative basis technology, which can be developed further.

6.4. Case Study 2: Thor Medical Systems Kft. (Hungary) (Peter Nemes)

The second start-up company analyzed in this thesis presents the Hungarian founded firm Thor Medical Systems, which is located in Budapest. The company is also active in the industry of medical engineering. This second case analysis follows the same structure as the former Austrian one. It starts with a short company profile, followed by a description of the firm's international strategy and markets, including the competitive situation. Afterwards the applied international market entry modes of Thor Medical Systems are presented and analyzed. Concluding with some future aims of the start-up. This practical part is based on an in-depth interview with Mr. Ferenczi, CEO of Thor Medical Systems Kft. Additionally information is included that is available on the Internet on the company website.

6.4.1. Company Profile

Thor Medical Systems Kft. was founded in 2005 in Hungary and is dedicated to the research and development of medical systems. At the moment around 95 percent of the firm's turnover is generated abroad, which pictures the significance of internationalization. The firm describes its business niche as delivering qualitative and at the same time affordable equipment for the industry of medical monitoring. One product specialty presents its mobility. Thor Medical Systems develops handheld devices that are mobile and at the same time straightforward in use, which is an important precondition for the global medical home care market.

Besides the development of the product itself, Thor Medical Systems additionally develops the corresponding software itself and offers its customers technical support. As the Austrian company this start-up also offers a solution for a certain niche in the industry of medical engineering. The firm evaluates its products not as a revolutionary invention, rather as an innovative solution that solves existing problems. Respiratory diagnostics devices typically are used with disposables and calibration systems that are all large in size and difficult in use.

The start-up developed a solution that does not require such calibration systems due to the fact that the product calibrates itself and disposables need not be replaced for each measurement operation. Summing up, the firm's solution is mobile, straightforward and reliable.

At the moment Thor Medical Systems has about seven employees, predominantly active in the field of research and development. The firm is constantly searching for software developers, electronic engineers, experts in plastic design and specialists for medical devices in the field of pulmonary and cardiac medical systems. The management team of the start-up has know-how in a variety of business and scientific fields. A typical characteristic of the firm's employees is international experience originating from working or writing their PhD abroad. Based on this experience in the field of medical engineering the founders of Thor Medical Systems recognized that Hungary has a long history in this field and hence presented an ideal starting point. Moreover due to its history Hungary has specific local know-how in the field of medical engineering. This in addition was a crucial factor in setting up the start-up in this country.

Thor Medical Systems cooperates with universities located in different countries mainly in Europe, such as the Technische Universität Wien or the University of Utrecht. The start-up regularly cooperates with the Hungarian Semmelweis University and the Budapest University of Technology. This kind of cooperation is decisive for the start-up with the aim to establish new technologies and for advancing the firm's products. Some of the employees are students, who are at the moment working on their PhD thesis and on Master thesis. Furthermore the start-up invests all the profit into R&D, which is necessary for the firm to stay innovative.

6.4.2. International Strategy and Markets

Thor Medical Systems operates in a global niche market, a sub field of medical engineering. The firm is active in a specific sector and concentrates on ultrasonic flow measurement and sensor technology. This niche market is global in size due to its limited national magnitude and the globally standardized applicability. For Thor

Medical Systems this niche is additionally interesting because international groups of companies like Philips, GE or Siemens are not paying attention to this field. These are some of the reasons why Thor Medical Systems based its firm in Hungary.
Furthermore there is a strong knowledge base on the Hungarian market in the field of medical engineering resulting from political influences in the former Soviet Union.

The start-up did not set up a strategy for internationalization at the beginning. This was rather scheduled from time to time or happened accidentally. However Thor Medical Systems recognized from the beginning that internationalization is inevitable in this niche high-tech market, as the theoretical analysis supports. The internationalization process was triggered by participation at an international trade fair. The start-up socialized and from this occasion the start up generated several international contacts and orders.

6.4.2.1. Competitive Situation

The competitive situation of Thor Medical Systems involves one direct competitor in the field of ultrasonic diagnostics. The firm NDD Medizintechnik AG in Switzerland operates in a similar and with the same sensor technology. Besides this strong competitor there are about fifteen other companies that devote their business to the field of respiratory diagnostics, but operate with an older technology in a different market.

Compared to the firm's competitors Thor Medical Systems is one of the cheapest suppliers in this field of medical technology. An Italian company exists that operates at the same price level but offers a different kind of technology. The remaining competitors are oriented at a different price level or offer a discriminative technology.

6.4.2.2. Evaluation of Patents' Importance

Thormed is frightened of the attitude towards intellectual property in Asian markets where counterfeiting is not forbidden by law. In Shanghai one of the start-up's German competitors has been copied already, in Beijing the Italian solution. Hence the firm appreciates the patents and knows about its importance, they are also aware of the fact that this does not protect them from being copied. Thor Medical Systems therefore

invests a tremendous amount of resources on the encryption and securing of their technologies to protect their own solution from illegal copying.

Thor Medical Systems possesses pending patents, especially for the firm's core sensor technology. For the company patents are essential, even if on Asian markets intellectual property is copied in many cases. The start-up does not disclose the invention in every detail; hence the problem of unfolding a firm's invention and idea in a patent does not exist in this case. In the theoretical part the problem of know-how disclosure in patents is treated in detail. The practical examination cannot reconstruct this problem due to the reason that firms like Thor Medical Systems state that inventions aren't completely unfolded in patents.

6.4.3. International Market Entry Modes

At the moment Thor Medical Systems applies the entry mode of direct and indirect exporting, implemented via distributors and sales partners. The start-up exports to a wide range of countries such as Austria, Germany, Brazil, Hong Kong, New Zealand, Norway, UK and the US. The firm's major OEM partners are located in the Netherlands, UK and US.

Besides exporting, the start-up is focusing on the establishment of a production subsidiary in Hong Kong at the moment. Due to the fact that capacity at the Hungarian production site has reached its limits. Hence for being able to fulfill orders at higher quantities the start-up future intention is to found a manufacturing plant in China.

However Thor Medical Systems does not plan to outsource special knowledge and intellectual property. This knowledge has to remain in Hungary. The decision for setting up a production entity in Hong Kong can be also traced back to the past international experience of Mr. Ferenczi. He organized many manufacturing outsourcing projects to Hong Kong in the past and therefore has a wide network there.

Summing up, at the moment the start-up focuses on rather resource friendly entry modes which are in the realm of possibility due to the restricted available resources.

However the start-up also develops the most resource intensive entry mode, namely a wholly owned subsidiary in Hong Kong. There are several theoretical reasons why this is traceable. The most decisive factor could be the past experience of Mr. Ferenczi in China. Further he conducted this outsourcing process several times in his past so that he is aware of the potential risks.

6.4.3.1. Evaluation of other Entry Modes

Thor Medical Systems is not able to exclude any entry mode from being applied in the future. At the moment the firm uses exporting to fulfill foreign orders and plans to establish a production subsidiary in Hong Kong in the near future.

In addition licensing is also interesting for the start-up especially for the firm's core sensor technology for respiratory signals. At the moment the firm is negotiating with two major customers, one located in the Netherlands and the other in the UK, for supplying those markets with OEM products.

Tighter types of cooperation the start-up could imagine are with countries like Germany as this market is characterized by an excellent partnership according to the experience of Mr. Ferencsi. Thor Medical Systems is convinced that every high-tech start-up evaluates Germany as the best possible business partner for tighter cooperation as Joint Ventures or Strategic Alliances. With Dutch business partners the start-up could also imagine such closer partnerships, but the firm would prefer German partners.

6.4.3.2. Preconditions for International Market Entry

It is obvious that the following listing is not complete. It rather illustrates the most important preconditions for Thor Medical Systems in the case of internationalization.

- **Economic Development Scheme:** Thor Medical Systems at the moment operates on self-generated money. But this was not the case from the beginning. The start-up relied on many different support sources as start-up grants, international funding and European grants. The firm, for instance, received a start-up grant of about € 100,000 which was necessary for starting business. This

monetary support was used primarily for developing products and for the first steps towards internationalization.

Thor Medical Systems appreciates this absolutely necessary support and is convinced that every start-up in this technological field relies on external support programs. But the firm perceives that the amount of support has decreased during the last few years.

Further in Hungary it is very time-consuming and difficult for a start-up to receive any grants. Thor Medical Systems considers itself as one of the few Hungarian start-up business success stories.

- **Certificates**: The most difficult precondition that is absolutely necessary in the medical engineering field is to obtain certificates for the target markets. Certificates are a prerequisite to sell medical technology products but they also have an impact on the firm's reputation. For instance Thor Medical Systems perceived that Hungarian certificates have less significance for the reputation of a product than German ones.
  Besides these certificates are very hard to obtain. In some key markets like the US the certification process of the FDA is perceived as a very complex and lengthy certification process, which can even hinder start-ups from entering the US market. Thormed is still processing to get access in the US market, but this seems to be a long and complex procedure.

- **Investors**: For the start-up the adequate investor presents a key criterion for being able to internationalize. Thor Medical Systems found a local investor that supports the start-up in an adequate way. For Thormed it is important that the investor shares the same modern way of thinking.

- **Cooperation**: Thor Medical Systems applies different kinds of cooperation with universities or with companies. Collaboration with universities is primarily important for knowledge creation, partnerships with companies for further

developing products. Both are necessary for creating an innovative solution that is technically mature for international markets.

In addition the start-up had the chance to learn from various start-ups as its main investor had several shares in other high-tech start-ups. As a consequence Thormed had the chance to learn from the failures from the other start-ups. This experience is perceived to be very important for avoiding own business mistakes.

- **International Trade Fairs:** such events are important for Thor Medical Systems to advertise its products and for expanding its contact network. The start-up receives a lot of support from the Hungarian government. At important international trade fairs such as the Medica in Düsseldorf joint stands for Hungarian small and medium sized companies are organized, which is a great possibility for firms with restricted financial budgets. For Thor Medical Systems such international trade fairs are decisive to internationalize its business and for advertising its products.

6.4.4. Future Aims

Future aims of Thor Medical Systems can be described by three terms: Growth, Asian markets and reputation. The latter often hinders the company in sales. In countries like Germany the start-up is convinced that German consumers favor national products as German products are considered to be extremely reliable and safe. Therefore in some countries the Hungarian firm has to invest in the establishment of a more reliable reputation and image. However markets exist that have a totally different perspective concerning the firm's reputation. In India Thor Medial Systems has a good reputation due to the fact that European products are perceived to have a high quality standard. But in total the start-up tries to focus more on the establishment of higher value reputation, which can be considered as a long-term goal.

The aim of growth and the targeted Asian markets can be considered as one aim, as the start-up estimates the future of this industry field lying in Asian markets. The firm

argues that it will focus on the Asian markets due to the fact that the rest of the world markets suffer from a continuous economic crisis. In contrast to these stagnating markets, China, India and the Asian region have incredible growth rates so the firm wants to capitalize. One statement, which enforces this argument, is that Thormed should have invested sooner and more intensively into Asian markets and less into the European and US markets. Another reason why Thor Medical Systems concentrates on Asian regions is the fact that the company's reputation is perceived much higher there.

6.5. Comparison and Findings (Marlene Wiedorn, Peter Nemes)

This part of the thesis tries to compare both interviewed companies by reflecting the main arguments given by the questioned companies. One further objective of this comparison is to answer some of the research questions mentioned in chapter 6.1.

6.5.1 Similarities

Both companies operate in the same industry of medical engineering and are similar in structure and were established in the year 2005. They are similar in size with seven full-time employees at Thormed and ten full-time employees at Anagnostics.
This makes both companies ideal for comparing and analyzing their internationalization process. Both companies are niche players and have a similar product policy. In the interview both indicate that their products require very few customization and calibration efforts from the customer side. This represents the main product strategy of both players and can be classified as a differentiation (niche) strategy from main global players that mostly produce highly sophisticated machinery mainly for hospitals, which require high calibration and maintenance efforts.

Both companies rely heavily on the cooperation with universities in the area of research but also product development. Anagnostics indicated that they have professional partners especially in the area of the applied product development especially because professional partners are more reliable and dedicated to project milestones.

Both companies have a management team with a very international experience profile. From the interview it can be argued that the management team from Thormed has international experience as the main management team completed studies in various foreign universities and also has professional foreign experience especially with Chinese partners.

It can be stated that the management team from Anagnostics has pronounced experience and focus in German speaking areas namely Germany, Austria and Switzerland. Further it can be argued that this international experience level is also reflected in the concentration and actual expansion of the business in these German countries. Based on these statements the theoretical arguments regarding the influence of international experience on international market entry is supported.

Both companies filed patents for their technologies. But both companies are skeptical about the use of patents for know-how protection. Thormed for example regards patents only as one small part for protecting their inventions. They rely heavily on encryption and securing technology built in their products. Thormed argues that especially in China and Asian countries the protection with patents is less useful as the enforcement of patent laws is less developed. Anagnostics primarily does not use patenting for know-how protection, as they believe that tacit knowledge is more important for know-how protection. Anagnostics states explicitly that they use patents to increase their market value and only secondarily to protect against product counterfeiting. The main reason for this may be the global aim of the entity, which is to increase market value.

Both companies have a similar attitude to patenting. Both state that the disclosure of the underlying technology is not seen as an obstacle and is not perceived as being disincentive for filing patents. As the invention is mostly formulated in a very abstract way a counterfeiter could not copy an invention from the patent itself. At this point the theoretical arguments are not supported.

Anagnostics and Thormed do not exclude any market entry mode. The market entry decision must fit the market situation and should according to Anagnostics be decided on various individual factors.

Furthermore both companies highlight the importance of external support for start-ups in their industry. Both companies relied heavily on government support in their beginning phase. Furthermore both point out the importance of governmental support at trade fairs and the knowledge exchange with governmental agencies especially for trade promotions and the support with export partners. This reasoning is treated in the theoretical part and is supported in the interview with both partners.

6.5.2 Differences

To begin with, the main difference of Anagnostics and Thormed lies in the business objective. Anagnostics tries to become more attractive for potential future investors, by for instance having some interesting pending patents available, as described before. On the other hand Thormed's goal is business growth, hence becoming a more important player in this global industry niche. So most of the subsequent differences could be rationalized by a different business objective.

For reaching this defined objective both firms decided to internationalize and are not able to exclude any possible entry mode from adapting in the future. However the start-ups apply different entry modes at the same business development stage. Anagnostics at the moment focuses on exporting; Thormed additionally establishes a production subsidiary in Hong Kong. A potential explanation for the different approach could be traced back to the overall business objective. Anagnostics chooses the more resource friendly mode for being able to keep on concentrating on R&D, which might lead to new pending patents. Thormed tries to reach a prospective organic growth by the set up of a production entity abroad for managing the current capacity problem. It is obvious that additional factors could have influenced the start-ups in their decisions, as for instance a different amount of granted governmental support.

The start-ups also differentiate in their internationalization approaches. Thormed rather applies the Born Global approach compared to Anagnostics, which on the other hand follows a stage development approach. Both firms would fulfill the preconditions for being global from the beginning onwards, but only Thormed follows this approach. This could again be explained by the different business aim of both start-ups and also the level of international experience varies.

Besides that, the start-ups have different target groups, Anagnostics develops for the labor and clinical market, Thormed focuses on the clinical and home care market. This is traceable when having the product portfolio in mind. Anagnostics, with its innovative drug testing solution and Thormed, with its mobile pulmonary diagnostic devices.

From a competitive perspective both start-ups face a different number of competitors in their field of application. Thormed has one direct competitor offering the same technology and about fifteen indirect ones with a different technology. Anagnostics at the moment is not confronted with any direct competitor, solely with indirect ones, which offer a different technology.

Overall, the commonalities of Anagnostics and Thormed definitely outweigh the listed distinctions. The different business objectives could be the trigger of the above-mentioned differences between these two start-ups. In general the statements of Anagnostics and Thormed are comprehensible and match to a large extent the theoretical assumptions.

7. Summary (Marlene Wiedorn, Peter Nemes)

The goal of this thesis is to illustrate the internationalization process of start-up companies, which turns out not to be a straightforward task. Moreover it is hardly possible to offer a precise recommendation how this process should be configured that start-ups in the long run can reach defined business goals. Focusing especially on start-ups in the high-tech industry does not facilitate reaching this thesis' aim. Quite the contrary, analyzing an innovative and fast moving branch in which not established firms are active is far more challenging.

Literature connected to this task is available, even if sometimes out of date or not accessible. Hence literature is analyzed, considered critically and if useful and valuable included in this diploma thesis. The included theoretical information is subsequently compared to the conducted case analyses. As a consequence the question *why* high-tech start-ups are motivated to internationalize business can be answered in a way that it is valid theoretically and also practically as the gathered information matches well with the two case analyses.

The main argument why high-tech start-ups internationalize is because of the home market's size. Developing an innovative and at the same time technological-advanced product solely for the firm's home market seems not to be lucrative from different perspectives. Hence striving for internationalization is a necessary and logical step, generally formulated at company establishments especially in small domestic markets as Hungary and Austria. There are far more reasons that motivate start-ups in the high-tech industry to internationalize, all discriminatively relevant and dependent on the start-up's business aim.

Besides trying to give an explanation why high-tech start-ups internationalize another interesting and at the same time main question is *how* these firms implement this integrated internationalization process. Every international market entry is separated into three interrelated decisions. Therefore the start-up has to decide where, how and

when to internationalize. Besides this internationalization is always accompanied by challenges, risks and chances that have to be included into every decision.

The first major decision a start-up has to consider is *which* market(s) to enter. Several authors describe the circumstances a start-up faces as suitable for being globally active. Theoretically high-tech start-ups tend to apply a Born Global strategy, which may be the case if the firm is fulfilling the seven factors by Baronchelli and Cassia (2008). The instable and fast changing environment, the limited size of the domestic market, the innovative branch in which start-ups are active, the available knowledge and experience of the management team, its previous gathered business experience and the available network links leading those firms to a global internationalization strategy from the company's beginning. These factors explain traceably why and when start-ups are in the situation of being able to apply a Born Global Strategy. Considered from a critical perspective, often the firm's set business goal(s) and existing restrictions, and limited access to financial resource thus prevent start-ups from being global from the beginning. The executed case analyses disclosed clearly this circumstance. When these firms were asked about their entered markets, they numerate several countries but never state that they apply a Born Global strategy. However they are convinced that being global is a wise and effective strategy especially in their industry. Financial and personal restrictions at the moment prevent them being able to apply a Born Global strategy. So theoretically Anagnostics GmbH and Thormed Kft see and evaluate their marketplace as a global one, but practically they entered several markets at once and also stepwise one by one, due to existing limitations.

The second question a start-up has to ask itself is *which* markets to enter. Here a firm can choose between various modes depending on the degree of risk and dependence the start-up wants to take. The thesis treats exporting, licensing, contract manufacturing, strategic alliances, joint ventures and wholly owned subsidiaries in more detail, analyzed from a start-up's perspective. Considering limited resources as a main characteristic of a start-up, it would suggest that export presents the most adequate entry mode for these businesses. This theoretical assumption is affirmed in the practical examination. The main applied international market entry mode is exporting. Export

matches optimally with the situation of new established enterprises. It is a low-risk and low-involvement entry mode and therefore very resource-friendly. An unsolicited order often presents the trigger to begin with exporting, which again conforms to the interviewed start-ups.

However exporting is not implemented exclusively, which again is assumed in theory. Thormed Kft already applies different entry modes even at that young business development stage. Both conduct direct and indirect exporting, Thormed is additionally developing a production subsidiary in Hong Kong at the moment. Hence this firm combines the most resource-friendly mode with a more cost-intensive one. The literature says that start-ups prefer low-risk modes, but in general apply several different modes at the same time. Further both firms state that they cannot exclude any entry mode, when asking them which possibility they would introduce in the future. Both firms explain that the chosen mode has to fit the chosen entry market.

Exporting supports high-tech start-ups in entering several markets at once. This is especially important when considering the Born Global approach. Bürgel and Murray (2000, p. 35f) explain that technology-based firms most likely enter more than one foreign market within a short time period. So the decision to implement a resource-friendly entry mode at that business development stage seems to be traceable again.

Bürgel and Murray (2000) further mention that product's characteristics play an important role when deciding on *direct or indirect exporting*, as the degree of customization and innovativeness. The interviewed start-ups apply both types, dependent on the markets like geographic and cultural distance. Besides both firms offer rather simple products, which additionally simplify indirect exporting.

When asking Anagnostics and Thormed about *licensing* both state that this mode is interesting for them, although they don't apply it at the moment. Especially a start-up can profit a lot from licensing, which is confirmed by the theoretical and practical examination. It is a very resource-friendly mode and especially for products that have a large part of R&D expenditures, licensing contributes to a faster amortization. Licensing

presumes an applied *patent*, which is lucrative from different perspectives. The questioned firms have different reasons for applying a patent. For Thormed the decisive reason is that patents protect the start-up's invention, Anagnostics on the other side appreciates that patents enable start-ups to attract venture capital. These discriminative perspectives result from different business aims the start-ups follow. In literature both aspects lead to a higher significance of patents. (e.g. Arundel, 2001, EPO, 2007; Mann, 2007)

However negative aspects exist as well. Authors like Arundel (2001) examine the problem of disclosing the invention when applying for a patent. Thereby the firm's (most) valuable information is disclosed and accessible to competitors or imitators. For a high-tech start-up it is essential to protect its technology, any illegal action against the firm could have an impact on the economic survival. In literature patents present a kind of double bind; in practice this cannot be reconstructed. The interviewed firms state that when applying for a patent in general the technology is developed so far that any competitor cannot follow rapidly. In addition the companies claim that patents are only superficial and that they have to be precise. This implies that with the disclosed information a competitor is not able to counterfeit the start-up's product. So the negative aspects explored in the literature are not included in the case analyses.

Summing up, the decision to apply for a patent always results from the start-ups business strategy and goal. If the firm plans to cooperate or to raise venture capital, patents enhance the start-up's value. Although patents are ignored in several markets like China, the positive aspects in the practical examination clearly exceed the negative ones.

Particularly high-tech start-ups are coping with capacity problems when internationalizing business. Hence including *contract manufacturing* as a possible and at the same time recommendable entry mode seems to be logical also because this method is widely spread in high-technology industries. (Wu et al., 2005) But contract manufacturing in theory is also described as a double-edged sword. A start-up should never outsource core competencies or processes the firm relies on. Especially in the

high-tech industry long-term contracts should be defined due to the reason that it might not be that easy to find a substitute for the chosen partner. (Arruñada and Vázquez, 2006) Thormed and Anagnostics are both aware of this double-edged situation, but limited capacity really presents a problem for them. Furthermore both firms develop a solution, consisting of hardware, software and service, and contract manufacturing solely affects the hardware. So the problem of know-how transfer can be lowered and at the same time this emphasizes the positive aspects of contract manufacturing in the practical examination.

Strategic alliances and *joint ventures* are further entry modes the start-up can decide on when going international. Both types share to a certain extent similar advantages, disadvantages, challenges and chances. As for any start-up the traditional go-it-alone model seems to be rather unrealistic and far away from financeable, these cooperation modes definitely justify an inclusion in this thesis.
Especially in the high-tech industry nearly all incumbents are connected to each other in form of networks of cooperative settlements, which also strengthen the practical relevance. (Duysters et al., 1999, p. 347f)

These modes enable start-ups to develop new markets, accelerating the market entry, exchanging ideas, gaining professional insight and also lowering uncertainty in technology and market. These positive aspects are confronted with negative ones, as the risk of choosing the wrong partner(s), the availability of a secret agenda or the lack of trust between the cooperation partners. Know-how drain and the difference in size and market position are problems that especially concern a start-up. Further Nueno (1999, p. 321) conclude that a cooperation is only meaningful and advisable if the start-up owns sufficient core competencies to differentiate itself from the partner(s). So the question remains: What is more advisable – implementing a strategic alliance or a joint venture?

A strategic alliance is more flexible compared to a joint venture, which might be important if the cooperation has to be adapted or in the worst case terminated. (Kutschker and Schmid, 2005, p. 872) Further, it is less cost- and resource-intense, again important for a newly established firm. Due to the high-tech start-up's less

established economic development stage a joint venture might not be an accurate entry mode at this stage of establishment, as it requires circumstances a start-up at this stage can hardly provide. So a strategic alliance might be more recommendable, when considering start-up's characteristics.

The last mode treated in this thesis and at the same time most risky and long-ranging international market entry are *wholly owned subsidiaries*. Literature advises against establishing a foreign subsidiary that integrates the entire value chain at that business stage. Alternatively for the start-up setting up a sales organization abroad is more recommendable. Thormed Kft at the moment is planning to develop a production subsidiary in Hong Kong, restricted to the production of the firm's hardware. The reasons for the establishment are on the one hand capacity problems and on the other hand business experience in China. Further, Thormed has already gained experience in lower-risk entry modes as exporting which is necessary for an establishment of wholly owned subsidiaries due to some authors.

The next question a start-up has to ask itself is *when* the firm should internationalize. Bürgel et al. (2001) state that if firms spend a large proportion of their efforts on R&D then such companies in general prefer rapid internationalization. This statement is affirmed by the questioned start-ups, both having high R&D expenditures. Start-up's size and available resources limit the speed of internationalization, but choosing the adequate entry location and mode can reduce these drawbacks.

Theoretical consideration of adequate timing of an international entry mode conducted by a high-tech start-up should be earlier and faster compared to older firms. Small, incremental, quick and considered steps in general are recommendable for new established high-tech firms. Anagnostics and Thormed both follow such a strategy.

Summing up, in general the included theoretical information matches the practical examination to a large extent. There are no huge differences or surprises, sometimes in literature problems become more important than they are actually are in practice. In

addition the questioned Hungarian and Austrian firms use almost the same arguments, perhaps this can be ascribed to the similarity of these start-ups or geographic closeness.

7.1. Limitation

To mention some limitations of this thesis it is important to cite the problem of validity. The practical examination is based on two case analyses, both very similar to each other. For offering a generally valid proposition this quantity is obviously not enough. The reason for including just two cases can be traced back to the length restriction of a diploma thesis. Further, the aim of this thesis is not to give a universally valid proposition, rather analyzing two very similar high-tech start-ups in different countries and comparing the results with the available literature.

8. Abstract (English) (Marlene Wiedorn, Peter Nemes)

This thesis deals with the theoretical analysis of the internationalization process of high-tech start-up companies, expanded by a practical examination. The latter is conducted with the help of the case study methodology by interviewing an Austrian and Hungarian high-tech start-up firm. The aim of the thesis is to illustrate the internationalization process of high-technology based start-up firms theoretically and compare the findings with a practical investigation.

Describing and analyzing the internationalization process of high-tech start-up is not a straightforward task, due to the fact that at this business stage the firm's processes are not developed completely. In addition this firm always faces restrictions, for instance from a financial as well as from a personnel perspective. Besides the high-technology industry additionally complicates a precise analysis, as the branch can be characterized as instable, unpredictable and short-dated. Hence when analyzing the market entry of high-tech start-ups many parameters have to be considered.

The thesis is separated into three main parts. The first concentrates on international theories with the focus on the validity for the chosen business type. Afterwards the main theoretical part deals with the international market entry of high-tech start-ups, subdivided into several strategic decisions as why (not), where, how and when to internationalize. The third part involves the practical investigation by applying case study methodology. The focus lies on analyzing two similar start-ups in different markets, which are of the same age, active in the same industry and are of the same size. The information was gathered by an in-depth interview and from additional sources such as company website or magazine publications, afterwards compared to literature publication.

The combination of theoretical and practical investigation offers a deeper insight into the international market entry of high-tech start-ups, with the aim of answering the defined research questions.

Abstrakt (Deutsch) (Marlene Wiedorn, Peter Nemes)

Diese Magisterarbeit beschäftigt sich mit der theoretischen Analyse des Internationalisierungsprozesses von High-Tech Start-up Unternehmen, erweitert durch eine praktische Untersuchung. Letzteres ist mit Hilfe der Fallstudienmethodik durchgeführt, anhand einer Befragung eines österreichischen und ungarischen High-Tech Start-ups. Das Ziel der Arbeit ist es, den Prozess der Internationalisierung von High-Tech Start-up Unternehmen theoretisch zu veranschaulichen und die Ergebnisse mit der praktischen Untersuchung zu vergleichen.

Den Prozess der Internationalisierung eines High-Tech Start-ups zu beschreiben und zu analysieren ist keine einfache Aufgabe, aufgrund der Tatsache, dass bei dieser Geschäftsstufe die Unternehmensprozesse nicht vollständig entwickelt sind. Zusätzlich ist ein solches Unternehmen immer mit Einschränkungen konfrontiert, zum Beispiel aus finanzieller als auch aus personeller Sicht.

Außerdem erschwert die High-Tech Industrie zusätzlich eine genaue Analyse, da diese Branche als instabil, unvorhersehbar und kurzfristig charakterisiert werden kann. Daher hat man bei der Analyse des Markteintritts von High-Tech Start-ups viele Parameter zu berücksichtigen.

Die Diplomarbeit ist in drei Hauptteile untergliedert. Der erste konzentriert sich auf die Internationalisierungstheorien mit dem Fokus auf deren Gültigkeit für den gewählten Geschäftstyp. Danach beschäftigt sich der Haupttheorieteil mit dem internationalen Markteintritt von High-Tech Start-ups, dies untergliedert in mehrere strategische Entscheidungen, wie beispielsweise warum (nicht), wo, wie und wann zu internationalisieren. Der dritte Teil umfasst die praktische Untersuchung, hierbei ist die Fallstudienmethodik angewandt. Der Fokus liegt auf der Analyse zweier ähnlicher Start-ups, die in unterschiedlichen Märkten angesiedelt, jedoch gleich alt und in derselben Branche tätig sind, und dieselbe Größe besitzen. Die für die Analyse notwendige Information stammt von eingehenden Befragungen mit den ausgewählten Firmen und von weiteren Quellen wie Unternehmens-Websites oder Publikationen in Zeitschriften. Danach sind die gesammelten Aussagen und Informationen mit Literaturveröffentlichungen verglichen.

Die Kombination aus einer theoretischen und praktischen Untersuchung bietet einen tieferen Einblick in den internationalen Markteintritt von High-Tech Start-ups, mit dem Ziel die definierten Forschungsfragen zu beantworten.

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Interview Questionnaire

Company Profile

1) When was the company founded and how? (*E.g. as a management buy-out, foreign subsidiary of other independent, newly established company*)

a. Does the company receive any funding or other external monetary means?

Staff / Founder Profile

2) What did you do professionally before setting up this company?

a. Have you generated valuable experience through your past work experience for this company? For instance?

b. What kind of experience do the founders and the senior management team possess? *(e.g. any training, international experience, network, qualifications, experience)*

Product characteristics

3) How would you best describe the innovation of your company's product? What does the start-up exactly produce?

a. Does the product need a great deal of explanation / configuration / customization / maintenance / training?

4) How would you describe the domestic and foreign competition? Does any exist? How close are competitors to this firm? (*Innovation leadership*)

5) How are the products distributed domestically?

International Activities / Market Entry

6) Are your products / services represented in foreign markets?

a. In which foreign market(s) is the start-up represented?

b. If abroad: Since when? And how many years after the foundation?

c. What percentage of turnover is generated abroad?

7) Why have you chosen to internationalize? What were the reasons / motives? *(e.g. growth, domestic market is small, promotions, collaborations, to generate knowledge and know-how)*

a. Was internationalization part of the company's strategy / plan, or was it spontaneous (*trigger*)? Formal strategy or chance?

b. If funding was available: Which? Would you expect to gain more support from the government etc? Why?

c. Does your start-up cooperate with others (suppliers, university etc)? Is there cooperation with universities (*for experience and knowledge generation, etc*.)? Why?

8) Which entry mode(s) did your company decide on during the start-up phase? Several at once? Why exactly this/these?

a. What were the advantages/disadvantages of your chosen entry mode(s) (during the start-up phase)? (*e.g. in the case of export: Trade Promotions*)

b. If you decided for several modes: Why? Why not?

c. What enabled you to use this entry mode?

d. What kinds of risks and problems have occurred?

e. Have you ever considered direct investment methods? If so, which ones and why? Why not?

f. Compared to now: Which modes does the company apply at the moment?

g. Why have the applied entry mode(s) changed over time? When and how (progressive/stepwise)?

9) In retrospect, what would you have done differently?

a. Enter other markets, different order?

b. Other time?

c. Other modes? Which ones?

10) What is your attitude towards patents in your company?

a. Did you have some patents during your start-up phase? If so: in which field?

b. Did any problems occur?

c. Was/is licensing an issue for your company?

11) Do you rate your company as a firm that operates in the high-tech industry as a "Born Global" company?

a. Why (not)? Reasons therefore?

b. Was this the case from the beginning?

c. What do you think are the preconditions for a Born Global?

d. Or have you chosen gradual internationalization? Why (not)?

e. Do you evaluate internationalization as a decision-making process? Why (not)?

13) Why haven't you decided for (*here mention: Joint venture, foreign offices, Strategic Alliances, etc.)* during the company's start-up phase?

a. Would this mode illustrate a reduction of the financial risk?

14) Do you currently have sufficient production capacity? How would you rate the workload? *If above 100 percent*: Do you consider expanding capacity? (*e.g. to other countries with lower labor costs)*

15) What is your estimate of the financial expenditure on research and development compared to your company's turnover? In percent.

16) What do you plan for the future related to internationalization?

This questionnaire presents a guideline for the in-depth interviews. Since such an interview should be more a discussion than a question-and-answer game, the questions could be arranged or formulated differently. This questionnaire should in fact deliver an overview so that no topic is missed during the interview.

Interview Transcript of Case Study Anagnostics Bioanalysis GmbH (Austria)

Wiedorn: Wann und wie wurde Anagnostics Bioanalysis GmbH gegründet?

Mag. Jaquemar: Die Firma wurde 2005 offiziell gegründet und zwar wirklich als komplettes Start-up. Nicht als ein Spin-Off der Universität oder als eine Neugründung eines Unternehmens, sondern wirklich gegründet aus der Idee eine neue Technologie umzusetzen und zwar ist der ursprüngliche Ideenlieferant und Gründer Herr Dr. Ronacher. Herr Ronacher war vor Anagnostics bei der Firma Lambda, das ist eine andere Biotec-Firma, die inzwischen zu Greiner Bio-One gehört, und dort hat Herr Ronacher auch in der Entwicklung gearbeitet, hatte viele Ideen die aber in der Firma Lambda nicht wirklich umzusetzen waren. Darum die Gründung von Anagnostics. Diese hat er mit Christoph Reschreiter zusammen gegründet, er ist der zweite Gründer. Dr. Ronacher ist sozusagen das Scientific-Brain mit der Produktidee, Mag. Reschreiter hat den administrativen und finanziellen Background dafür. Gegründet wurde Anagnostic natürlich mit wenig Eigenkapital, dann hat man sich natürlich um Förderungen, Start-up Förderungen, umgesehen.

Wiedorn: Wie würden Sie die Förderunterstützung einschätzen?

Mag. Jaquemar: Die Förderhöhe war durchaus angemessen. Interessant ist hierbei noch zu bemerken, dass die Firma in Oberösterreich gegründet wurde, dort gabs bezüglich Seed-Kaptial und Start-up Finazierung gute Möglichkeiten. Die Firma war auch angesiedelt im Tech-2-Be, in der Hafenstraße in Linz, und dort hat es mit den Förderungen eigentlich gut funktioniert. Da gibt es in Österreich einige Möglichkeiten, beispielsweise übers AWS. Da konnte sich Anagnostics gut durchhanteln. Natürlich nur bis zu einem gewissen Zeitpunkt. Eben wenn es zur Kommerzialisierung kommt, das muss natürlich anders angestellt werden.

Wiedorn: Über wieviele Mitarbeiter verfügt Anagnostics und in welchem Bereich sind diese tätig?

Mag. Jaquemar: Aktuell haben wir zehn Mitarbeiter. Dies ist aufgeteilt wie folgt, es gibt eben ein Management Team, das sind die beiden vorher genannten Gründer und ich. Dann haben wir noch eine Person in der Administration, die restlichen sind in der

Forschung und Entwicklung. Mit Herrn Ronacher sind es sechs Leute die für Forschung zuständig sind. Daher 6:4.

Nemes: Über welchen Hintergrund verfügen diejenigen in der Forschung tätig sind?

Mag. Jaquemar: Diejenigen in der Forschung haben alle ein Studium gemacht. Biochemie, Biologie, Mechatronik etc.

Wiedorn: Wird mit anderen Partnern wie Universitäten oder Unternehmen kooperiert?

Mag. Jaquemar: Ja natürlich. Immer so kleinere Projekte mit Universitäten. Viel gemacht wurde in Zusammenarbeit mit der FH Hagenberg, weil es aus der Nähe ist und unser IT-Zuständiger, der für die Hardwareentwicklung zuständig ist, kommt von dort. Und so hat sich das ergeben, zusammen hat man beispielsweise Software entwickelt. Dann gabs noch weitere Projekte mit anderen Universitäten, auch außerhalb von Österreich. Aktuelle Projekte gibt es mit Universität Freiburg, wobei ich sagen muss die Universitätskooperationen sind halt was sie sind. Wenn Sommer ist passiert gar nichts, man darf halt bei solchen Projekten nicht so zeitgedrängt sein, vorsichtig ausgedrückt. Dies ist halt mit industriellen Partnern anders. Die gibt es natürlich auch. Uni ist sicherlich gut für Know-How, da kommt man auch ohne viel finanziellen Aufwand heran, klarerweise ein Vorteil. Andererseits sind die industriellen Partner für uns sehr wichtig.

Wiedorn: Wer sind die Kunden von Anagnostics?

Mag. Jaquemar: Wir haben zwei große Märkte. Das ist einerseits der In-Vitro-Diagnostik Markt, der Markt ist 40 Milliarden Euro insgesamt, ein globaler Markt. Das kann man wirklich als eigenständigen Markt sehen. In Österreich ist dieser Markt 230 Millionen Euro groß. In Deutschland das Zehnfache. Der zweite Markt in den wir sind ist der Life Science Research Markt. Wo es in die Forschung hineingeht, aber auch pharmazeutische Produkte entwickelt werden. Dieser Markt ist auch in etwa 30 Milliarden Euro. Wir haben somit Partner in beiden Bereich, die sind entweder in Österreich oder in Deutschland. Teilweise arbeiten wir in Projekten die gefördert werden, wie FFG Projekte. Mit solchen Partnern sind auch schon welche erfolgreich abgeschlossen worden. International geförderte Projekte sind für uns natürlich wichtig. Dort sind oft zwei industrielle und ein akademischer Partner involviert. Ziel bei solchen Projekten ist entweder eine Technologie weiter zu perfektionieren oder eben ein gemeinsames Produkt auf den Markt zu bringen. Beides ist möglich.

Wiedorn: Wie sieht der Marktzugang bei diesen Märkten aus?

Mag. Jaquemar: Dieser ist beispielsweise bei In-Vitro-Diagnostik nicht ganz einfach. Dieser ist zum einen stark reguliert, es gibt keine Markteintrittsblockaden, aber man braucht gewisse Zertifizierungen um ein Produkt für die Diagnostik einführen zu können. Vergleichbar mit dem Vorgang bei pharmazeutischen Produkten. In vielen Bereichen bei In-Vitro-Diagnostik muss man auch als Gesamtanbieter am Markt sein. Das heisst wenn man z.B. dem AKH etwas verkaufen möchte für die Labordiagnostik, dann ist es am besten wenn ich von der Adminsitration Hardware bis zur Software alles anbieten kann. Sprich für eine kleine Firma ist dies schwierig. Da wäre natürlich ein Partner hilfreich, um diese Kommerzialisierung zu beschleunigen. Ich habe 19 Jahre Erfahrung in internationalen Unternehmen, beides in Life-Science und In-Vitro-Diagnostik und da weiß ich dass es für eine kleine Firma ein sehr schwieriger und langer Weg ist. Darum ist man natürlich bestrebt einen Partner zu finden. Da gibt es verschiedenste Möglichkeiten, wie die gemeinsame Kommerzialisierung. Kooperationen haben wir auch, dass der Partner uns bezahlt um zu entwickeln. Entwicklungsprojekte eben.

Wiedorn: Wie sieht es mit der Konkurrenzsituation in Österreich und Weltweit aus?

Mag. Jaquemar: Im genau selben Bereich in dem wir aktiv sind, gibt es sowieso niemanden weiteren. Konkurrenz gibt es aber immer für die Anwendung. Das heisst als Beispiel, Drogentests, da gibt es natürlich viele am Markt. Da gibt es verschiedene Firmen die solche Tests anbieten. Aber so wie wir es anbieten, mit dieser Technologie, gibt es niemanden. Wir haben ein Differenzierungsmerkmal zu anderen. Unsere Zielgruppen, wenn wir jetzt bei Drogentests bleiben, sind Einrichtungen zur Suchttherapie, Drogenambulanzen und sonstiges. Und nicht im speziellen Drogenschnelltests, das machen wir eben nicht, sondern mit unserer Technologie können wir sehr viele Parameter auf einmal testen, die sogenannte Multiplextechnologie. Das ist eben das neue und innovative an unserem Produkt. Da gibt es praktisch niemanden, der dassgleiche macht. Es gibt eine Firma, die eine ähnliche Technologie hat, aber gleich eben nicht.

Nemes: Wie definieren Sie den Markt?

Mag. Jaquemar: Der Markt für uns ist natürlich ein globaler Markt. Aber derzeit sind wir eben hauptsächlich in Österreich und Deutschland. Und wir beginnen gerade in der

Schweiz und Benelux. Wovon wir aber überzeugt sind, dass wir nicht für jedes Land die komplette Kommerzialisierung selbst übernehmen können. Das ist finanziell gesehen außer Reichweite. Daher ist unser Ziel ein gemischtes Modell, mit Distributionspartnern und Eigenvertrieb agieren. Oder auch mit unabhängigen, freischaffenden Partnern, freie Handelsvertreter. Diese gibt es im Life-Science Bereich, sie verfügen eben über verschiedene Produkte diverser Hersteller. Stellen somit ein Portfolio zusammen, sind aber selbstständig, arbeiten auf Provisionsbasis. Das wär eben auch eine Möglichkeit.

Wiedorn: Wie wird derzeit die Internationalisierung der Länder Österreich, Deutschland und Schweiz gehandhabt?

Mag. Jaquemar: Derzeit machen wir noch alles selbst, daher direkter Export. Für die ein oder andere Kooperation die wir haben, siehts anders aus, eben durch Partnervertrieb. Aber allgemein gesehen machen wir derzeit noch alles selbst.

Wiedorn: Wieviel des derzeitigen Umsatzes wird im Ausland generiert?

Mag. Jaquemar: unsere Umsätze sind derzeit noch sehr gering. Wir haben bis heute vielleicht Umsätze von in etwa 200.000 Euro gemacht. Das ist keine Größe, aber das Potential liegt natürlich nicht in Österreich. Die Firma exisiert nicht deshalb weil man glaubt in Österreich viel Umsatz zu erwirtschaften. Beide Märkte sind global. Der Life-Science Markt sogar noch mehr, weil die Produkte weltweit angeboten werden können so wie sie sind. Im Gegensatz dazu ist der In-Vitro-Diagnostik eher regional unterschiedlich z.B. werden Tests in manchen Ländern von der Krankenkasse bezahlt, in anderen wiederum nicht. Daher muss man in diesem Bereich überprüfen für welche Länder das Produkt geeignet ist. Am Life Science Markt ist das Produkt fertig, da muss nur mehr die Gebrauchsanleitung übersetzt werden, aber im In-Vitro Bereich kommt es bei jedem neuen Markteintritt zu zusätzlichen Kosten.

Wiedorn: Wie sieht es mit der Anpassung/Customization der Produkte aus, wenn man diese im Ausland einführt?

Mag. Jaquemar: Bei Life Science muss nichts angepasst werden, bei In-Vitro-Diagnostik schon. Generelle Dinge wie Zertifizierungen sind notwendig, dass man überhaupt ein Produkt verkaufen kann.

Wiedorn: Wie ist es zu dem ersten Auslandsauftrag gekommen?

Mag. Jaquemar: Dies war eine direkte Ansprache.

Wiedorn: Wie sieht es mit Messen aus. Sind sie dort auch vertreten?

Mag. Jacquemar: Ja bei Messen sind wir auch vertreten, zum Beispiel die größte in Europa für den Diagnostics Markt ist die Medica. Dort sind relativ viele österreichische Firmen vertreten. Messen sind ein sehr wichtiger Aspekt für uns. Wir sind Teil der sogenannten LISA (), das ist eine sehr gute und nützliche Einrichtung für uns. Weil wir über diese Dachmarke, die zusammengesetzt ist aus verschiedenen Clustern in dieser Branche, eben der Gesundheitscluster OÖ, Humantechnology Styria oder die LISA Vienna Region. Und eben die LISA organisiert Gemeinschaftsstände bei Messen, übernehmen die Organisation, uns so kommt man als kleines Unternehmen ohne großen Aufwand und relativ günstig zu einem Messestand bei bedeutenden Messen wie der Medica. Das ist für Unternehmen wie uns extrem wichtig. Klar, wenn man eine gewisse Größe hat, macht man es selbst, aber bis dahin ist die LISA eine sehr sehr große Hilfe für uns. Allein schon der administrative Aufwand für eine solche Messeteilnahme ist nicht zu unterschätzen.

Nemes: Anagnostics produzieret die Geräte und Software selbst?

Mag. Jaquemar: Wie produzieren den Hyborg, das ist das Gerät. Aber unsere Technologie steckt in der Hybcell, da ist unser Know-How drinnen, darauf haben wir ein Patent und dass ist unsere IP. Die Einzelteile werden für uns hergestellt, z.B. die Formen mit Spritztechnik erstellt. Das Gerät, der Hyborg, wird für uns von der Firma Microtronics hergestellt, dass eigentlich auch ein Start-up ist. Die bauen für uns, aber es ist eine Gemeinschaftsenwicklung, wir zahlen dafür dass diese niederösterr. Firma es uns erstellt. Zusammen mit dem Hyborg, der Hybcell und unserer selbsterstellten Software ergibt es dann eine Solution – unser Produkt. Entscheidend ist was wir machen, die Chemie dahinter, damit die einzelnen Komponenten zu einer Solution werden. Das ist unser Know-How.

Nemes: Wie weit ist dieses Patent gültig?

Mag. Jaquemar: Dieses Patent ist weltweit gültig. Patente sind ein wichtiger Punkt in der Kommerzialisierung. Wenn man eine Technologie hat, so wie wir, sollte man recht rasch patentieren. Also IP schützen. Wobei es heute eigentlich so ist, dass man sich dadurch heute nicht mehr wirklich schützt. Die Technologien sind so schnelllebig geworden, dadurch sind Patente ohne hin nicht lange von Wertigkeit. Aber was ganz wichtig ist für kleine Unternehmen wie uns, Patente sind Teils des Wertes einer Firma. Zum Beispiel wenn man Venture Capital lukrieren möchte, dann wird der strategische

Investor immer sehen was man an Patente hat bzw. wie es mit der IP aussieht. Daher muss man ein Patent angemeldet haben und es auch einen gewissen Wert entsprechen. Dafür braucht man natürlich Patentanwelte, weil es sauber gemacht gehört, damit es funktioniert. Hierbei schützt man natürlich nicht jedes Land, daher meine ich mit weltweit, die EU und Schweiz, USA und der dritte Markt für den Fernen Osten ist Singapur. Für alle anderen Ländern braucht man das eh nicht schützen lassen, die kopieren das ohnehin, denen ist das egal ob Patent oder nicht. Singapur ist da eben anders, sehr viele große und internationale Unternehmen sind auf diesem Markt.

Wiedorn: Ist die Offenlegung der Innovation bei der Patentanmeldung ein Problem?

Mag. Jaquemar: Naja man macht dies eben zu einem gewissen Grad. Man macht es auch dann wenn man mit der Technologie schon sehr weit ist, wenn einen kein anderer mehr einholen kann. Das Problem ist natürlich auch das Patente oft sehr allgemein gehalten sind, so allgemein wie möglich, aber trotzdem so dass das Patentamt sagt es sei spezifisch genug. Aber wenn Sie sich Veröffentlichungen im wissenschaftlichen Bereich ansehen, würde ich behaupten das mindestens neunzig Prozent der angemeldeten Patente nicht 1:1 nachgekocht werden können. Selbst wenn es im Detail publiziert wurde. Das spezifische Know-How steht eben darin nicht. Darum ist die Offenlegung nicht problematisch. Für kleine Firmen wie für uns ist eine Patentanmeldung sicherlich wichtig, große Firmen mittlerweile Patentieren gar nicht mehr. Zuviel Aufwand und wenns es dann zu Streitigkeiten kommt, zieht sich das über Jahre und wenn man Glück hat bekommt man dann die Anwaltskosten herein. Das weiß ich aus eigener Erfahrung. Große „Sachen“ werden natürlich noch patentiert, aber nicht jede Kleinigkeit. Auch von den Kosten her darf man es nicht unterschätzen, pro Land oder Entity kann es schon bis 4000 Euro kosten. Dann kostet es noch etwas pro Jahr und die Anwälte auch noch. Patentkosten von ein paar Millionen sind für große Firmen ja keine Seltenheit.

Wiedorn: Bezüglich Patente, ist oder war es schon Thema Lizenzierung anzustreben?

Mag. Jaquemar: Bis jetzt noch nicht, aber es ist durchaus möblich. Es ist auch möglich dass wir Einlizenzieren können. Wir sind auch in Gespräch mit Firmen wo wir eben Einlizenzieren. Selbstverständlich ist das ein Thema.

Wiedorn: Ist es durch Ihre Patente bis dato zu Problemen gekommen?

Mag. Jaquemar: Gar nicht.

Wiedorn: Was sind für Anagnostics die Gründe für einen ausländischen Markteintritt?

Mag. Jaquemar: Das resultiert bei uns einfach aus der heimischen Marktgröße. Österreich ist viel zu klein. Und der Markt an sich ist generell ein globaler. Das wären die Hauptgründe.

Wiedorn: Ist Auslandsfertigung ein Thema?

Mag. Jaquemar: Ja selbstverständlich. Zum Teil lassen wir ja schon jetzt z.B. die Plastikteile fertigen, daher Outsourcing ist für uns ein Thema. Wir müssen ja auch schauen dass wir die Produktionskosten niedrig halten. Derzeit ist es ja noch eine Art Manufaktur, jedes Gerät wird von Hand gefertigt. Einzeln gebaut nach Auftrag. Wenn man auf beiden Märkten nun standardmäßig produzieren lässt, wären die Kosten nur mehr ein Viertel so hoch. Daher natürlich interessant. Wir könnten um ein Viertel produzieren. Das ist aber derzeit nicht das wichtigste für uns. Jetzt geht es viel mehr um den Ausbau unserer Märkte um eben eine Stückzahl zu erreichen bei der sich dieses Outsourcing wirklich auszahlt.

Nemes: Das Managementteam von Anagnostics hat also derzeit Erfahrung im D-A-CH Raum?

Mag. Jaquemar: Nicht notwendigerweise. Christoph Reschreiter war bei einer Automationsfirma vor Anagnostics, und da ein Jahr in Korea und hat dort Verkaufsorganisationen aufgebaut. Und bei mir ist es weltweit, ich war davor in Positionen in denen ich global agiert habe.

Wiedorn: Derzeit exportiert Anagnostics ja alles noch selbst und direkt. Warum haben Sie sich genau für diese Eintrittsmethode entschiden?

Mag. Jaquemar: Das resultiert aus unserer Größe. Die Märkte sind auch noch alle sehr nah an Österreich. Das ist einfach so, natürlich wenn man wächst macht man das klarerweise nicht mehr selbst. Allein der logistische Aufwand wie Lagerhaltung etc. Aber mit unserer Größe ist das derzeit noch kein Problem. Das ist alles unter einem Dach derzeit.

Wiedorn: Und wie stellen Sie sich die Internationalisierung von Anagnostics in der Zukunft vor?

Mag. Jaquemar: Ja beispielsweise kann ich mir Auslandsniederlassungen vorstellen. Es gibt im wesentlichen natürlich für jeden Bereich, also für Life Science und In-Vitro-Diagnostics, gewisse Zielmärkte. Und so sieht es auch mit dem Marktzugang aus. Für

Diagnostics ist der Marktzugang in die USA sehr schwierig. Da macht es wirklich erst ab einer giewissen Größe Sinn einzutreten, oder mit einem starken Partner. Die FDA kontrolliert dort alles, und dies ist eine gewisse Hürde. So gesehen werden wir mit Life Science beginnen, über einen Partner, weil auch der Vorort-Service und die Wartung ein wichtiger Punkt sind. Das können wir nicht von St. Valentin aus bewerkstelligen. Dafür benötigt man eben Partner. Ab einer gewissen Größe wäre es natürlich auch sinnvoll in den USA selbst vertreten zu sein. Aber das kann auch nur in Form eines Representitative Office sein. Die finanziellen Aufwendungen sind natürlich relevant. Im Life Science Bereich würde man in der USA erst an die Ost- und an die Westküste gehen, dort ist unser Life Science Markt. Dort sind auch andere große Firmen wie Therme etc. Was Europa betrifft, wir haben uns gesagt, den deutschsprachigen Raum machen wir selbst, und alles andere machen wir über Distributoren. Der nächste geplante Schritt ist Skandinavien, Benelux und UK. Alles ist natürlich abhängig davon ob es Life Science oder In-Vitro-Diagnostics ist. Bei Diagnostics benötigt man eben einen guten Vertriebspartner, weil die Märkte an sich sonst sehr schwer zugänglich sind.

Wiedorn: Nehmen wir das Beispiel USA, würden Sie eher zu Joint Ventures oder doch zu Strategischen Allianzen für eine solche Kooperation tendieren?

Mag. Jaquemar: Ein Joint Venture würde ich mit den USA nicht machen. Unbedingt etwas dass wiederum schnell aufgelöst werden kann. Natürlich muss man sich aber die Zukunft von Unternehmen wie uns vor Augen halten. Wie sieht die Zukunft aus? Wir glauben nicht dass wir mit Anagnostics in zwanzig Jahren tausend Mitarbeiter haben. Uns wird es so oder so nicht mehr als Anagnostics geben. Voraussgesetzt es funktioniert alles, dann wird es so sein dass wir einen strategischen Investor irgendwann einmal haben, oder uns jemand kauft. Und so wird es sein. Das ist unser Ziel.

Wiedorn: Bei Kooperationen sind die Größenunterschiede problematisch?

Mag. Jaquemar: Seit über einem Jahr haben wir zwei Venture Capital Investoren. Nichts geheimes, entweder Privatinvestor oder eben institutionalisiert vom Land Niederösterreich. Die haben investiert, und im Jahr 2011 haben wir eine nächste Finanzierungsrunde. Und das benötigen wir gerade eben für die Kommerzialisierung und Produktionsausweitung. Und dieses dafür notwendige Kapital bekommt man nicht mehr allein in Österreich. Da muss man schon internationaler agieren. Investoren aus

Deutschland, Schweiz, vielleicht auch aus UK. Da muss man sehen, aber es wird notwendig sein. Eine zweite Möglichkeit wären Firmen die in diesem Bereich schon aktiv sind. Im Diagnostics Bereich wären das Firmen wie Siemens oder kleinere Firmen. Die Gefahr bei strategischen Investoren ist das diese nur ein Produkt interessiert und wir eben eine One-Product Firma werden. Da muss man sich eben entscheiden ob strategische oder finanzielle Investoren. Bei letzteren entscheidet man als Firma noch eigenständiger. Es steht natürlich beides zur Diskussion, wir wissen noch nie wie es nächstes Jahr läuft.

Wiedorn: Wie sieht es derzeit mit den Kapazitäten und der Auslastung aus?

Mag. Jaquemar: Ja wir sind an den Grenzen angelangt. Das heißt wir haben so viele Projekte an Land gezogen, sei es Kooperationen, Forschungsprojekte oder Kundenprojekte, sodass wir derzeit nicht mehr mehr machen können. Was für uns jetzt wichtig ist, dass wir bis Ende des Jahres eine gewisse Anzahl an Produkten im Markt haben, dass wir unseren Cash-Flow erhöhen und somit neues Personal einstellen können. Also Ziel ist es Kapazitäten in Österreich auszubauen. Einen Mitarbeiter im Bereich Verkauf planen wir in Deutschland einzustellen.

Wiedorn: Was ist derzeit der höchste Kostenfaktor bei Anagnostics?

Mag. Jaquemar: Personal. Und das zweite ist das Gerät, weil wir die Entwicklung und Produktion finanzieren. Und das liegt derzeit pro Stück bei rund 70.000 Euro, und das ist eben nicht Nichts. Wichtig ist derzeit für uns eine Balance zu finden zwischen den Kapital das in Geräten gebunden ist und den Personalkosten, dass sind unsere Hauptkosten.

Nemes: Werden die Produkte nach Kundenwünschen gefertigt, oder auf Lager?

Mag. Jaquemar: Naja wir haben auch für uns selbst einen Bedarf an Geräten, eben für die Forschung. Aber wir haben eine gewisse Projektion, und da fertigen wir schon drei Stück auf einmal. Aber klarerweise wenn ich drei Stück auf Lager habe, und die werde ich nicht los, hab ich 200.000 Euro gebunden. Da ist sehr dynamische Planung notwendig, das ist bei uns sehr wichtig. Ein Fünf-Jahresplan ist schon nach kurzer Zeit alt.

Wiedorn: Welche würde die nächste Internationalisierungsmethode sein, die Anagnostics in Zukunft anstrebt?

Mag. Jaquemar: Wie gesagt, der nächste Schritt läge außerhalb von D-A-CH. Auch möglichist es mittels Export. Eine Niederlassung ist derzeit nicht denkbar, aus finanzieller und organisatorischer Sicht. Einen Markt den ich noch vergessen habe zu erwähnen, der interessant ist für Diagnostics ist der Mittlere Osten. Das ist ein interessanter Markt mit ganz eigenen Charakteristika, dort sind viele österreichische Firmen vertreten. Das wäre ein eigenes Kapitel. Das ist aber ein Markt in dem man direkt nichts erzielen kann, dort geht es nur über Partner. Benelux sind wir gerade dabei wer Vertriebspartner wird. Die Geräte müssen klarweise gewartet werden, und das geht natürlich nur Vorort. Und wir haben das Service outgesourct. Denn wenn ein Gerät ein Service benötigt und dies in Frankfurt steht, dann sind das 800 km von St. Valentin, und das macht keinen Sinn. Das heißt wir haben uns einen Servicepartner gesucht, der generell diese Art von Geräten wartet. Das heißt bei Wartungen in beispielsweise der Schweiz kommen Techniker von diesem Servicepartner zum Einsatz.

Nemes: Wie hoch ist der Schulungsaufwand für die Geräte?

Mag. Jaquemar: Das ist eine Schulung im Ausmaß von drei Tagen. Zum Glück ist das Gerät an sich nicht kompliziert zu bedienen. Wenn das Gerät funktioniert ist eigentlich alles straight forward. Als Beispiel wenn wir beim Kunden sind würde ich behaupten dass dieser nach einer Stunde das Gerät komplett selbst bedienen kann. Das ist nicht bei allen Produkten in dem Markt so. Das ist für uns aber ganz wichtig, darum nennen wir sie auch smart. Im Background eine relative komplexe Technologie, aber relevant ist dass es für den Kunden ganz einfach zu bedienen ist. Das normales Laborpersonal damit umgehen kann, also nicht nur hochspezialisierte Laborkräfte. Und dies ist gewährleistet. Die letzte Installation beim Kunden hat in etwa eine halbe Stunde gedauert.

Nemes: Produktpiraterie, ist dies ein Thema?

Mag. Jaquemar: Ja sicherlich, einer der Gründe warum wir im Bereich Schnelltests nichts anbieten. 90% der Schnelltests kommen aus China, da ist das Thema nur billiger. Denn Schnelltests sagen nur Ja oder Nein, und das ist billig herzustellen. Darüber gehen unsere Methoden aber hinaus. Da braucht man Know-How. Ganz ausschließen würde ich Produktpiraterie auch nicht, aber es ist in genau unserem Markt eher unbüblich. Bei lange am Markt befindlichen Produkten kommt es schon vor, eben bei Schelltests, die werden schon mal nachgebaut.

Wiedorn: Ja oft wird angenommen dass bei aufwändigeren Produkten das Know-How am Standort verankert ist und dadurch man nicht einfach kopieren kann. Trifft das zu?

Mag. Jaquemar: Ja genau so ist es. Selbst wenn sie jedes Einzelteil herstellen können, könnten Sie damit relativ wenig anfangen. Da ist viel Know-How dabei, das nicht in einer Beschreibung steht.

Wiedorn: Rückblickend betrachtet würden Sie bezüglich Internationalisierung anders vorgehen?

Mag. Jaquemar: Rückblickend betrachtet, würde ich einen anderen Niederlassungsort für die Firma wählen. Da die Gründer am Standort Linz waren, wurde die Firma auch dort gegründet. Und Life-Science und Diagnostics am Standort Linz ist nicht ideal. Dort die entsprechenden Leute zu finden ist schwierig. Linz ist eher technisch orientiert, Chemie, Sofware, IT von mir aus, aber Life Science gar nicht. Es gäbe drei Standorte die in Frage kommen, das wäre Innsbruck, Graz und Wien. Dort tut sich in diesem Bereich auch etwas. Es gibt einige Clusters dort. Aber es ist schon schwierig für unser eigenes Labor Leute zu bekommen. Weil eben unser Investor das Land Niederösterreich sind, haben wir uns unter anderem für den Standort St. Valentin entschieden. Die Investoren wollen klarerweise dass wir unsere Wertschöpfung im Land Niederösterreich machen. Darum St. Valentin. Dort tut sich halt leider recht wenig, aber für die Kommerzialisierung ist das egal. Für die Entwicklung ist es von Bedeutung. Außerhalb von Österreich tut sich viel rund um München, Basel und Zürich, Freiburg auch. Auf alle Fälle braucht man die richtigen Leute. Startförderungsmöglichkeiten gibt es in Oberösterreich gute, nach dieser Phase tut sich aber rund um Wien mehr. Aber gut, dass ist eher eine subjektive Beobachtungen.

Wiedorn: Und rückblickend betrachtet, hätten andere Märkte angezielt werden sollen?

Mag. Jaquemar: Die Überlegung hat schon etwas an sich, dafür müsste man schon in sehr frühen Stadium wissen in welchen Bereich, ob Life Science oder In-Vitro, man arbeiten möchte. Und das wussten wir damals noch nicht.

Nemes: Also kann man sagen die Internationalisierung war ein inkrementaler Prozess?

Mag. Jaquemar: Ja absolut. Und den muss man einfach organisch machen. Wie gesagt im Life Science Bereich kann man in Österreich nicht überleben. Man kann in Österreich überleben als Vertriebsorganisation, in der man viele Produkte bündelt und diese dann vertreibt. Aber mit so einen Produkt wie unseres nur in Österreich zu

vertreiben, das geht einfach nicht. Außer man könnte das Gerät billig in der Garage erzeugen, das ist aber auch nicht Ziel des Unternehmens. Somit ist man auch gezwungen das Produkt überregional einzuführen. Aber man kann durchaus Märkte auslassen, man kann sich beispielsweise entscheiden nicht in die USA zu gehen. Wir haben den Markteintritt in die USA auch noch nicht zeitlich definiert. Das ist etwas das stimmen muss, da fühlen wir vor, sehen uns um Partner um etc.

Nemes: Das Ziel des Unternehmens ist es also dass man irgendwann attraktiv genug ist um aufgekauft zu werden?

Mag. Jaquemar: Ja so ist es.

Nemes: Und dies schafft man in dem man Profitabilität vorweist?

Mag. Jaquemar: Man benötigt in diesem Stadium eine erfolgreiche Markteinführung. Profitabilität ist eher egal, sicherlich macht es Sinn wenn es Umsätze gibt oder das die Produktionskosten sehr viel höher sind als der mögliche Verkaufspreis. Das Produkt muss natürlich marketable sein, das spielt schon eine Rolle. Profitabilität ist nicht relevant, wir werden sicherlich in den nächsten zwei Jahren auch noch nicht profitabel arbeiten können. Ziel ist es einen Marktzugang zu haben, eine Technologie, und natürlich auch Leute die von der Technologie überzeugt sind. Das Gerät könnte ich sicherlich auch in Singapur produzieren, mit dem entsprechenden Know-How. Aber ohne Know-How geht es eben nicht. Das Potential des Produkts ist entscheidend um Attraktivität zu schaffen, ist es flexibel, ist es ausbaubar. Nicht nur das man einen bestehenden Markt hat, sondern eine Basistechnologie auf der man aufbauen kann. Dafür gibt es auch einen Business Plan, für die nächsten drei Jahre, den auch unsere Investoren natürlich kennen. Wichtig ist auch dass wir Know-How aus den verschiedensten Bereichen bündeln.

Wiedorn: War von Beginn an ein Netzwerk vorhanden?

Mag. Jaquemar: Auf ein Netzwerk lege ich persönlich viel Wert. Das ist durchaus in dem Bereich wo man sicherlich im Nachhinein früher anfangen hätte können. Aber man kann natürlich nicht alles machen, da ist man eben natürlich als Start-up in den Ressourcen auch sehr eingeschränkt. Es gibt Firmen im Life Science Sektor, die erst seit vier fünf Jahren am Markt sind, die aber das Netzwerk gut genutzt haben. Die haben das Produkt und die Technologie zuerst wissenschaftlich bekannt gemacht, und über Nacht sozusagen wollten alle in diesem Netzwerk dieses Produkt haben. Sehr smarte Strategie.

Dafür braucht man natürlich einen langen Atem, da viele Investoren eben Umsätze sehen wollen.

Wiedorn und Nemes: Vielen Dank für dieses hilfreiche und ausführliche Gespräch.

Duration of Interview: 1 h 15 minutes

Interview Transcript of Case Study Thor Medical Systems Kft. (Hungary)

Wiedorn: Could you tell us how the company Thor Medical Systems was founded?

Ferenczi: In the former communist block the different industries were divided into sections that were geographically restricted. In the Eastern European and Soviet block all these industries were shared and specifically indentified who manufactured what. Medical technologies were mainly manufactured in Hungary for a market of more than a billion people. Even though communism was quite restricted in politics and freedom of speech, technology and science was free to do as they pleased. As a result of this freedom in technology and science a huge company evolved called Medicore Corporation. This cooperation was the 4th largest medical cooperation in the world after General Electrics, Siemens, Philips. At that time it employed 10, 000 people. During the collapse of communism the company was gradually destroyed and absolutely collapsed in the end. A huge and incredible amount of intellectual property was simply lost. Some of the assets were taken by entrepreneurs especially the real estate of the company. In some cases under very suspicious manners it was transferred to private companies and then sold at the fraction of the actual price so it was complete and total destruction.
Some of the technologies stayed and remained. One of the biggest remaining from Medicore was Innomed, which still exists. But Medicore Corp was manufacturing all kinds of medical products ranging from the smallest devices to the largest ones. From blood pressure monitors to computer tomography from X-ray systems to incubators.

One very interesting small field in the Medicore Corparation was the respiratory diagnostics field. It was partly continued by a private company called Piston Lmtd. This company still exists and at that time continued the technologies of Medicore Corporation. They didn't develop anything new at that time and their products especially in the terms of spirometry were no longer competitive on an international level.

A couple of my engineer colleagues and I were doing our PhDs and studying abroad in the US, in Finland, in Germany and other parts of the world. We met at meetings about medical technologies and markets. We understood that this medical technology had a history in Hungary and we understood that it could be modernized and if we could make it competitive we could create products that would be successful on international markets.

We returned to Hungary and decided to work in this field. We understood that there was a technology history in Hungary. This country is capable of having companies in this niche market. It is especially suitable for the Hungarian knowledge base and what is available locally. We understood that if we create this niche markets then we do not disturb the interests of huge companies like Phillips, GE or Siemens, because this is such a small industry that big companies are not interested in it. This is typically in the range of a couple of million-dollar market. It is perfectly suitable for this small country.

Secondly, we met an old person Gyula Satori who had been working for Medicore Corp. since 1963. He was the first to create open type spirometers in Central Eastern Europe in former East Germany. He became our teacher and we learned everything from him and how it had been done in Medicore for 40 years. We modernized his knowledge and created products based on our international experience with high technology like microprocessors and micro controllers, prototype plastic solutions and sensor technologies, etc., also based on the old knowledge that was available in Medicore Corp. Gradually we created new sensors and based on the sensor technology we created products and found international customers. We took the business on a global, international level immediately.
From New Zealand, Norway, Brazil and to Hong Kong we have distributor partners. Furthermore we have major OEM partners in the Netherlands and UK.
Nemes: Have you received any external funding for establishing Thormed?

Ferenczi: For four years we were working on our own. We applied for European grants and received a Start-Up grant of 100,000 €. That was a very important step. Without that money it would have been almost impossible to start anything. So these European

grants for start-up companies are very useful. Sadly these European grants have been reduced in the last few years.

Especially in Hungary it is very difficult to receive any start up grants. In most of the cases Hungarian start-ups went bankrupt or have not been continued at all. We are one of the few success stories. Most of the money was lost. The money which was used for us was used for creating products and helped us to become successful on a international level. This was the first step, in the second step we found a local investor who had 17 companies in the Hungarian region. We were very lucky with the investment group because they were very modern thinking. The investor, who graduated at the George Washington University, is manager and the main owner of the group. We also cooperated with a couple of his companies. We learned a lot from some of these companies. Some of these companies were successful and some of them were not. We observed that we could learn more from the failures of others than from their success.

Eventually we arrived at the stage we are right now where we have reached a higher level. Probably the local investor will sell a stake of the company, so we will belong to an even bigger organization and will create a entity in Hong Kong and then we could proceed with manufacturing in China. This is happening right now.

Nemes: Where are you producing right now?

Ferenczi: We are manufacturing in Hungary right now. Our quantities are increasing so our plan is that if we have major orders and we have larger quantities we will start producing in China. The special knowledge and products are still made in Hungary. We keep all the intellectual property in Hungary, because in China it is difficult to keep intellectual knowledge. So whatever is safe to manufacture in China will be manufactured there.

Nemes: Do you use patents for protecting your intellectual knowledge?

Ferenczi: Yes we have patents, but in China they do not respect these patents.

Wiedorn: Is licensing interesting for Thormed?

Ferenczi: Yes, we have core sensor technology for the respiratory signals were we have two partners. We have two major customers one in Eindhoven and another one in the UK. Also we are discussing with partners to supply the market with OEM products.

We also have a very good partner in Germany, actually it looks as if the most friendly cooperation place for Hungarian high-tech companies is in Germany. Any high tech company in Hungary usually finds the best partners in Germany. This is also true for the Dutch. I do not know if it has cultural reasons but typically we have the best cooperation with Germans. We have also got OEM partners in Florida Miami and we are also supplying to Latin America.

Nemes: What do you think is so innovative about your products?

Ferenczi: We didn't invent anything that is revolutionary. We created a solution that solved problems. The respiratory diagnostics products are typically used with disposables and with calibration systems and older systems are big and difficult to use. We created solutions, which do not require calibration systems as they calibrate themselves and which do not need disposables. Especially in less developed countries they do not need to buy the disposables for each measurement they just buy the device once. We supply them with disinfection solutions and we created the first and only waterproof spirometer which can be disinfected, which is used for testing lung function and asthma.

For home care we have created a small medical device with artificial intelligence which has got automated interpretation and it actually speaks and informs the patient about their respiratory disease.

Wiedorn: Do you have any direct competitors? Domestically or internationally?

Ferenczi: Yes, for our newest sensor technology our biggest competitor is in the ultrasonic diagnostics there is NDD Medizintechnik in Switzerland.. With older technologies for respiratory diagnostics there are about 15 companies that are related to this field. and the players know each other.

Nemes: Would you describe yourself as the price leader on the market?

Ferenczi: I think if we really wanted to we could be the real price leaders. We are one of the cheapest. There is an Italian company with a different kind of technology, which is also quite cheap. In terms of price and non functionality but for similar diagnostic purposes we are competing with the Italians. But we are really afraid of the Chinese evolving, because we already know that a Chinese company in Shanghai is already copying the German solution and a company in Beijing is copying the Italian device. So

we are very afraid and therefore created encryption technologies and securing technologies to make it secure from copying.

Nemes: Do you think that the disclosure of patents is a problem in this sense?

Ferenczi: We understand that this patent world is not exactly about protecting your inventions. This has its own rules and very strange rules. So you do not write down all your inventions and ideas in a patent but you write down those topics and features, which can be protected with a legal text. So we do not write everything down in our patents.

Wiedorn: Do you also join international trade fairs?

Ferenczi: Of course, yes. It is part of marketing. We receive a lot of help from the Hungarian state. Mostly from European funding it provides help for small and medium sized companies to go to international trade shows, and also advertising in papers etc. We applied for this and won a lot of support from them and also at major shows they organize common joint national stands. For example this year we are already at the end of our budget for marketing. We are very grateful that there is a joint stand in Düsseldorf at the Medica. We are participating and exhibiting at the Hungarian stand, which is far cheaper than having our own stand.

Nemes: Did you have a clear strategy before you tried to internationalize. Or did you receive an unsolicited order?

Ferenczi: I remember the first Medica exhibition. When we started this company we did not have much money I traveled to Düsseldorf myself for the first time and I took the prototypes with me. I put down the prototype on empty places without having a reservation or anything like that until they sent me away. In the end it was quite successful as we found a lot of international customers.

Nemes: According to your statements would you say that the market is a global one?

Ferenczi: Of course in Hungary we are market leader for the new device. For the old technology Medicore is still the market leader. But we sell most of the new devices in Hungary. Our biggest Hungarian distributor has a big market share in Slovakia and in Rumania, especially in the Western part of Rumania. In Austria we have a very good distributor; the Menzl family which is in Vienna, Schwarzenbergisches Krankenhaus in Innsbruck, in Graz and in Salzburg. In Austria we are quite good and sales are increasing. In Austria the Italian manufacturer was the market leader in Western Austria

especially in Innsbruck the Swiss company is preceding. But it looks as if our price and quality is good and our market share is rising.

Nemes: What professional experience did you have before you started this cooperation?

Ferenczi: Mr. Zoltan is a software engineer and algorithmic expert and he was working for GE Medica a consultant company. I was working in Finland for a company called Innovative Ideas working with innovative IT solutions. I was also working for British and Italian companies. I was also organizing manufacturing outsourcing projects to Hong Kong that is why I also have connections in Hong Kong. But I was also working for a bigger Hungarian medical engineering company that is quite successful on the international market.

Wiedorn: Is it difficult to distribute the product? Do you need to customize products to different countries?

Ferenczi: First of all for sales reputation is important. The country's reputation is sometimes hindering us in sales. For example in Germany people are really interested in buying local products, because German products are more reliable that everything else from other countries. This makes it very difficult to sell Hungarian products in Germany. But in many parts of the world we have a high reputation as being Europeans. For example we have very good sales in India because we have European products and also in Vietnam.

Most of the sales are straightforward so the products are standard with a broad range from home care to hospital care also including primary care. Depending on the local market and the level of the markets' healthcare system. For example in China there is only hospital care and no primary care system. On the other hand in the US the primary health care system is the strongest. So a different approach is required.

Nemes: Are there difficulties with law and regulations?

Ferenczi: This is the most difficult question. The European certificate is obviously necessary because we are in a European country and we have a local certifying body. Actually we certify our products with SGS, a Swiss based certification agency. Also for reputation issues because jt could be also certified in a Hungarian certification agency but that agency does not have much of a reputation for example in Germany. The Swiss one has the required reputation. The Swiss agency has a medical certification center in the UK and that certification is accepted in India and Hong Kong and also in Argentina.

In the US the FDA approval is very difficult to obtain as we are still processing it and also for the new product we have to do it again and again. There is one person who works twelve hours a day for the regulatory issues, as it is very difficult. Also in Brazil we have started to process the local certification. We have realized that they do not take it too seriously in the Ukraine. It is very strict in Russia, the Russian certificate is difficult to obtain. Also in SFD approval for China is complicated because you need to provide certifying information to the local authorities.

We had a very interesting experience with Taiwan. We had a partner in Taiwan and we were doing the certification process with this Taiwanese partner. They ordered a sample product from us. This particular sample product we protected with every possible securing mechanism we had. We had filled it up with glass, strong materials so that it was absolutely impossible to take apart. If they took it apart there would be fibers in it, which would cause the system to die if it was manipulated. It would lose the memory and we encrypted the pcp, chipsets everything was fully encrypted. So there was no way to take it apart and understand how it worked. We sent this sample out to them and they were very disappointed. It turned out that they only wanted to have the documentation for the certification to copy the product. Afterwards it turned out that they did not want to order anything else. In the end they did not want to do the certification.

Wiedorn: Is there any cooperation with universities?

Ferenczi: Of course yes. We have excellent cooperation with the Semmelweis University. Especially in the pneumology center. It is Hungarian but has also faculties in Hamburg, Germany and is also very popular with German students. It has quite a high reputation and they help us a lot in testing the devices and providing medical information. We also apply for grants together; we sponsor some of their doctors especially some of their researchers and PHD students.

We also have an excellent relationship with the Budapest University of Technology and the Technische University Vienna, especially with TeleMedica Systems. We have got a good connection to the University of Utrecht in the Netherlands. We have also got some cooperation with the University in Szeged. So we try to have as much cooperation as possible with universities.

Nemes: Do you have conjoint projects with universities? How is the cooperation organized?

Ferenczi: Half of the company is still doing their PHD or masters. We are located around 100 meters from the Technical University of Budapest and so around half of our staff is still studying at university.

Wiedorn: How many employees do you have at the moment?

Ferenczi: That's a good question. We have around 20 to 25 cooperative partners but about 7 of them are full-time employees.

Nemes: How much of the turnover is invested in research?

Ferenczi: We put all our profit into research so the owners do not take any profit. Everything is returned to R&D.

Wiedorn: What percentage of the turnover is generated abroad?

Ferenczi: Around 95 % of the turnover is generated abroad. Only about 5 % is generated on the Hungarian domestic market.

Nemes: What are your plans for further internationalization? Do you plan to sell the company to a bigger investor, maybe in the US?

Ferenczi: We do not go to the US. Our future is in Asia not in Europe or the US. These markets are in a continuous crisis. Whatever anybody says the investors are all in Hong Kong and Asia even the US investors. In the US we plan to open a sales-office. But for future investment we will go to Hong Kong. Also because in Hong Kong we have a much higher reputation than in the US. Actually among the Chinese it is very interesting that the Chinese people believe that the Hungarian (They say Shongjali the name of Hungary) came from the East and we are a kind of a eastern nation. They still believe that we are descendants of the Hun. Despite the fact that we are genetically Europeans we are still descendants of Asians. So we are kind of their European brothers. As a consequence they like us and I believe that this is also a benefit we can use.

Nemes: If you are going to China, do you plan to solely manufacture your products or maybe try to sell your intellectual know how?

Ferenczi: No, in China the legal protection is not strong enough to sell our intellectual knowledge. We would only sell our products. The Chinese culture is very unique in this sense. The way of doing business there is very different to doing business in Europe, but if somebody understands these differences one could do very good business there.

That part of the world is growing. China and India have an incredible growth rate and Europe and the US are just lagging behind.

Wiedorn: Do you plan to do other forms of cooperation apart from direct and indirect exporting? Like Joint Venture or Strategic Alliances.

Ferenczi: For example, in India we are creating a Joint Venture. But it is more a sales organization for the purpose of creating a joint brand. This is called Thormedica Systems India and also with our partner in Brazil we are creating the brand Thormedica Systems Americas. We are creating the framework with the joint venture and mainly try to establish and upgrade the brand.

Nemes: Again back to your customers. Who are the main customers?

Ferenczi: First of all it is a niche market. The most traditional market is pneumology departments in hospitals. In every hospital there is normally a pneumology department. They need respiratory- and lung function testing devices. This is market number one.

The second market is the general practitioners especially in very advanced markets as in the US or Western Europe. The number of general practitioners is growing. In general practitioners are those who are not specialized in respiratory diseases. They have these small mobile portable devices for general check ups. This is market number two.

The third market is home care for asthmatic people. Asthma is a chronic incurable disease which cannot be cured yet.

The second biggest market is COPD (chronic obstructive pulmonary disease), which is the fastest growing disease in the world especially in developing countries like China, because it is caused by air pollution and smoking. In the Western world the number of smokers is declining and in Asia it is increasing. In China the government even supports smoking. Furthermore they work in highly polluted environments and live in extremely polluted cities. So the market potential is increasing.

Nemes: Do you regret anything in the process of internationalization? Do you regret some steps or some cooperation with partners?

Ferenczi: After all my experiences I would do many things differently, but overall it was not that bad.

Nemes: Do you have any special memories or some special cases?

Ferenczi: When the crisis started in Europe I should not have invested so much in European markets. This might not be true for Austria, but for example in Sweden, Italy

and Spain everything went down. We should have invested in India, the Arabic countries, Saudi Arabia, Egypt, China and Australian region instead. We should have invested more in marketing and should not have invested so much in Western Europe.

Nemes: Is it also because your product is aimed more for developing countries?

Ferenczi: No, because Western markets are down. In India nobody has the respiratory care systems yet so they start from scratch. In the Western market a lot of people have these highly developed devices. They do not replace them that often due to the crisis and just use them for a longer period.

Nemes and Wiedorn: Thank you so much for this interesting discussion!

Duration of Interview: 55 minutes

Work Distribution of Authors

1. Introduction	Marlene Wiedorn, Peter Nemes
2. Definitions	
2.1. International Market Entry	Peter Nemes
2.2. Start-up Company	Marlene Wiedorn
2.3. High-Tech Sector	Peter Nemes
2.4. High-Tech Start-up	Marlene Wiedorn
3. Internationalization Theories	Peter Nemes
4. International Market Entry of High-Tech Start-ups	
4.1. Motives and Stimuli for Market Entry	Marlene Wiedorn
4.2. Categories of Risk	Peter Nemes
4.3. Market Location Approach	Marlene Wiedorn
4.4. International Market Entry Modes	Marlene Wiedorn
4.5. Timing of International Market Entry	Peter Nemes
5. Synoptical Table	Marlene Wiedorn, Peter Nemes
6. Case Study Methodology	
6.1. Case Study's Starting Point	Marlene Wiedorn, Peter Nemes
6.2. Industry of Medical Technology	Marlene Wiedorn, Peter Nemes
6.3. Case Study 1	Marlene Wiedorn
6.4. Case Study 2	Peter Nemes
6.5. Findings and Comparison	Marlene Wiedorn, Peter Nemes
7. Summary	Marlene Wiedorn, Peter Nemes

Curriculum Vitae

Persönliche Daten:

Name:	Marlene Wiedorn
Geburtsdatum:	10. Juni 1985
Geburtsort:	Wien
Staatsangehörigkeit:	Österreich
Tel.:	0699 18 77 88 22
E-Mail:	marlene.wie@gmail.com

Ausbildung:

10/2007 – 11/2010	Magisterstudiengang an der Universität Wien, Internationale Betriebswirtschaft mit Schwerpunkt Internationales Marketing und Internationales Management Eingereicht: Magisterarbeit zum Thema „Market Entry of Start-up Companies – A Case Analysis of Austrian and Hungarian High-tech Firms“
09/2006 – 07/2007	Fachhochschule Oberösterreich, Campus Steyr, Bachelorstudiengang Internationales Logistik-Management Abschluss: Bachelor of Arts in Business
02/2006 – 07/2006	Molde University College, Norwegen, Auslandssemester, Logistikhochschule
10/2004 – 01/2006	Fachhochschule Oberösterreich, Campus Steyr, Bachelorstudiengang Internationales Logistik-Management
09/1999 – 06/2004	Höhere Lernanstalt für wirtschaftliche Berufe, Freistadt, Maturaabschluss

09/1995 – 06/1999	Gymnasium, Freistadt

Besondere Kenntnisse:

Sprachen	Deutsch (Muttersprache), Englisch (sehr gut), Spanisch (gut)

IT

Betriebssysteme	Microsoft Windows, Mac OS
Anwendungssoftware	MS Office - Excel (sehr gut) - Access (gut) - Word (sehr gut) - Power Point (sehr gut) Statistikprogramm SPSS (gut)
GPM Tools	- Adonis (gut) - Aris (gut)
Betriebliche IS	SAP R/3 MM/PP/SD (Usererfahrung)

Praktika:

07/2009 – 08/2009	Auslandspraktikum bei Compoint Consulting GmbH, Griechenland Aufgabe: Durchführung Absatzanalyse und Entwicklung Marketing- und Logistikstrategie für Premium-Oliven-Öl
02/2007 – 06/2007	Unternehmensprojekt bei Plastic Electronic GmbH, Linz Aufgabe: Marktstudie für den Einsatz einer Smart-Folie im Bereich des Marketings und der Logistik inkl. Verfassung theoretischer Arbeit (Bachelorarbeit Teil 2)

10/2006 – 01/2007	Unternehmensprojekt bei Sunmaster Energiesysteme GmbH, Kirchdorf Aufgabe: Erstellung eines Lastenheftes zur Einführung eines ERP Systems inkl. Verfassung theoretischer Arbeit (Bachelorarbeit Teil 1)
10/2004 – 02/2005	Unternehmensprojekt bei C. Bergmann KG, Traun Aufgabe: Optimierung der Lagerlogistik und Lagerlogistikprozesse

Berufserfahrung:

10/2008 – 07/2010	Studienassistentin am Lehrstuhl Internationales Marketing, Universität Wien/Institut für Betriebswirtschaftslehre
07/2005 – 06/2006	A. Haberkorn & Co GmbH, Linz, Marketing und Vertrieb
03/2004 – 08/2004	Peek & Cloppenburg, Linz, Verkauf

Sonstiges:

Universitätsprojekt in Zusammenarbeit mit T-Mobile (3. April bis 5. Juni 2008). Research Objective: Wie kann man Non-User von "Internet am Handy" zu Usern und so „Internet am Handy" massentauglich" machen? Anschließende Präsentation der Ergebnisse im T-Mobile HQ Wien.

Teilnahme am L'Oreal Brandstorm Wettbewerb 2008 (1. Februar bis 15. Mai 2008) Internationaler Marketingwettbewerb: Entwicklung einer neuen Produktlinie mit dazugehöriger Marketingstrategie und Marktanalyse. 2. Platz im nationalen Finale.