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**Role of Intellectual Capital in Company Growth: A Case
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Role of Intellectual Capital in Company Growth: A Case Study on Technology Companies in Finland

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To all entrepreneurs and especially those of seeking growth business opportunities

TAMPERE UNIVERSITY OF TECHNOLOGY

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ABSTRACT

The research objective of this study is centered on investigating the value added by intellectual capital from the variety of strategic resource allocation in technology growth firms by diverse actors. The actor perspective is not limited to venture capital investors but attention is given to any of the intellectual capital value adding actor types suitable for leveraging companies to further growth stages. From the company perspective, especially the strategic resource dependency explained from the intellectual capital standpoint is one of the major contributions here. The second contribution is the descriptive analyses of investment-like occurrences of intellectual capital value adding from both the growth company and the actor perspective.

The phenomenon of interest, intellectual capital paced firm growth involving the investment perspective, is well known in venture capital literature, termed sometimes as smart capital. Also scholars inspired by the resource dependency backed strategy management literature have added their views on firm growth boosted by intangible resources. However, the literature on intellectual capital reveals only a few studies focusing on explaining the dynamism of intellectual capital within growth firms featured by investing. Filling this research gap is an aim of this study.

The research approach is by nature explorative and action-analytical. The leading thread of the thesis is the well-known notion that the growth of companies is not only restricted to financial capital funding but also to intellectual capital value adding, comparable with funding. However, a less known is how and what type of intellectual capital is required to alleviate the inertia embedded in growth, and especially, in which order the diverse intellectual capital qualities are served along growth. Accordingly, the theoretical foundation is the IC-theory. The other adjacent theoretical regimes, such as the views of the resource based strategy management or VC theory serve in providing the appropriate concepts for the operationalising of case data.

The research problem is formulated into two lengthy research questions and their subquestions. In brief, RQ1 is: what is like the growth pattern defined in terms of intellectual capital? In turn, the first two subquestions of RQ2 are centered on the questions: what are the generic profiles of

diverse intellectual value adding actors and what are the feasible IC-value adding spot areas and their levels of importance in accordance to the IC growth pattern? The third subquestion of RQ2 focuses on the input-output consideration of IC framed by investment cycle in technology company growth. Ultimately, these two research questions disclose the role of intellectual capital in investments on technology company growth.

The research strategy comprises four phases. First, at the beginning of the empirical part, a growth pattern is derived directly from the case studies with less theoretical concepts which can be termed an exploration-description phase. Second, two theoretical concepts of growth in company internal business creation (i.e. micro view) and diversifications due the expanding on market (i.e. macro view) are operationalised and combined into to the comprehensive 7*7 matrix. Moreover, it is the growth pattern, first expressed in terms of operation management due to the quality of the case data, and, furthermore, transfigured into the form of IC-growth pattern, which is the positive answer to RQ1.

The expansive modes of the growth pattern are after a null diversification a minor product, a minor market diversification followed by a minor reverse (restructuring) diversification. Next, major diversifications involve buying existing product/service business aiming also to the expansion by products and customers. The novelty of the growth pattern comes from the IC-interpretation of growth and the notion of restructuring as one of the diversification types. In fact, it matches with the same 7-step business creation pattern as the two others, witnessing the nature of growth present in firm restructuring occurrences.

The characterisation of the third phase is exploration-generic conception where, first, the testing of the growth pattern by actor cases gives generic actor profiles articulated in intellectual capital terms. An abstraction from those profiles, moreover, entails the concept of the four main cycles framed by a single diversification, where each of the cycles is engaged with a particular type of IC-value adding actor profile. A further analysis suggests the actor type of providing structural capital during the conceptualisation-exploitation-generation, a main cycle, as the most feasible point of entry to the new investor-like IC-providers.

The fourth research phase, the input-output assessment of intellectual capital value adding framed by a single diversification affords a definition of the cause-effect of intellectual capital value adding within an investing process in growth companies. The outcome is competitive advantage taking different appearances due to the diversification type in question which ends the processing of RQ2.

Finally, a comprehensive concept system grounded on those three derived concepts gives the overall view on the role of intellectual capital in technology company growth. It is also the major contribution of this study to be added to the theories concerning intellectual capital.

Implications on IC-theory and further use of the results of this study, the definition a comprehensive hierarchial IC-model of company growth is suggested for consideration in any further IC-studies dealing with growth technology companies. In this regard, the main level presentation of intellectual capital, in three parts, is further divided into eleven subsections, which are then defined by factors, 35 in total. Disclosing the pivotal role of ownership management in the variety of structural capital main factors, absent in IC-theory is also an outstanding contribution.

This study also entails some practical implications. First, a technology growth company in need of managing its business portfolio should use specialised advice more readily than is currently found in practise. A chief restructuring officer taking the lead, not just in restructuring the customer and product portfolio, but also gearing the company towards new growth is worthy of a shareholder position, not just a hired director. Answers to the question of how and when the intervention of a CRO can be accomplished can be taken into the theory of this study.

Frequently asked question by the owners and management of growth companies is, how and when the required new competences, i.e. IC, should be incorporated along company growth. For this matter, due to the increased understanding of the dimensions of the growth firm at the micro and macro levels, a practical outcome is the growth scenario analysis consultancy framework, which is trialed already. Also, the study is a feasible theoretical foundation for writing a practical business book focusing on novice entrepreneurs looking forward to opportunities to transform their intellectual capital into future returns.

TIIVISTELMÄ

Väitöskirjassa tutkitaan aineettoman pääoman panostamista kasvuyrityksiin osana aktorien strategisten resurssien allokointia. Aktorinäkökulma ei keskity pelkästään taloudellisia resursseja ja osaamista panostaviin pääomasijoittajiin, vaan myös aineetonta pääomaa panostaviin toimijoihin, joiden panoksilla on keskeisesti vaikutus kohdeyrityksen kasvuun. Yksi tämän työn kontribuutioista on yrityksen kasvun riippuvuuden tarkastelu strategisista resursseista selitettynä aineettoman pääoman näkökulmasta. Toinen kontribuutio on kuvaus ja selitysmalli investoinnin kaltaiselle aineettoman pääoman panostamiselle. Tutkimusaineisto koostuu pääasiassa kasvuhakuisista teknologiayrityksistä..

Tutkimuksen kohdeilmio – aineettoman pääoman panostaminen kasvuyritysten kasvun kiihdyttäjänä – on tuttu riskirytysten pääomasijoitustoimintaa sekä resurssiriippuvuuslähtöisesti yritysstrategiaa käsittelevässä kirjallisuudessa. Kuitenkin aineettoman pääoman tutkimus on sivunnut aineettoman pääoman panostamisen logiikkaa teknologiakasvuyrityskontekstissa suhteellisen vähän verrattuna alan koko tutkimusvolyyymiin. Tutkimus pyrkii täydentämään tätä vajetta.

Tutkimus on luonteeltaan eksploratiivinen ja toiminta-analyttinen. Väitöskirjan punainen lanka perustuu huomioon, että yritysten kasvua rajoittava tekijä ei ole pelkästään taloudellisten resurssien puute, vaan myös se, että aineetonta pääomaa on rajallisesti saatavilla. Kuitenkin vähemmän tunnettua on se, millaista aineetonta pääomaa ja missä järjestyksessä yritykset tarvitsevat kasvun eri tasoilla. Tämän vuoksi työn teoreettinen viitekehys on aineettoman pääoman teoria. Toisaalta tälle läheiset teoriat, joita yleensä on esitetty venture capital-teemaa ja resurssiriippuvuutta tarkastelevassa strategiakirjallisuudessa, tarjoavat lähtökohdan tarvittavien apukäsitteiden luomiseksi tutkimusdatan operationalisointia varten.

Tutkimusongelma on muotoiltu kahdessa pitkähkössä tutkimuskysymyksessä alakysymyksineen. Tiivistetysti ilmaisten ensimmäinen tutkimuskysymys on: millainen on teknologiayrityksen kasvu aineettoman pääoman termein kuvattuna mallina? Toinen tutkimuskysymys on: millaisia ovat teknologiayritysten kasvun panostamisen syklit aineettoman pääoman kannalta? Sen kahdessa alakysymyksessä luodaan yleistetty esitys erityyppisten aineettoman pääoman aktorien profiileiksi, jonka jälkeen nämä sovitetaan IC-kasvumalliin. Kolmas tutkimuskysymyksen 2 alakysymys tarkastelee aineettoman pääoman panostamisen vaikuttavuutta yrityskasvuun. Tarkentaen toinen tutkimuskysymys nostaa esille näiden syklien eri osavaiheissa tapahtuvan aineettoman pääoman panostamisen eri lajit ja näiden keskinäisen riippuvuuden sekä vaikutuksen kohdeyrityksen kilpailuetekijöihin. Yhteenvetona tutkimuskysymyksiin syntyy aineettoman pääoman panostamisen malli, jolla kuvataan aineettoman pääoman rooli yrityskasvussa

Tutkimus on nelivaiheinen. Alussa pyritään johtamaan kasvumalli suoraan tutkimusdatasta muutaman apukäsitteen avulla, jota voidaan luonnehtia eksploratiivis-deskriptiiviseksi vaiheeksi. Seuraavaksi kaksi teoriakäsitettä, kasvun mikrotason käsite eli yksittäisen liiketoiminnan kasvun vaihemalli ja makrotason käsite eli diversifikaatio, jolla kuvataan yhtä yrityksen kasvusykliä kilpailutilanteessa markkinoilla, yhdistetään 7*7-matriisikuvaukseksi. Tämä on samalla organisaation operaatioiden avulla kuvattu kasvun malli, josta johdetaan

varsinainen aineettoman pääoman käsittein kuvattu teknologiayritysten kasvun malli. Tämä malli on vastaus ensimmäiseen tutkimuskysymykseen.

Johdettu aineettoman pääoman malli perustuu makrotasolla seitsemään perättäiseen diversifikaatioon, joita ovat nolladiversifikaatio, pieni tuote-, pieni markkina- ja pieni käänteinen diversifikaatio sekä vastaavat kolme isoa diversifikaatiota. Tyypillisesti isot diversifikaatiot sisältävät olemassa olevan liiketoiminnan hankintoja, joilla laajennetaan tuoteperhettä ja asiakaskuntaa. Yksittäinen diversifikaatio taas kuvataan seitsemänaskelisen uuden liiketoiminnan kehitysmallin avulla, joka on yleinen kaikille diversifikaatioille. Kasvumallin uutuusarvo perustuu paitsi IC-käsitteistön soveltamiseen myös käänteisen diversifikaation huomiointiin. Viimeksi mainittu sisältää kaikki seitsemän kasvun vaihetta mikrotasolla, mikä osoittaa sen myös olevan tasavertainen muiden diversifikaatioiden kanssa.

Kolmannessa vaiheessa, joka voidaan luonnehtia eksploraatiivis-geneeriseksi vaiheeksi, testataan kasvumalli aktoriaineistolla ja aktoreille luodaan geneeriset profiilit aineettoman pääoman termin. Yleistämällä aktoriprofiilit johdetaan nelisyklinen kuvaus tiivistämällä yksittäisen diversifikaation mikrotason seitsemänvaiheinen kasvumalli neljään päävaiheeseen. Kukin näistä neljästä vaiheesta edustaa tietyn tyyppistä aineetonta pääomaa sekä panostavan aktorin ydintoiminta-aluetta.

Neljäs vaihe on aineettoman pääoman panostamisen vaikuttavuuden tarkastelu yksittäisen diversifikaation rajaamassa kasvusykliä, joka on käytännössä yrityskasvun yksittäinen investointisykli. Sen tuotos taas näkyy kilpailuetuna, joka saa eri diversifikaatioiden mukaisesti eri muotoja. Lopulta saavutetaan ensimmäistä vaihetta lukuun ottamatta em. osatuloksiin perustuva kokonaisvaltainen kehysmalli, joka tarjoaa kuvauksen aineettoman pääoman roolille teknologiayrityksen kasvussa. Johtopäätösosassa tehdään lisäksi yhteenveto profiileista erityyppisille aineettoman pääoman panostajille.

Väitöskirjan teoreettisia hyötyjä ovat em. yrityskasvun malli aineettoman pääoman käsittein avulla kuvattuna. Lisäksi teoriaosassa johdettu aineettoman pääoman 35-muuttujainen hierarkkinen malli soveltuu perustaksi mm. kvalitatiivisille yrityskasvun aineettoman pääoman tutkimuksille. Myös omistajuuden tarkastelu osana rakennepääomaa on täydentävä tekijä nykyiseen aineettoman pääoman teoriaan.

Työn käytännölliset sovellusmahdollisuudet liittyvät mm. liiketoiminnan uudelleen organisoimiseen, strukturoimiseen, professionaaliseen hallintaan, joka ei saa kasvuyrityksiltä useinkaan tarvittavaa huomiota. Chief Restructuring Officerin eli uudelleen suuntauksen johtajan tulee olla yritykselle enemmän kuin vain tilapäinen johdon konsultti. Sitoutuneena osaomistajana tällainen kyvykäs aktori toimii paitsi liiketoimintaportfolion analysoijana myös uudelleen suuntauksen johtajana.

Toinen sovellusalue perustuu väitöskirjan tarjoamaan ymmärrykseen aineettoman pääoman olemuksesta yrityskasvun mikro- ja makrotasolla, joka luo pohjan johdon konsultoinnin skenaariotyökälulle kasvu-urien vaihtoehtojen mallintamiseksi.

Kasvuyritysten johdon usein esittämä kysymys on, miten ja missä vaiheessa kasvun edellyttämät osaamisresurssit tulisi kytkeä osaksi yritystä ja miten toimiva johto voi varmistaa oman asemansa. Tämä työ tarjoaa luontevan perustan kirjoittaa käytännöllinen kirja, joka on tarkoitettu alkaville yrittäjille tai aineettoman pääoman panostajiksi tähtääville kanssaryrittäjille.

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In Holy Week, Maundy Thursday, 5th April, 2012, Tampere

Pekka Kamaja

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LIST OF ABBREVIATIONS

BA	Business Angel
CFO	Chief Financial Officer
DD	Due Diligence
FVCA	Finnish Venture Capital Association
IC	Intellectual Capital
IPO	Initial public offering
IPR	Immaterial Property Rights
LBO	Leveraging buy out.
M & A	Merger and acquisition
OEM	An original equipment manufacturer or OEM is typically a company that uses a component made by a second company in its own product, or sells the product of the second company under its own brand [Wikipedia].
RBV	Resource based view
ROI	Return on investment
VCF	Venture capital firm
TCO	Total cost of ownership, TCO analysis was popularized for the Gartner Group in 1987 within IT-technology. TCO as a concept denotes the cost of owning an investment utility from the purchase, through its maintenance, and finally its sale or wreck. The object of investment is leased or rent for a production use to customer who settles periodically payments to the factual owner of the equipment. Differing from a pure rent business the customer pays only on use (with guaranteed service level) and supplier (owner) bear all risks of property.
TEKES	Finnish Funding Agency for Technology and Innovation

LIST OF APPENDICES

Appendix 1: In-depth case description – The machine vision system firm case

Appendix 2: Taxonomy of the intellectual resources of case firms – (with Coding)

Appendix 3: Summary of the business process appearances on growth stage

1 INTRODUCTION

The first subchapter of Chapter 1, the introduction, is an orientation and also discussion of the ontology of intellectual capital. Consequently, the study here focuses on discussing companies' increasing demand for intellectual capital.

The second subchapter begins with a brief introduction to the scope of this research study. This overview first gives an overall idea of the research objectives of this study. Next, the key definitions are introduced in order to set out more accurate boundaries for the research area. Accordingly, the pivotal terms appearing in the title of this study are discussed briefly.

The third subchapter is the actual discussion about research strategy and introduces the research questions, the research setting and approach, the research design in brief, theoretical limitations and contribution of the study. The final, fourth subchapter presents the structure of the whole study.

1.1 ORIENTATION OF STUDY

In the early years of the industrial era companies like the Ford Corporation were able to dominate the market because of the insufficiency of goods, here cars. Accordingly, customers were offered only one colour option, the black T-Ford, as there were no market-driven reasons to multiply the number of variants (Chesborough 2003). Hence, both the manufacturing and marketing operations in those days were mechanistic, leaving no room for intellectual capital (Contractor & Lorange 2002, p.495). Today, companies are like high-trim F1-cars served by high-ranking experts. Unlike companies in the past, modern enterprises are highly dependent on varied intellectual capital contributions. Consequently, intellectual capital can be judged as a valuable asset to firms (Pike et al. 2002, p.659).

Therefore, the 21st century is shaping up to be a knowledge driven and dependent society. The most prominent resource dictating the global economy now and in the future is knowledge and companies' intellectual resource base (Drucker 1983; Huizing & Bouman 2002, p.189; Johannessen et al. 1999, p.274). Companies are competing with knowledge that forms an enabling platform for developing new competitive products and services (Itami 1987; Chesborough 2003; Teece 2000; Mathews 2003, p.1160). Therefore, large organisations are becoming progressively more alert to the significance of knowledge for efficiency and competitiveness (Halawi et al. 2005, p.76) as well as for emerging growth firms (Pike et al. 2002, p.657).

In parallel with continuously increasing knowledge repositories, it has become more expensive to produce new knowledge which has given a rise for the research and

development activities focusing on more specialised areas. Moreover, business firms are calling for more productive people capable of meeting the heightened knowledge and experience requirements for a knowledge worker (Drucker 1973; 1983; Castells et al. 2002).

Under the pressure of absorbing more and more efficiently intellectual capital, companies have come to rely more on intangible assets which, in turn, have become more complex and unstable (Lev & Sougiannis 2000). A look at business economics trends reveals that the tangible asset value of firms' total market value has declined constantly. In 1982 the figure was 62 %, and in 1992 38 % among S&P500 firms (Blair 1995; Horibe 1999). Yet, in 2002 the average market value of firms' tangible assets from the total market value was as low as 15% (Kaplan & Norton 2001). Still evidence for the increasing power of intellectual capital is embedded in the figures of the aggregate gross license revenue obtained by all U.S. universities that approached \$1 billion for the first time in the fiscal year 2002 (Bulut & Moschini 2006).

Since the 60s and 70s, the split of monolithic corporation structures into more agile independent business organisations has made companies more dependent on the services provided from their value network (Chesborough 2003). Along with the rise of competitive advantage considerations (see e.g. Porter 1980) it was suggested that firms re-think their internal value adding processes but as well as more broadly their position in the value chain among integrated firms (Porter 1985).

Due to business process re-engineering thinking (Davenport & Short 1990; Hammer 1990) companies began to streamline their business processes. Moreover, inspired by core competence discipline (Prahalad & Hamel 1990; 1994), companies handed out their self-supported infrastructure services to outside parties and focused their attention on their most vital business activities (Prahalad & Hamel 1994). Among the technology and service outsourcing industries, especially outsourcing of information technology became popular during the 90s. It paved the way to more comprehensive forms of outsourcing such as business process outsourcing (Vinning & Globerman 1999; Melby 2001). Eventually, firms were learning to form long-term partnerships with providers selling service offerings of less business importance for the buyer company (Willocks et al. 1999).

In the presence of a less controlled business environment it seemed like the performance gain was dispersed and diluted within the business network involving the investors, investee and other members not intended to be gain receivers. In fact, the invested value was insufficiently returned to the original investors. As an example of this was the phenomenon called the IT-paradox noted in late the 80s. Solow put this aptly: "we see computers everywhere except in the productivity statistics." (Brynjolfsson 1993, p.1). The accompanied research in the 90s pointed that the value was diluted forward in the value chain, enabling lower product prices to the customers due to the increased cost-efficiency of the supplier (Brynjolfsson & Hitt 1996, p.544).

Firms re-organising the business operations by externalising, networking and improving customer relations, gave a rise for searching synergistic partnerships. In fact, this phenomenon was termed a business ecosystem (Moore J. 1993), denoting both the structure of the members belonging to a certain business community and the increased economic contribution the members could enjoy instead of running their businesses outside of the system.

“What’s in or out of the core”-thinking was also contributed to by the emergent of performance indicator systems (Kaplan & Norton 1996), which, furthermore, enabled the benchmarking of economic performance of a particular firm against the best practises available within the industry in question. Intellectual capital systems (Sveiby 1997b, Sveiby 1998), in turn, created a new tool for the collection of monitoring systems available to companies interested in analysing the reasons on the factors behind the productivity and internal efficiency of companies.

Good news for the actors capable of providing outstanding intellectual contributions was signalled by the emerging venture capital industry that manifested not only dependency on financial capital but, moreover, knowledge and intellectual resources (Stopford & Baden-Fuller 1994). In the early 80s, technology-related ventures accounted for as much as 70 percent of the companies’ financing and often more than 80 percent of the total dollars invested in any given year. Yet, the availability of venture capital does not automatically generate the climate under which technology development can flourish (Sapienza & Timmons 1989, cited in Camp & Sexton 1992).

The relatively short history of the venture capital industry has given rise to a multitude of actors holding smart capital (see e.g. Schaefer & Schilder 2007, p.13). Not only formal venture capital firms but also less formal actors like business angels and other informal intellectual contributors with varying financial reserves have appeared. Consequently, today the technology growth business investors’ arena is more fragmented and diversified, embodying a dispersed crowd of profit-seeking actors (Harrison et al. 2004).

In sum, knowledge workers have become scarcity and financial property, in turn, abundance. Hence, the thing enabling the global economy to grow is ultimately knowledge and intellectual resources. New meaningful knowledge is the fuel for companies to grow and create sustainable competitive advantage and create innovative offerings (Teece 2000). On the other hand, knowledge in its structured form is fluid and difficult to control that implicates a higher risks involved in creating, managing and utilising intellectual capital (ibid. 2000).

One knowledge investor archetype is certainly found among the management people of a business organisation. A wise CEO is frequently expected to hold a magic wand, transfiguring touched objects, like risky business operations, into gold. It is not rare among the public listed companies that the recruitment of a new CEO positively influences firm’s stock rating.

In October 2004 a top business leader, Finnish Lasse Kurkilahti left Elcoteq SE, a data communication and display electronics contract manufacturing company, and moved on to take the chair of CEO of Kemira Plc, a Finnish corporation in the chemical industry. Immediately, the stock ratings regarding both companies reacted considerably. Elcoteq's rating sank by 4.4 % and Kemira stocks went up by 4.1 % (Kauppalehti 2003). A calculation of the change in Kemira's stock rating and company's total market value gives a valuation worth 38 million EUR for Mr. Kurkilahti's business experience and leadership skills.

Interestingly, in the reverse situation, where a CEO with a poor reputation leaves a company, the impact on the stock rating could also be positive. The leaving of CEO Igel from TeliaSonera, a Swedish-Finnish telecom, caused the stock rating to increase by 2, 6 % on 12th June 2007 (Kauppalehti 2007).

It is not only famous leaders who are valued explicitly following a certain economic yardstick like the change in the stock price. Also scientific results and scientists may constitute an important economic manifestation. Despite the fact that research results are very cumbersome to evaluate, there was compelling evidence of the skyrocketing value involved in the breakthrough LED-technology research carried out by Professor Shuji Nakamura. A well-documented law-suit considering this particular technology pointed out the business opportunity value embedded in intellectual property rights. As stated (www.CompoundSemiNews, 2004), "a judge ordered Nichia (the claimant), a Japanese company, to pay its former employee Shuji Nakamura a total of 20 billion yen (\$189 million) in compensation for the blue LED patents he filed while working for the company in Feb 2, 2004, 20 billion yen in compensation for patents that he filed while working for Nichia".

These stories of Mr. Kurkilahti, Igel and Nakamura here highlighted the ultimate economic value of the knowledge and intellectual property of individuals. Although not as well- documented, these top actors have equivalents all over the business world acting as the intellectual resource providers at the second, third and lower league levels of businessmen ranking.

1.2 OBJECTIVES AND SCOPE OF STUDY

The main task of this study is to investigate the intangible side of strategic resource dependency of growth firms, where the intellectual capital approach is chosen. Therefore, the objective of the study is to increase understanding of the role of intellectual capital in company growth, where the focus is set on value adding by IC. Moreover, the study is interested in defining the levels of strategic importance of IC and addressing the role of intellectual value adding from the investment point of view. Hence, the study is a new addition to theories discussing growing firms dependent, not only on financial, but also on intangible resources (see e.g. Penrose 1959).

Although the previous Subchapter 1.1 is not a complete introduction to the appearances of intellectual capital value adding, three main ontologies of intellectual capital within

the arena of technology business growth can be found. Precisely they are shown in terms of three blocks vertically in the middle in Fig. 1. Moreover, the Figure 1 is an illustration of the scope of this study which is discussed next here.

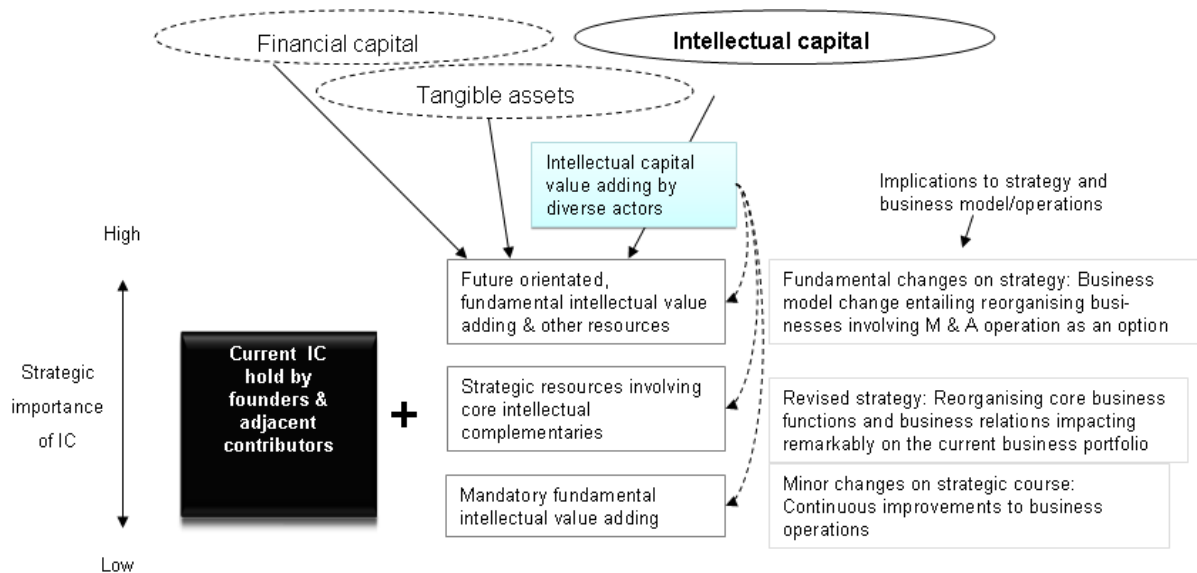


Figure 1: Overview on investment-like intellectual capital value adding

Depending on the growth stage and other external and internal causes, firms are exposed more to a scarcity of strategic resources the higher they are positioned at the levels of Fig.1. Due to their strategic nature these resources are scantily available on the market or, even more frequently, absent (Dierickx et al. 1989). For example, the future orientated fundamental IC value adding-block points to the market space available for divergent capital investors capable of offering so-called smart capital, which is business wisdom bundled with money (Schaefer & Schilder 2007, p.13).

Besides the currently hold intellectual capital (the black block in Fig.1) companies are dependent on external intellectual capital which is pointed in the middle in Fig.1. From the bottom the 1st block in middle, mandatory and fundamental intellectual capital is any type of knowledge based services bought from the market to satisfy the company's business development needs. Typical actors at this point are business consultants providing expertise, which is specialised knowledge focused on business process improvements and expansion of customer/product basis. The intervention can be characterized as episodic (Rice 2002). Accordingly, the implication for the firm's strategy course is relatively low.

Next, the 2nd block in Fig. 1 stands for the strategic contributions centered on the major improvements to the firms' core business functions. The intervention is based on a strong leadership. In practice, a new actor may be a new CEO taking care of a major strategic course change focused on urgently needed improvement in the company's profitability. The means are, e.g. extending the customer basis, creating new offerings or restructuring the business portfolio in another way.

The 3rd block implies the idea of strong intervention by external investors. Here, the main focus is on rethinking the firm's main course and the business model. The implications here are restructuring ownership and establishing strategic alliances necessitating sharing ownership to new parties. Besides intellectual capital also the role of financial and tangible resources is outstanding.

The research area is illustrated in Figure 2, which points out an expansive perspective and a stage-wise growth continuum in respect of growth-orientated technology firms.

From the actor point of view Fig. 2 holds both the firm internal and external value-adding actors, the latter staying as external ones or moving inside the firm. In turn, from the growth continuum perspective the scope of Fig. 2 ranges from an invention to an innovation or innovations up to a mature firm. As stated by Schumpeter (1942, p.132), an invention is a precursor to innovation(s), where the latter always has a commercial goal as explained more detailed in Subchapter 4.1.1. The other concepts referred to in Fig.2, except the fundamental concepts introduced in the next subchapter, are discussed in the theory part. The stages of growth are in Subch. 4.4.2, the actor types in Subch. 4.5. Ch. 3 is entirely dedicated to discussion of intellectual capital. The theory of intellectual capital value adding is in Subchapters 4.2 – 4.3.

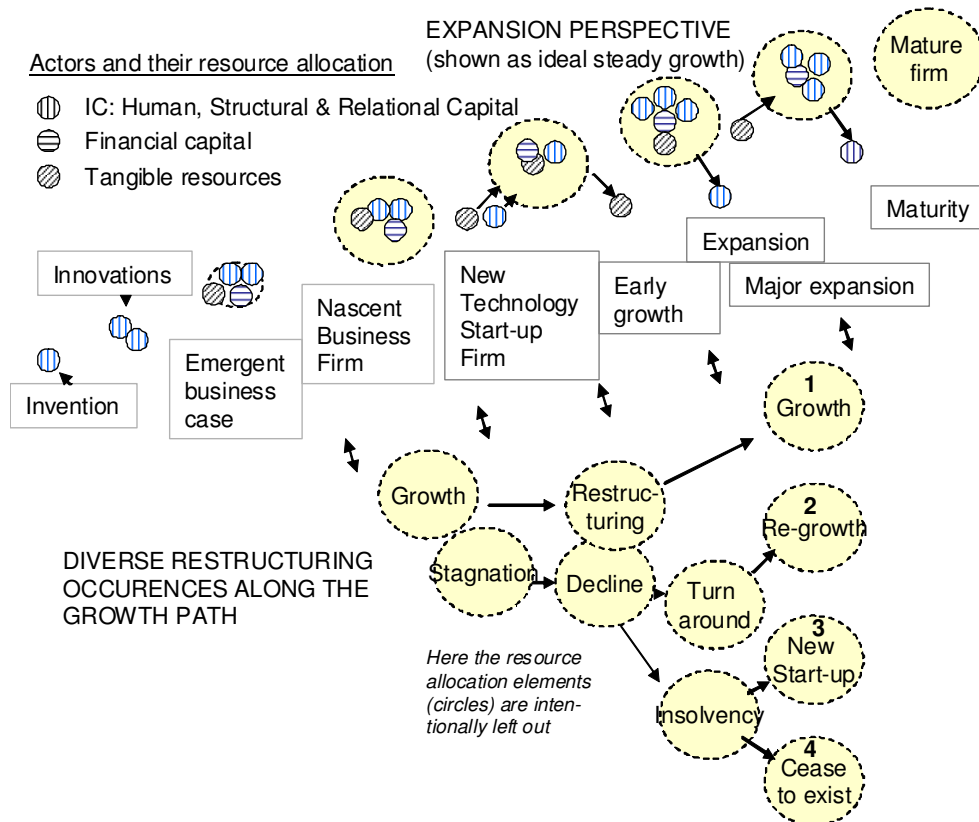


Figure 2: Research area of the study

The steady growth, which is referred to by the expansion perspective of a singular business operation in Fig. 2, embodies two connotations: (1) the growth of a new technology firm and, (2) the growth of a new business within the business portfolio an

established firm. Precisely, the latter would necessitate pointing the internal resource allocation from sources held by the company (or corporation) in Fig. 2.

The small circles denote the dependency on intellectual capital, financial and tangible resources provided by diverse actors along the development from the invention stage. Together, these three types of resources form a seed-bed (Alsos & Carter 2004; Vintergaard 2004) necessary for growth.

In Fig. 2, the numbered circles of the restructuring perspective apart from the expansion perspective refer to the four viable outcomes, possible at any of the growth stages. The first trajectory, as indicated by reference number 1, points an occurrence of a restructuring of the business portfolio, needed to improve the firm's profitability. Option 2 is a successful turn-around case, where the firm undergoes through a distressed period successfully. Case number 3 denotes a bankruptcy where the new legal owners after insolvency take over the business from the owners of the collapsed firm and continue the business. The fourth choice denotes irrevocable abolition of the firm and its businesses. These two latter options are not considered here.

Due to the relatively recent nature of intellectual capital theory, ca. 20 years and due to the lack of an appropriate theoretical foundation of explaining the dynamism of growth orientated technology firm growth in terms of intellectual capital (see e.g. Liang & Lin 2008; Subchapters 3.5 & 3.6) or, even more, investment-like intellectual capital value adding (see e.g. Leitner & Warden 2004, p.34) the theory part does not provide intellectual capital interpretation along the growth continuum. Consequently, the discussion of growth in general and in terms of intellectual capital is one of the research objects of this study, and therefore, belongs to the analysis part, Ch. 7. Grounded on these facts, the approach of this study is explorative.

A special emphasis here is placed on investigating the dependency of strategic intangible complementaries along the investment cycles of firm growth, which is to say intellectual value adding and, moreover, investment-like intellectual capital value adding. Consequently, the main research problem is to discover a systematic pattern, a framework, for explaining this dependency view. After defining the pattern, further emphasis is centered on contributor roles and finding a systemic view of the actors' value adding in terms of investment cycles. These two perspectives are expected to explain the logic of intellectual capital functioning as a complementary for financial capital, which means reducing the need for direct financial investments.

Therefore, in principle the research is two-fold dividing into the exploration-concept definition part and generalisation-pattern building part. Accordingly, the results are expected to be exposed gradually along the pattern building in two phases where the first is a comprehensive view on to the growth continuum and the latter, a more specific investigation drilling down to the concept of investment-like intellectual capital value adding. This means that the research problem can be divided into the following two sets of subquestions, which are expressed here by one long sentence in the form of a bullet

list and title. Note that the two titles below are not expressions of the main questions, but a reference used later on in the study when recalling the research questions.

RQ 1: Generation of the intellectual capital growth pattern

- a. What is the strategic resource dependency of technology companies' growth from embryos to mature firms expressed in terms of operations management growth pattern and, especially,
- b. What is like the growth pattern defined in terms of intellectual capital?

The 2nd research question is bridged by the pattern matching with actor case data leading towards the first subquestion of RQ2

RQ 2: Describing the intellectual capital value adding cycles framed by investment in technology company growth:

- a. What are the generic profiles of diverse intellectual value adding actors matched against that pattern, and
- b. What are the feasible IC-value adding spot areas and their levels of importance according to the IC growth pattern, and furthermore
- c. What is the cause-effect of intellectual capital from the investment perspective in company growth?

Together, both these RQs are the answer to the title of this study – what is the role of intellectual capital in company growth?

Although the beginning of RQ 1 may seem trivial, it is highly necessary in order to lay the foundation to define the IC growth pattern. Together the 2nd subquestion of RQ1 with the investigation of RQ2 yields the actual results of this study.

Next, the two research questions are discussed here in more detail and their theoretical foundation explained. In Fig. 3, next here, is a diagram of the theories taken to build the outcome to the RQ1. The first part of the RQ1 reaches to define firm growth in terms of operation management pattern which is based on the strategic resource (based) dependency view on (abbr. RBV view) and it is referred by the block in middle in Fig. 3.

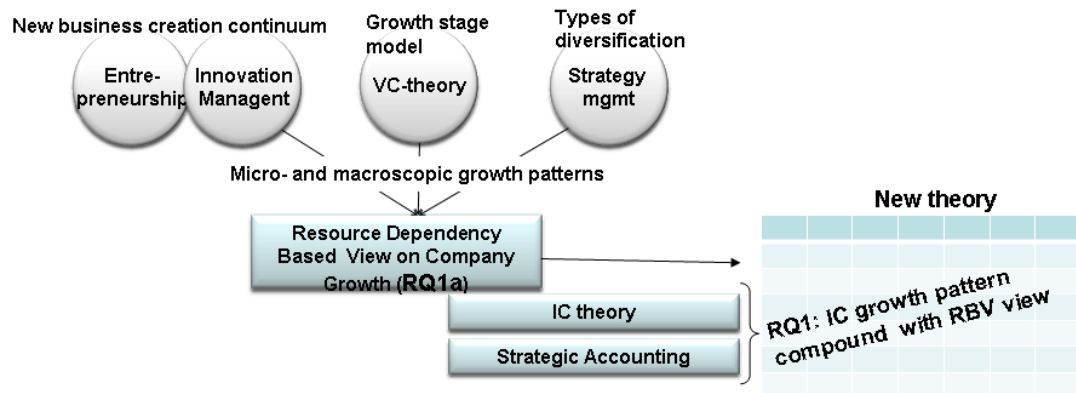


Figure 3: Theories related on RQ1

In turn, the RBV growth pattern is grounded both on the detailed level, micro view, and the more general level, macro view. As seen in Fig. 3, the first view is rooted in entrepreneurship and innovation management theories, whereas the latter has its origin in the growth stage concept found in VC-theory and the diversification types of expanding businesses available in the strategy management literature. Note that from here onwards, the term micro view is used to represent the firm internal growth from the first vague idea up to a single viable business entity in the company's business portfolio. In turn, the term macro view denotes the company's strategic investments, major movements, among competitors on market towards a mature firm. The analysis unit of micro view is a business creation step and for macro view the analysis unit is diversification, these both concepts explained later on this study (4.1 and 4.3 – 4.4).

Moreover, the RBV-pattern paves the way to the IC-related growth pattern, which is the 2nd part of RQ1. This is because the cross-over from RBD to intellectual capital regime is grounded on the three theoretical perspectives on intellectual capital value adding. They are IC-theories explaining the dynamism of IC, and the intangible resource value chain or value adding concepts available in RDB theories and strategic accounting literature.

In turn, RQ2 is centered on conceptualising the role of intellectual capital in the investments into growth firms. First, the actor analysis of the intellectual value adding yields typology which is elaborated into the more generalised pattern of the most feasible spot areas, which are cycles of IC-value adding to business growth. The background theory related to value adding actors is taken from VC- and entrepreneurship literature, as shown in Fig 4.

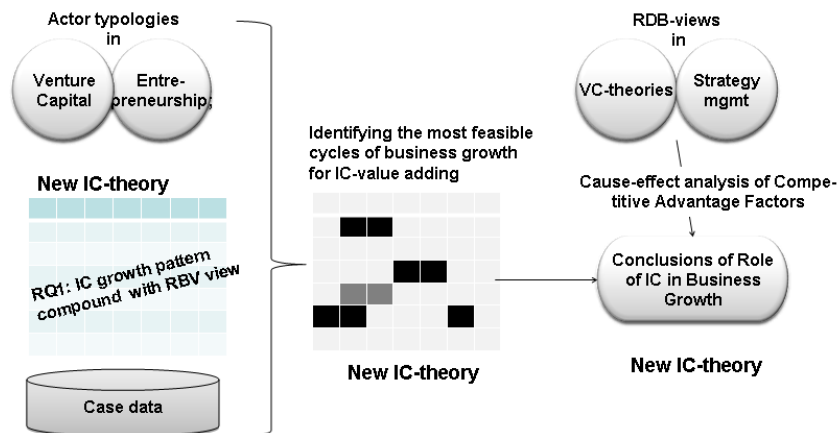


Figure 4: Research objectives of RQ2

Next, the generalised pattern is used to evaluate the role of IC in business growth. Grounded on the actors' intellectual capital profile analysis and the IC growth pattern, a further elaboration of the most obvious cycles, or spot areas, for intellectual capital value adding is generated. Further, the different levels of importance of intellectual capital value adding are emphasised, as stated by differently coloured cells in the table in the middle of Fig. 4.

Finally, the cause-effect analysis of intellectual capital within investments in growth companies ends the study. Accordingly, the role of intellectual capital in business growth is analysed, as also pointed out in Fig 4 on the right. For that, the labels from the RBV-related theories are taken for verification of the IC generating competitive advantage.

1.3 KEY DEFINITIONS

In order to define more precisely both the research area and the phenomenon of this study, first, the elementary terms: *technology*, *growth*, *business*, *intellectual capital* and *investing*, embedded in the title of this study, are given a brief definition here. The other pivotal concepts, needed in the analysis part for the operationalisation of the research data, are given special attention in chapters 3 and 4. Namely, they are the composition of intellectual capital; the concept of new business creation, including the definitions of invention and innovation; the concept of intellectual capital value chain; the definition of diverse investor actors; the venture stage model and the concept of diversification

The word *technology* is origin of ancient Greek word, *techne*, referring to the skill of the artist (Hatch & Cunliffe 2006, p.141). In accordance with an organisational context technology is defined as (ibid p.141), “methods and knowledge with which objects are produced and services rendered, as well as the tools and equipment used”. Central to this study is accepting not only technology products but also services to belong to a part of technology. As Hatch & Cunliffe (2006, p.142) state, technology involves both this hard and soft side as it is: “looking ways to minimize inputs to and/or maximize outputs from a given production system” (Hatch & Cunliffe 2006, p.142).

The etymology of *business* refers to the state of being busy, busyness (Merriam-Webster’s Online Dictionary). In business economics, a business encompasses three definitions: (1) “a commercial or mercantile activity engaged in as a means of livelihood”; (2) “a commercial or sometimes an industrial enterprise”; and (3) “dealings or transactions especially of an economic nature” (ibid.). As this study examines businesses from early stage embryos to internationalised firms, definition 2 reflects ideally a legally established firm. In turn, definition 3 is referable to a business embryo and definition 1 to a more advanced business project before its actual legal establishment.

When especially speaking about a singular business instead of business portfolio or a business firm, it is defined as “a legally recognised entity within an economically free society, wherein individuals organize based on expertise and skills to bring about social and technological advancement” (Wikipedia).

Following Luenberger: “[T]raditionally, *investment* is defined as the current commitment of resources in order to achieve later benefits. If resources and benefits take the form of money, investment is the present commitment of money for the purpose of receiving [hopefully more] money later [...] However, in most situations the amount of money to be obtained later is uncertain” (Luenberger 1998, p.1). A more

general definition for an investment is: “resources or assets used to generate income” (Horngren et al. 2002).

Conventional finance theory posits that a positive relationship exists between the risks of an investment and the expected return on investment (Brealey and Myers 1996). This conception is also accepted by venture capital theory, which considers high return expectations subject to high risks. It is also widely reported that venture capital investors allocate not only money but also intellectual capital in order to secure their risks and profit increase (Harrison et al. 2004; Timmons & Sapienza 1992; Sapienza et al. 1996; Schaefer & Schilder 2007; Luukkonen 2008). According to Gompers and Lerner (1999, p.349), venture capital consists of “independently managed dedicated pools of capital (i.e. financial and intellectual) that focus on equity or equity-linked investments in privately held, high growth companies”.

Firms at the early stages of growth suffer from a scarcity of intellectual resources and/or financial capital. Once moving from a prospective business endeavour to a more mature firm, as shown in Figure 5, a firm encounters knowledge and capital gaps. Therefore, a venture needs both financial and knowledge funding in order to become an investable business firm (Rasila 2004).

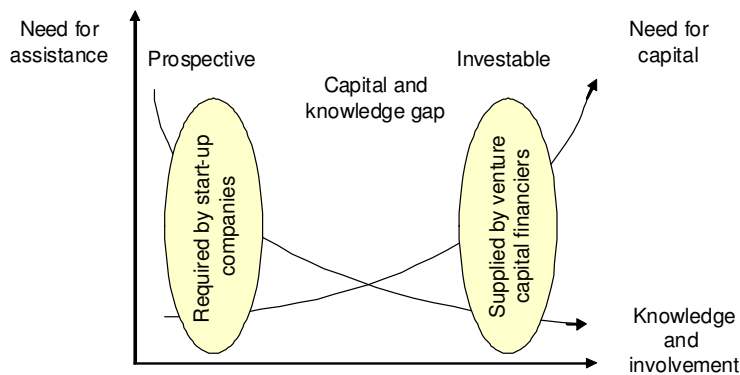


Figure 5: Room for intellectual capital investors - The equity gap vs. the knowledge gap (Rasila et al. 2002)

This occurrence is seen, for example, when the founders of a technology and product development orientated firm become dependent on other knowledge based resources (Grundsten 2004). And yet, this is the space for intellectual capital providers to become investor-like IC-value-adding actors, which may exchange their knowledge based property to the future returns following the VC-practises.

Young growth firms typically hold scarce financial reserves and a tiny net income from operations. Accordingly, it is more appropriate for the firm to compensate key personnel and the owners by shares and other future-orientated rewarding instruments (Rasila 2005). In general, the effort of individuals or teams of business organisations producing an increased organisational performance and consequent improvement in the company’s profitability and revenue figures is compensated in different forms.

Depending on the organisational position and personal status on contributing to company growth, the rewarding mechanism of a key employee may postulate a compensation model comparable with the logic of investment. More precisely, frequently paid compensation (e.g. salary) becomes minor compared with the future earning schemes (e.g. the increase in the value of shares), which is typical for entrepreneurs. Yet, this compensation model is known in research papers discussing the venture-to-capital actors (see e.g. Harrison et al. 2004).

The etymology of the term intellectual capital is rooted on the terms intellectual and capital. From the business perspective, intellectual capital is defined in chapter 3.

The definition of *intellectual* is “a) given to study, reflection, and speculation; b) engaged in activity requiring the creative use of the intellect” (Merriam-Webster Online Dictionary 2009) where the intellect refers to human mental capacity defined more precisely in Chapter 3, discussing human capital.

In turn, Capital, following its Latin origin, *capitellum*, means small head and it is diminutive form of *capit or caput*, head (ibid.). Moreover, capital formulates wealth in the form of money or property owned by a person or business and human resources of economic value (ibid.).

When trying to make sense of the difference between intellectual capital and intangible asset, there in turn seems to be no universal definition available in the literature to separate these two concepts: “To date, a widely accepted general positive definition of intangible assets is lacking” (Gerport et al. 2008, p.38; Lönnqvist 2004). It is not rare to find both terms used in parallel and sometimes treated as synonyms (Teece 2000; Leitner & Warden 2004, p.36) as here in this study.

Competence has its origin in the Latin word *competentia*, which means compatibility between action and knowledge of individuals for executing a given task. Unlike capability, competence implicates the sufficiency of qualification; capacity to deal adequately with a subject (Oxford English Dictionary). In this respect, capability is a more general expression of successful task enforcement rather than competence. Capability, in turn, is more mechanistic in nature: “Capabilities are repeatable intellectual patterns and routines, which use available resources for producing products and/or service to customers” (Alajoutsijärvi & Tikkanen 2000).

Defining the correspondence between intellectual capital and intellectual resources comprising competence is bridged by the concept of competitive advantage (see a more detailed account in subchapter 3.6). Fostering competitive advantage is dependent on human competences, whereas competitive advantage is a manifestation of intellectual capital rooted in intangible resources. Buenos-Campos (1998, p.221) define this aptly: “basic competencies of intangible character that allow to create and maintain competitive advantage [-] argues how we can tie intellectual capital to the resource-based view (RBV)”. More precisely, from the firm point of view the role of competence is two-fold: it is both directly a resource as well as enabling a particular actor to mediate resources.

Company growth as such is two-fold. Following Penrose, the term growth within the firm context embodies two main ideas. First, growth is the “increase in amount of a firm’s [...] output, like sales”. Secondly, it is “increase in size or an improvement in quality as a result of a process of development” (Penrose 1959). Consequently, by this definition, business growth comprises not only the visible expansion in terms of market and technology operations but also a less visible reorganising of firms’ internal structures and ways of doing business more profitably. Certainly, a testimonial of successful growth is necessary. Once a market operation or a new product launch completed and new viable business is generated, there must be signs in the value per share or equivalent.

Due to its pivotal role, growth is approached by the theoretical considerations of growth as: (1) diversifications, (2) firms’ positioning in value chains, (3) venture growth stages from embryonic to maturity, (4) business creation and extending the firm’s business portfolio, and (5) intellectual capital value investing. The first two at the macro-perspective and are discussed briefly here. These perspectives are discussed in Chapter 4, where the latter three are subject to a micro view and the first two for macro view assessment.

1.4 RESEARCH SETTING AND LIMITATIONS

The research setting involving the research design and strategy is discussed here, followed by the theoretical foundation and limitations. A research setting is an action plan of the path from the preliminary research questions to the conclusions. It typically embodies the research problems and claims. Moreover, it defines the chosen analysis units and the logic of how the claims are connected with data. A research setting also considers assessing the required and sufficient amount of data (Koskinen et al. 2005, pp.43, 160).

Neilimo & Näsi (1980) developed a four field typology for the methodological choices used in business research, which is frequently complemented by the constructive research methodology approach discussed by Kasanen et al. (1991). The former is a two-dimensional framework defined by the theoretical-empirical and normative-descriptive dimensions. Moreover, they constitute the four methodological choices, which are conceptual, nomothetical, decision-orientated and action-orientated approaches. From these concepts, this study is mostly related to the action-orientated approach, which is also termed the action-analytical approach (Neilimo & Näsi 1980).

Typical for research projects which are qualitative in nature, as this one, is that the research question is general and descriptive, becoming a set of more precise research questions when developing and reformulating the hypothesis (Koskinen et al. 2005, p.38). A less definite research problem may be reflected in the complicated nature of the access on research data. “[M]ost fieldwork work is exploratory, which further suggests that the researcher has flexibility in looking for data and open-mindedness about where to

find them. These are needed to explore the phenomenon under study when relatively little is known about it.” (Shaffir & Stebbins 1991, pp.5-6).

Applicable for this study is a research setting based on an induction-deduction structure as suggested by Shaffir and Stebbins (1991, pp.5-6). Here, an induction phase is characterised by exploration ending in research question reformulation or generation and the latter, deduction, is emphasised by a descriptive and explanatory approach.

The selection of research methods chosen here obeys the logic of case study research (Yin 2003; Eisenhardt 1989; Pettigrew 1990). Grounded theory (Glaser & Strauss 1967) is applied here due to its case material saturation principle, which is explained in Chapter 2. The research data selection, the units of analyses and the more detailed research design is also available in the next chapter.

The research data comes from three firm case studies and one early stage business case. Auxiliary firm and embryo business case material is taken in order to increase the robustness of the study when necessary.

In terms of theory, the study is rooted on the resource dependency view and intellectual capital theory. The former is not exactly a coherent theoretical framework and the main insights on business firms’ dynamic and business critical resources is carried from the Penrosean tradition enriched by, for example, Kogut & Zandler (1992; 1996) and Conner & Prahalad (1996) and the derivatives from that foundation such as the competitive advantage and business model perspectives.

The other adjacent theories or disciplines needed for developing the conceptions of firm growth and venture capital process accompanied are available earlier here, as summarised in figures 3 and 4 and the related text. A special theoretical contribution here comes from the venture-to-capital discipline (see e.g. Rasila et al. 2002; Rasila & Okkonen 2003; Rasila 2004, p.106) discipline.

Deriving research and eventually formulating the conclusions is challenging because business growth is dependent on multiple variables. “There is a complex set of interactive factors that affect the evolution of entrepreneurial ventures. It is unrealistic to expect that all important control variables can be held constant over the life of an extended, longitudinal study of the impact of co-production on entrepreneurial success” (Rice 2002). Therefore, selecting the right variables and leaving out the less explanatory variables engaged with the building of IC-growth pattern is important. In fact, this rule is considered by first taking the business process perspective at the beginning of the analysis part in Chapter 6.

1.5 SUMMARY OF THE CONTENT OF THIS STUDY

A summary of the content of this study follows the next sections here. To find a more detailed presentation of the contents, please look also at the first subchapters of the particular chapter in question.

Chapter 2 presents the methodology framework applied here. The first subchapter gives an overview of the research data, ontology of the phenomenon of interest and the units of analysis. It is followed by the research approach (2.2.), teleological pondering (2.3.) and the epistemology on Subchapter 2.4.

Chapter 3 is a definition of intellectual capital appearing in dynamic business environments. For the purposes of this study its main contribution is in presenting the terminology which is central to transfiguring case analysis resource-based interpretations into intellectual capital phraseology. Moreover, the terminology is applied to describe the investment opportunities along the business growth path from embryos to mature firms.

Subchapter 3.1 begins with a short introduction (3.1.1) to the actual theme, intellectual capital definitions. Three theoretical perspectives adjacent to the intellectual capital theory are briefly discussed: those of the resource based view, which was one of the foundations of developing the intellectual capital theory in the 90s; the core or strategic competence concepts, and strategy management. The next two Subchapters (3.1.2 and 3.1.3) present intellectual capital frameworks and their explanatory power in explaining organisations' intellectual resource pool.

Then the next Subchapters, 3.2, 3.3 and 3.4 define human, structural and relational capital, the main subcapitals of intellectual capital. Finally, Subchapter 3.5 summarises the discussion of intellectual capital and reveals the theoretical IC-framework applied in this study.

Chapter 4 is dedicated especially to unfold the dynamism in company growth. The chapter is divided into three main themes, each of them yielding valuable concepts of the actual framework building together with the IC concepts stated in Chapter 3. Hence, these three perspectives are bound to a holistic intellectual capital framework for explaining technology business growth together with empirical data in Chapters 6 – 8.

The first theme is the micro view of technology business growth discussed in the first three subchapters. The first one (4.1) observes value-adding from the business opportunity recognition-generation-deployment continuum point of view. The next subchapter (4.2) introduces four theoretical perspectives to the intellectual capital value chain concepts, beginning from the resource-based view by Kogut & Zandler, which is the first perspective. This is followed by the concepts arising from intellectual capital theories (2nd perspective) and ending with Norton & Kaplan's strategic resource value chain concept (3rd perspective). The fourth perspective is taken from financial accounting theory, bridging the way to the investability discussion carried out in the next subchapter, Subch. 4.3. Before that, a synthesis is composed from these insights into the microlevel mechanisms of technology growth at the end of Subchapter 4.2 in Figure 23.

Followed the micro view consideration, presented in Subchapters 4.1 and 4.2, Subchapter 4.3 focuses on assessing marketability and yardsticks for valuating the investability of intellectual capital. That is to say, that the point here is in introducing

the theory of quantitative measures besides the qualitative perspective for characterising of the investability of intellectual capital.

Subchapter 4.4 comprises the second theme anchored on the macro-level concepts of explaining technology business growth. The venture stage model and the concept of diversification are especially considered. Finally, Subchapter 4.5 takes an actor view on growth, which is the third theme in Chapter 4.

Chapter 5 begins the empirical part of this study. The first subchapter is dedicated to explaining the structure of the subsequent three chapters (6 – 8) central to the analytical process derived there. Subchapter 5.2 summarises the preceding research work carried out before writing the finalised versions of the case studies. These studies are presented in Subchapters 5.3.1 – 5.3.4, where three case presentations plus one pre-seed case summary in the format of structured case reports are introduced.

The first attempt to build the growth pattern is in Chapter 6. First, intellectual resource taxonomy grounded on the findings in the cases is shown in Subchapter 6.1. The taxonomy is, in fact, the comprehensive repository of intellectual occurrences constituting the business process perspective of the case firms. Next, Subchapter 6.2 is a summary of the fundamental business activities of the case firms appearing at 1st and 2nd levels in the taxonomy. Both these two analyses (taxonomy and business activities analyses) are used for building the dynamic growth pattern. The dynamism is interpreted by means of order of business processes appearances along the firm growth path. Eventually, the growth pattern articulated in terms of intellectual capital is shown in Subchapter 6.3. Unfortunately, the result is unsatisfactory for this study purpose. However, it points out the entities that are the foundation for deriving the first growth pattern in terms of operation management, the answer to the 1st subquestion of RQ1.

Whereas the first attempt of building the growth pattern is derived from the case studies with less theoretical concepts, Chapter 7 is crafted with a relatively rich set of concepts explained in two theory chapters (3 and 4). First, the concept of business creation process is validated and enhanced on the basis of the case material. In the next subchapters, 7.2 and 7.3, the theoretical concepts of diversification and venture stage model, (present in the theory part in Subchapter 4.4), reflected with cases are woven together, making up the macro-level perspective of the aimed for growth pattern. Next, the micro view concept of business creation process is linked with the previous one, and a 7 business process step included in each of the 7 diversification stages growth pattern is formed.

So far, the pattern is articulated by the operation management terminology. The required transformation into the form of intellectual capital model is facilitated by the concept of intellectual capital value chain and the business growth model expressed in intellectual capital terms is finalised in Subchapter 7.4.1. The answer to the 2nd subquestion of RQ 1 (*IC-growth pattern*) is brought forth through Table 37 and Fig. 29, where the latter is a pure intellectual capital growth pattern and the former a transparent presentation on the grounds of business operation terminology. Subch. 7.4.2 shows the practicality of

applying the IC-growth pattern by one of the case firms. A spiral form presentation from intellectual capital growth pattern closes Subchapter 7.4.3

The actor analyses of nominees into the intellectual capital investor role are carried out in Subchapter 7.5, which also tests the derived growth pattern. The pattern matching captures the most promising profiles suitable for the role of intellectual capital investors. Generalising these profiles, the appropriate entry points and impact cycles for intellectual capital investors based on the growth pattern are claimed in Subchapter 7.5.4.

Subchapter 7.6 discusses of the impact cycles, which are the manifestations of intellectual capital key areas of creating firm intangible value. Moreover, on the grounds of generalised actor profiles these areas form the definition of the four major step investment cycles.

Chapter 8 is dedicated to analysing the second subquestion embedded on the RQ 2 which of interested of the cause-effect of intellectual capital from investment perspective in company growth. First, the definition of the output of the intellectual capital investment in Subchapter 8.1 is defined. The operationalisation of the concept of business model is derived. Moreover, a business model is defined by the competitive advantage factors which of the manifestation of the yield from the intellectual capital investment framed by the single diversification.

Based on results of the previous subchapter, Subchapter 8.2 elaborates the role of intellectual capital within the other resource allocation framed by a singular diversification, which is also the frame of investments on company growth. Here, intellectual capital allocation interacting with other resource allocation is shown, how it transforms to competitive advantage of the firm, and, eventually, financial value.

The summary of results and recommendations, Subchapter 9.1, comprises the comprehensive concept of the role of intellectual capital in company growth. Consequently, the combined 7-step micro * 7-level macro IC-growth pattern, the concept of investment cycle and the definition of the output of investment-like intellectual capital value adding are combined to the comprehensive concept system. Yet, a cost function is derived, representing the costs sunk into acquiring intellectual capital. Then, a comparison of the costs of acquiring intellectual capital and return of investment is demonstrated by means of the financial investment cash-flow model captured from the financial accounting literature.

Conclusions and the contribution of this study are discussed finally in Chapter 9 including the positioning of investment-like intellectual capital value adding within any of the categories of intellectual value adding with or without financials and tangibles.

2 METHODOLOGY

A discussion of the methodology begins with a presentation of the phenomenon to be studied, which is discussed first here in subchapter 2.1, dedicated to ontology reasoning. Also the units of analysis and appearances of the phenomenon are presented.

The available research orientations are pointed out in the next subchapter, 2.2. The elimination of unsuitable methodology options and choice of the most suitable ones with respect to the purposes of this study is the first task.

The third subchapter (2.3) comprises the teleology discussion. Consequently, the research strategy is outlined, followed by a proposal for the most appropriate way of deriving the analytical process as a general level presentation.

In turn, subchapter 2.4 discusses of epistemology questions. It first introduces the access methods and points out the set of applicable methods arising from the prerequisites set by the research data. A second theme here is the case selection criteria.

Subchapter 2.5 discusses the alternatives for deriving analytical process from the organised research data. Hence, the overall methodological framework is provided by a more detailed view on the analytical tools. A second theme here is the problems involved in generalising research data towards formulating new theory.

Finally, the last subchapter (2.5) ends the methodology part. The methods used for processing the research data into more advanced forms such as case reports and tabulation of intellectual resource findings are present in Chapter 5. Hence, only the data access methods are present here in the methodology.

2.1 OVERVIEW ON RESEARCH DATA AND UNITS OF ANALYSIS

As suggested by Eisenhardt (1989, p.533), the initial steps of the research process of this study involved the tasks of choosing the most interesting topic, defining the preliminary research questions, reading literature, improving the research questions, selecting cases, crafting instruments and protocols, entering the field, collecting and analysing data, shaping hypotheses, unfolding literature and reaching closure when achieving improvements becomes small. Accordingly this research project was started by the initial phase involving outlining of the research problem and familiarising with proper theories. Theoretical ponderings was accompanied by creating a sound preunderstanding of the phenomenon of interest.

The next step, following Hammersley & Atkinson (1995), is choosing an appropriate research methodology and carrying out data collection while the theoretical conceptions are left in the background. In fact, the professional job of the author of this thesis as a

management consultant since 1999 provided appropriate company case data divided into three areas: (1) distressed SMEs; (2) international technology growth firms; and (3) teams aiming to commercialise their innovations. However, the author's membership in the three business consultancy associations: (1) the Finnish Turn Around Management Association, since 2006; (2) the Finnish Co-entrepreneur Association, since 2006 and; (3) the Management Consultant Association during 2006 – 2008 gave a sound understanding of the intellectual capital value adding from the actors' side. Together, the firms and the intellectual capital providers are the two perspectives on the phenomenon of this study.

Suggested by Yin (2003, pp.21-22), the next task after pondering the nature of the phenomenon is the definition of the research questions followed by the definition of the units of analysis. Both these two definitions set the boundaries within the available research data and provide the main perspective of analysis for the researcher. Shaping them goes here, first, by articulating four different manifestations of the phenomenon of interest which is the role of intellectual capital in the growth companies.

In fact, the four manifestations, as introduced in Table 1 next here, are related, one by one, to the questions what, why, how and when, which is typical of studies applying case study logic (Yin 2003). Yin (2003) especially advises the researcher to test the phenomenon of the study by using these four questions. This approach leads not only to well articulated research questions, but also allows units of analysis, which are the devices of the analysis work within case material. Finally, the puzzle of the research questions, the manifestations sorted by the four questions, is presented in the reference table, Table 1, in Subchapter 2.4. In turn, the units of analysis are disclosed in Table 2.

In Table 1, the first manifestation focuses on the visible outcomes of intellectual capital which is answering to the question of WHAT. Observing intellectual capital is most feasible in its outcomes, which are tradable assets like any product or service. The impact of intellectual capital is visible on them and a reversely derived analysis from the outcomes back to the resources avails the entire chain of value adding by intangibles and tangibles. The developmental stages of making a product, launching onto the market or a firm internal management development project are examples here, which are, in fact, structuring intellectual capital. In sum, the materialised outcome and preceding value adding stages accomplished by allocating intangible and tangible resources form, in fact, a singular investment cycle of creating new business.

The second manifestation in Table 1 - WHY - is related to the economic gain and compensation granted to the actors for their intellectual stakes. As an example, a product designer has finalised his or her innovative design job, which leads to the launches of a new tradable product for the customer market and an earning prospect for the firm. Obviously, the designer is rewarded for his or her effort, which is the answer to the question WHY - why allocate one's intellectual capital to a given task? On the other hand a successful product business may also attract investors to invest financial capital aiming at expanding the firm and increasing its financial value. Eventually, a more mature business firm will become as a liquid tradable object as such.

Table 1: Cross-reference table between phenomenon and research questions

RELATIONSHIP BETWEEN MANIFESTATIONS OF PHENOMENON AND RESEARCH QUESTIONS	
Manifestations related with phenomenon of interest	Research questions, RQ
WHAT: "outcomes where the impact of intellectual capital is visible"	RQ 1: "Generation of the intellectual capital growth pattern" RQ 2: "Describing the intellectual capital value adding cycles framed by investment in technology company growth"
WHY: "is related with economical gain and compensation"	No RQ :
HOW: "transaction view and explaining..."	RQ2 in some extent
WHEN: temporal view on investing continuum	RQ 2

Although there is a difference in the size and risk in respect to these two cases, they both are concerned by the question of why invest intellectual capital besides other tangible assets, and furthermore, financial capital. It should be noted that also a designer, not only the VC-investors, deals with financial assets. The explanation is simple: a particular knowledge worker would sacrifice his/her extra working time voluntarily, which is measurable in money for the company receiving this contribution.

As the scope of the study suggests (Fig.1), there are at least tree main types of intellectual value adding profiled by more or less of the features of the logic of investing. However, a more thorough investigation of the traits of investing would lead to researching the characters of risk levels, return on investment, commitment of the actors and their contributions to the investee. As this area would merit an entire research project, it is not included in this study, except for the actor analysis, where the traits of investing are discussed.

The common aspect both of WHAT and WHY manifestations are the intimate relationship between the subject, actor, and possessed resources, an intellectual capital contribution possibly tied with other resources. Moreover, this relationship is subject to ownership management of intellectual capital. Accordingly, the third manifestation is taking the transaction view and explaining - HOW. Hence, the scope of an investment cycle needs to be extended to cover both ex-post and ex-ante situations. For example, a patent is the outcome of a particular researcher's study, who is the producer, and after filing the patent there will be a possessor of the IPRs, probably a firm or research institute if not the researcher him/herself. As said, assessment of the ownership and return on investment topics are excluded here.

The fourth manifestation comes from the temporal perspective present in investments and is related with - WHEN. It encapsulates two views. It is mostly related with expressing the opportunity windows along the growth path for diverse intellectual capital contributions. Second, an actor sacrificing mental power and likely tangible property will probably spend a substantially long period gaining the desired economic wealth. Hence, the fourth manifestation is, in fact, the time span defined by the range beginning from incurring costs until the deliberate termination of the efforts dedicated

to achieving a positive cumulative cashflow, or intentionally interrupted in a case of failure by the investors.

In sum, in this study, especially the questions WHAT and WHEN are the pivotal, whereas the WHY and especially HOW are in a secondary role.

The next task is the definition of the units of analysis as shown in Table 2 here. Their purpose for this study is crafting the entities of analysing the research data. The linkage to the four manifestations is that they enable formulation of the research questions, whilst also being the foundation of defining the units of analysis.

The main unit of analysis is the firm constituted on a single business or a business portfolio. It is profiled by the business functions, the business model factors introduced later on in the end of Subchapter 4.3.4 and ownership structure.

The first embedded sub-unit is the stage of growth divided into more detailed growth cycles of creating new business. The purpose of sub-unit 1 comes from the need of analysing the resource dependencies of a firm. Furthermore it is profiled by the company strategy line, the type of diversification as the cycle of growth and the new business creation or restructuring process embedded on the diversification cycle. The embedded sub-unit 2 deals with actors and their value adding as pointed in Table 2.

Table 2: Presentation of the units of analysis

UNITS OF ANALYSIS			
	Unit of Analysis	Object	Identifiers
Main unit	Firm constituting one business or a business portfolio	Firm's strategic investment/ main course of business	1) Business functions and 2) Business model 3) Legal entity owned by individuals or institutions
Embedded sub-unit 1	Growth stage divided into cycles of business development operations	Resource dependencies	1) A strategy line or company paradigm change 2) Diversification 3) New business creation and restructuring acts
Embedded sub-unit 2	Actors	Value adding offerings	Actor (individual, team, an institutional operator) providing financials, tangibles and IC

In fact, Table 2 reveals an investment system which embodies occurrences appearing at the macro and micro levels. Accordingly, the realm of investments is composed of the fragmented pieces of growth such as the steps of a singular business operation, as well as the more comprehensive entities like diversification and strategy line. Common to all are the contributions of the value adding actors which are the fuel for nurturing growth.

It should be noted that this study does not try to find causalities between the reasons and underlying factors impacting on the investment process, but concentrates on searching for the circumstances and conditions advantageous for actors tending towards intellectual capital investors.

In sum, the visibility vs. invisibility and micro vs. macro point of views are the main challenges here, as they would be for any researcher deriving qualitative research based

on business firm case data. In practice, the pressures arise here from the intertwined nature of financial and intangible and non-financial tangibles that are the stakes of investing along the value adding stages of a growth.

2.2 RESEARCH APPROACH

Discussion of the main research approach is followed by selection of the research data and refining of the objectives of the study. Discussions held at international scientific forums emphasise research type classifications like quantitative vs. qualitative, positivism vs. interpretive and research studies grounded on restricted vs. large research data (Kasanen et al. 1991, p.313). Further on, the main approach influences the methodological instrument choices, as stated by Kauranen et al. (1992, p.30): “(the research approach) has an effect on how information is obtained and processed in the course of the study”. As in this study, the obtaining of the data and processing of the research questions are discussed in the next subchapters.

Habermas suggests a three-faceted qualitative research categorisation grounded on the knowledge-constitutive interest point of view. The first aspect is the technical interest captured by the positivism paradigm prevailing in natural science. The second is the practical interest comprising a knowledge perspective related to securing and expanding the possibilities of mutual and self-understanding in the derivation of life. The third is the emancipatory interest dictated by overcoming dogmatism, compulsion, and domination (Habermas 1971, p.168). A contemporary interpretation of these three knowledge-constitutive approaches uses the terms technical-rational, hermeneutical and emancipatory approaches (Toivonen 1999, p.13).

Following Koskinen et al. (2005, p.33) a researcher is faced to make the choice between two alternatives - the positivistic and interpretive approaches. The first obeys the principles of positivism found mostly in natural science, where the researcher preserves independence over the phenomenon of interest and the approach is explanatory and normative. Sometimes it is necessary to apply an approach, the latter alternative, found in humanistic sciences, where the object of research is on the acts, events and thoughts of human beings. Instead of explaining and formulating norms, the emphasis is on interpreting and understanding the motives and arguments behind human behaviour (ibid). Considering these two approaches as contrary to each other is not self-evident because they may be mixed to a certain degree and finding either a pure qualitative or a quantitative approach is difficult (Alasuutari 1999, p.32).

The interpretive approach, unlike positivism, is a diffuse group of divergent research practises consisting of social phenomenology, hermeneutic theory, existentialism and post-structuralism (Kasanen et al. 1991, p.313). In business economics the term interpretive approach is sometimes replaced by social constructivism, the constructing of social reality as it appears to a researcher (Koskinen et al. 2005, p.33).

The two definition pairs, qualitative vs. quantitative and interpretive practicism vs. positivism, are reflexive. Moreover, they embody a certain parallelism as realised in

Table 3. Following Gummesson, the positivistic paradigm constitutes the scientific foundation for quantitative research and the hermeneutic paradigm for qualitative research (Gummesson 1993, p.12). Although positivism is predominantly characterised by the quantitative aspect, there is, however, qualitative research not exactly interpretive in nature (Kasanen et al. 1991, p.313).

Table 3: Comparison of positivist, social constructivist and qualitative research approaches

Smith et al. 2002, p.30			By author	Merriam 1988
	Positivism	Interpretive tradition		Qualitative approach
Researcher	Is independent from the object	Is a part of the unit being studied	Researcher as an instrument	A researcher is the primary instrument for data collection and analysis. Data are mediated through this human instrument, rather than through inventories, questionnaires, or machines
			Researcher's involvement	Qualitative research involves fieldwork. The researcher physically goes to the people, setting, site, or institution to observe or record behaviour in its natural setting.
Human interests (economics, politics...)	As a rule ought not to matter, are assumed not to matter	An inevitable part of any research		
Explanations	Demonstrate causal relations between variables	Add understanding about the object		
Progress in science	Through hypothesis, demonstration and counterdemonstration	Rich, carefully explicated data makes a set of "precedents" (as in common law)		
Concepts	Are "operationalised" to be measurable	Articulate the "sub-jects" understand-ings; are based on lay notions	Conceptualisation	Qualitative research is descriptive in that the researcher is interested in process, meaning, and understanding gained through words or pictures.
Unit of analysis	Homogenous, typically small units	The unit can be "holistic", difficult to define. Like: what is management at all?	Object of interest	Researchers are concerned primarily with process, rather than outcomes or products.
			Researcher's interest	Researchers are interested in meaning - how people make sense of their lives, experiences, and their structures of the world
Generalisation	Statistically	Theoretically	Research process	The process of qualitative research is inductive in that the researcher builds abstractions, concepts, hypotheses, and theories from details
Sampling	Requires a large sample that is selected stochastically	Small sample selected on purpose to maximise inform.		

The summary of the characters of positivism and social constructivism approaches is present in the first three columns on the left in Table 3, following Easterby-Smith et al. (2002, p.30). The right-most column stands for discussion of the qualitative approach

following Merriam (1988). The shaded column is added by the author, indicating the main ideas emerging from the content of the column on the right side by Merriam.

Combining these two presentations from their separate sources will not produce a fully commensurate comparison and may cause accusations of arbitrariness. However, the point here is to emphasise the proximity of the interpretive and qualitative approaches, which is obvious when comparing them with each other.

Eventually, after familiarisation with the discussed alternative main research approaches, the interpretive one was chosen for the purposes of this study. Selecting a proper research approach for living organisations is reflected first of all by the research problem (Yin 2003, p.7). With regard to this study, interested in the occurrences of investing intellectual capital, there is no other choice than the qualitative approach rooted in the interpretive research tradition. The argumentation for this choice comes from: (1) the chosen analysis units; (2) the character of the phenomenon to be studied; (3) the quality of the research data consisting of cases and observation within a social context; (4) the researcher's high involvement with the object of the study, and (5) the descriptive nature of this study. So far, all these viewpoints match with the columns "interpretive tradition" and "qualitative approach" in Table 3, thus giving support to the selection.

Further support for preferring a qualitative approach comes from Shaffir & Stebbins (1991, p.6): "Most explorative studies, however, are predominantly qualitative, possibly augmented in a minor quantitative way".

2.3 DERIVING NEW THEORY

This subchapter, deriving new theory, focuses on teleological considerations, i.e. introducing the research strategy, the framework for deriving the new theory from the research data and the case selection principles. The discussion of acquiring the research data is in Subchapter 2.4, next here, after the research strategy discussion.

First, here in Subchapter 2.3.1, the dilemma of either using an overall case study research framework, including both the strategy approach and methods vs. building an own framework is considered. Next, the 3-stage research strategy approach proposed by Shaffir & Stebbins 1991 is introduced. In Subchapter 2.3.2, the analysis and case selection principles available in the case study research strategies are discussed. Eventually, the outcome here is the ideal research strategy apt for this study including the major analysis principles and the practical analysis tools were chosen.

2.3.1 Deliberate Analysis Framework

Emerging in the field of case study research, two research strategy choices are frequently met when choosing the main approach for carrying the research process. These are case study logic (Yin 2003; Eisenhardt 1989) and grounded theory (Glaser & Strauss 1967; 1970). However, instead of applying all-inclusive research packages such

as these two, the researcher of this study preferred to ensure the freedom to define the best fit approach for the research object of the study.

First, the most prominent approaches for deriving the analysis process, deduction and induction are discussed here, which is summarised in Table 4. Next, in pointing the guidelines to an analytical strategy and then comparing a couple of research strategies, grounded theory and multiple case study research strategy are introduced. The next passage is dedicated to assessing the generalisation aspects. This chapter ends with a summing up of the argumentation for the chosen analysis strategy framework applied here for analysing the research results and generalising them.

Outlining an analytical framework considers deciding on the flow of the research process from the research data end to the results. Two generally known analysing concepts, deduction and induction are frequently introduced as a couple of opposite approaches for deriving research results (Gummesson 1988, p.22; Olkkonen 1993, p.30).

Analytical processing can be run by means of a thorough reading of the research data, engendering a fresh and grounded interpretation. A prerequisite for this simplistic approach is, however, a systematic and analytical study (Koskinen et al. 2005, p.241), which is complemented by an intimate first-hand understanding of the human acts being observed (Shaffir & Stebbins 1991, p.5).

Table 4: Major differences between deductive and inductive approaches

DEDUCTIVE EMPHASIS	INDUCTIVE EMPHASIS
Scientific principles	Gaining an understanding of the meanings attached to events
Moving from theory to data	Close understanding of the research context
Need to explain causal relationships between variables	Collection of qualitative data
Application of controls to ensure validity of data	More flexible structure to permit changes of research emphasis as the research progresses
Operationalisation of concepts to ensure clarity of definition	Realisation that the researcher is part of the research process
Highly structured approach	Less concern over the need to generalise
Researcher independence of what is being researched	
Necessity to select sample of sufficient size in order to generalise conclusions	

Constructing the analytical overview is delineated on how and where the hypothesis along the research process is formulated. The presence of a rich theoretical background favours the hypothesis to be derived from theory. In turn, a thin theoretical foundation compels researchers to derive the hypothesis along the research study, which is consistent with the inductive approach (Koskinen et al. 2005, pp.31-32). A prerequisite for a deductive approach besides rich theory is the access to multiple samples enabling the testing of variables against the theoretically derived pattern or concept. An example

of this kind of research logic in qualitative research is the multiple case study logic empowered by pattern, where the samples are cases (Yin 2003, p.47).

Following Saunders et al. (2009, p.127), central to choosing between these two options is the richness of the available theoretical foundation: “a topic on which there is a wealth of literature from you can define a theoretical framework and a hypothesis lends itself more readily to deduction. With research into a topic that is new, is exciting much debate, and on which there is little existing literature, it may be more appropriate to work inductively by generating and analysing and reflecting upon what theoretical themes the data are suggesting”.

Discussion of the circumstances favourable for one or the other, deduction or induction, defines the prerequisites of quantitative or qualitative research (Gummesson 1993, p.22). In turn, Koskinen et al. (2005, p.31) emphasise that the reasoning process in most qualitative research studies is grounded on induction. The factors characterising deduction and induction best are found in Table 4, next here following Saunders et al. (2009, p.127).

Sometimes it is useful to apply both induction and deduction: especially when the hypothesis is derived by an induction process, and furthermore deduction is needed when testing it. It is as Gummesson states: “after an inductive start [...] follows deduction in an effort to arrange data in meaningful patterns” (Gummesson 1993, p.16). This idea is suggested as well by Shaffir and Stebbins (1991, pp.5-6) in Figure 6 below, where, especially the lower part of the figure relates to the methodological interest area of this study. Mixing induction and deduction, apt for this study, is shown next in Fig. 6.

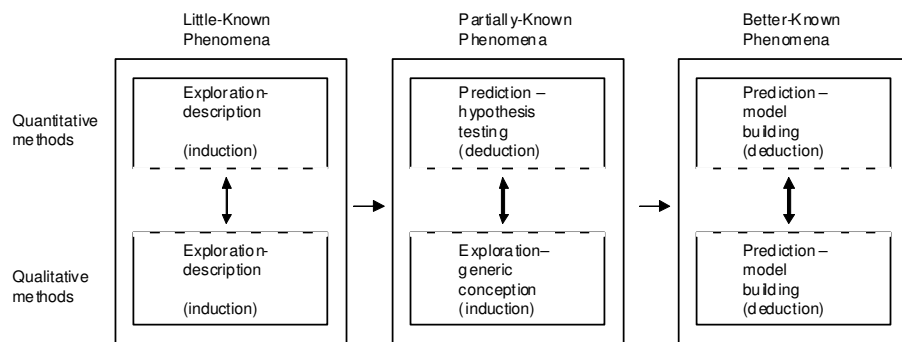


Figure 6: The shift from induction to deduction and the differences between qualitative and quantitative methods (Shaffir & Stebbins 1991, p.6)

A research project is started by exploration as stated on the left side at the bottom of the illustration. At this stage, the researcher begins to produce tentative descriptions from the phenomenon of interest, continuing towards more solid interpretations. Next, he or she will derive inductive analysis entailing generalised results. Here is the point of formulating the hypothesis. Eventually, the end point is a model built up following a deductive approach, necessitating more research data for test purposes. “As we know better the phenomenon we have chosen for examination, we move to the right [...]. That

is, we come to rely less and less on exploration and more and more on prediction along the lines of hypotheses obtained deductively [...]" (Shaffir & Stebbins 1991, p.6).

Moreover, Shaffir and Stebbins (1991, p.6) characterise the research process from left to right (in Figure 6) by "an ever-wider range of phenomena and through its internal development of an ever-growing number of generic concepts", which is the processing involved in the middle-block. Yet, they continue: "this process typically unfolds over the course of several studies. [...] On the far right side of the figure, we find a well-developed grounded theory about a reasonably known, broad range of related phenomena. At this point concern is chiefly with enhancing the precision of the (new) theory".

The shift from exploration towards prediction changes the research orientation from sensing to seeing. At the beginning the researcher naturally recognises characters and points of attraction embedded in the occurrences related to those manifested by the phenomenon itself. These two modes are exactly what is said about analysing texts, where the emic perspective denotes the former, and the etic the latter (Pike 1954 cited in Alasuutari 1999, p.100; Koskinen et al. 2005, p.31).

In this study the explained three-stage (Fig. 6) analytical orientation is exercised in the analysis part ranging from Subchapter 5.2., or actually beginning from the initial research acts not documented here until the end of Chapter 8. The analytical orientation of analysing case descriptions (subchapters 5.3.2.-5.3.5.) applies the etic view, which is, furthermore, precisely congruent with the generic-conception phase (the middle block in Figure 10). Precisely, the exploration-description approach is driven in the Chapter 6, which is the first part of this study. Typical for the exploration-description tactics is using the terms and concepts which are close to the natural language of describing firm's evolvement. Natural means here using low-level abstractions, symbols and terms embody a descriptive point of view.

Then, generalising the occurrences of interest as exercised in the second major analysis part of deriving first partial result, IC-pattern (Subchapters 7.1 – 7.4) match with the idea of the exploration-generic conception (the 2nd stage). The research orientation here is still explorative, but the research is derived by using analytical concepts derived from the theory in chapters 4 and 3 as well as the case descriptions. In fact, the end-result of this second stage, IC-growth pattern is an object of the further model building and developing additional views on intellectual capital investment-like value adding onwards from the subchapter 7.4 of manifestation of IC-pattern. Here, the deductive analysis is dominant and the process is in line with the third stage (prediction – model building).

However, the explanation of applying the Shaffir-Stebbins approach here is a brief overview whereas the more detailed way of applying this orientation is explained in Subchapter 5.1., which is the explanation of the deliberate research process of this study.

2.3.2 Principles for analysis work and case selection

Next, the analysis and case selection principles available in those two case study research strategies were assessed. More generally, analytical analyses methods (e.g. Seale 1999) and other case study research methodology literature (e.g. Alasuutari 1995; 1997; Gummesson 1993; Koskinen 2005) were considered.

The development of case study related methods into becoming a research logic and even an entire research strategy, has been contributed to by the two pioneers, Yin and Eisenhardt, as stated by Yin himself (2003, p.1). As stated by Yin (2003, p.3), case study logic is more like a research strategy than a method. It provides a guided approach for researchers to manage research process from case selection up-to research project closure (ibid.) as well as a comprehensive toolset defining analysis units, retrieving the research data, generalising the analysis results from the case material and in the end deriving results (Eisenhardt 1989, p.533).

In turn, grounded theory methodology was developed as the framework to derive new theory from the empirical research data (Glaser & Strauss 1967, 2–3). The main principle is forming the initial categories by continuous comparison of the case data. Further on, the initial categories are aggregated, the boundaries of the research area finalised and the level of abstraction increased, to finally produce new theory. The guiding principle in grounded theory is ensuring flexibility in the analysis process (Glaser & Strauss 1967, 1, 101–115).

Besides these two approaches, there are miscellaneous guidelines in the methodology literature appropriate for case study research. Although they do not provide analytical tools like the two above (see e.g. Seale 1999), nevertheless, these non-all-inclusive frameworks offer the strategy line for leading the research process.

A general reasoning for selecting case study approach, as done here partially, lies in the complexity of a particular research area to be investigated, especially when “innumerable factors, and entangled interconnections between them, do not allow simple and unambiguous research designs (...)” (Gummesson 1993) as is the case here. Another criterion also valid here for selecting case study logic arises from the quality of the research data. When there is a spectrum of descriptive material such as case stories, document archives, interviews, direct and participant observation and contemporary literal sources, case study research logic is an obvious choice (Eisenhardt 1989, p.534).

After deciding on the analytical approach among the different alternatives and their combinations, the researcher is faced with the selection of a case from the available data. The first criterion is to select divergent cases representing diverse characters of the object of the study. Selecting polar type cases and cases representing extreme situations is important for validity reasons (Pettigrew 1990; Eisenhardt 1989). Accordingly, polar-type cases are differentiated by the following properties: (1) industry specificity; (2) high vs. moderate growth; (3) venture capital firm funded vs. non VC-firms funded cases; (4) successful vs. failed firm cases; (5) business model: firms/cases founded on tailored services/products vs. standardised services/products; (6) companies possessing

a sound board of director working vs. CEO alone standing for a board of directors; and (7) early staging of business cases before establishing a firm vs. firm cases.

The next challenge is deciding on a sufficient number of cases. Good advice here (Glaser & Strauss 1970, pp.61-62), is that the actual number of cases needed in a specific study will be determined by saturation, i.e. the diminishing marginal contribution of each additional case. However, when the end point is not explanatory but more descriptive, the number of cases is less important. As stated by Glaser & Strauss (1970, pp.1-15). In turn, Seale advises adjusting the research problem and the study's explanatory regime with case selection, which will lead to selecting the number of cases. His five step procedure in deciding the number of cases is driven by multiple iterations and monitor the construct validity by excluding inappropriate cases and reformulating the problem (1999, p.83). Based on these rules, this study ended up with four cases.

However, extending the case number beyond the four cases was needed at certain points of the analysis process, e.g. the consideration of the three business models was strengthened by additional cases. This approach is in line with grounded theory, as introduced by Glaser & Strauss (1967). Namely, their analysis method provides the idea of the continuous comparison and saturation which means extending the number of case studies when necessary, as is done here.

Concepts do not appear randomly but as a derivatives from interpreting phenomena embedded in studies. A second view included in grounded theory is the classification of the interim analysis results, which is applied during the tabulation process here. First, the saturated primary data is classified at a low abstraction level. Next comes aggregating the first level classes into more general classes. This process involves as many levels as required for writing the interpretation in the form of new theory (Koskinen et al. 2005, pp.237-238; Purs 1987; Seale 1999, pp.91-99). Moreover, here is the point of criticism pointed at grounded theory: the classification and coding will destroy the link with the original data (Koskinen et al. 2005, p.237).

2.4 DATA ACCESS AND SUMMARY OF PREFERRED METHODOLOGY

The pondering of and questions about accessing research data is called epistemology. Accessing and elaborating collected data is influenced by the research question and approach: "The research question of the study has an implication for selecting research approach, and further, the research approach has an effect on how information is obtained and processed in the course of the study" (Kauranen et al., 1992, p.30). Therefore, these two fundamental entities dictate the selection of appropriate data access approaches and, furthermore, the methods.

One categorisation of data access methods is expressed by fact and sample approaches (Alasuutari 1999). Sometimes the former is termed the mechanistic variant of the factist perspective (Alasuutari 1995).

In the case where a researcher collects facts related to object(s) to be studied from primary sources, to the informants or to information sources, then a *fact perspective* dominates. Consequently, the focal point of interest is on the phenomenon to be described and explained. From the methodology point of view the fact approach necessitates a comprehensive description of the object enabling the creating of a trustful explanation (Alasuutari 1989; Koskinen et al., 2005).

In turn, a study applying a sample perspective concentrates on text or content of speech as such. The quality of a particular research grounded on sample perspective depends on the richness of interpretations. Rich data, consequently, calls for the finding of new aspects and sights of the phenomenon, which is sometimes called a dense interpretation (Greetz 1993, pp.9-10).

Both these concepts have their roots in social sciences, and following Bertaux and Kohli (1984, cited in Alasuutari 1997, p.2), they are the sociostructural and the sociolinguistic approaches. The latter refers to a sample approach because the pivotal perspective is analysing texts and the former the fact perspective.

Ultimately, the two ways of becoming familiar with the research object are intertwined: “In the social sciences, life stories have traditionally been approached from two alternative but often combined perspectives” (Alasuutari 1997, p.2).

Table 5 below sums up the applied data access methods in this study categorised by the fact and sample views. The fact perspective is on the left hand side in the table, where the first is the access method typical for case studies that are frequently encountered in management and business economics studies (Gummesson 1988; *ibid.* 1993). Yin argues that an efficient approach operates with six types of data sources: (1) archival records, (2) interviews, (3) surveys, (4) direct observation, (5) participant-observations, (6) documents and artefacts (Yin 2003, pp.85-97). All these sources were applied during the data collection phase of this study. Moreover, some these sources work also as access methods, as is discussed next.

The second choice in the table next here, as well as being applied in the fieldwork of this study in considering two cases which are explained in Table 26 in Chapter 6, is *observation-orientated research*. It can be divided into direct and participant observation tactics (Yin 2003, p.85). Participant observation is a dominant access method for anthropology studies, and it has also been adopted into other social sciences and, further, into business economics and management sciences (Koskinen et al. 2005, p.79). The anthropologist and the pioneer of developing the participant observation method, Bronislaw Malinowski, emphasises building an intimate contact with the social context of the study: “The final goal (here: ethnographic study) is to grasp the native's point of view, his relation to life, to realize his vision of his world call for participant observation approach” (Malinowski 1961, p.25).

Although the participant-observation method offers rich data, it is subject to the risk of informal manipulation of the contemporary events to be investigated (Yin 2003, p.8). More precisely, he states four risks: taking an advocacy role in the issue under

investigation to the detriment of scientific practice; politicising by supporting the ideas of a certain group within the observed organisation; the participant role attracts too much attention relative to the observer role; and the physical dispersion of the organisation makes it impossible to be in the right place at the right time (Yin 2003, pp.95-96). Most often the observation material is documented in the form of the analytical, thematic, theoretical and personal memoranda (Koskinen et al. 2005, p.97).

The third alternative, research grounded on documents, is appropriate for historical business economics and management studies. Following Dahl (1971, p.34), data sources can be divided into personal and institutional data sources, where they both may be either secret or public ones. Basing a particular study entirely on documents is subject to appropriate distance from the object of study when the interviewing of contemporary persons is excluded.

Table 5: Business economics research orientations

Research methods typical of a fact perspective	Research methods typical for a sample perspectives
Access methods typical for case studies (see, e.g. Eisenhardt, 1989; Yin 1984, 2003)	Organisation culture research (e.g. Smircich 1983)
Participant observation orientated research (Malinowski, 1961)	Narratology orientated research (Boje, 2001)
Research grounded on documentation sources (e.g. Dahl, 1971)	
Survey orientated research	
Organisational Development, OD (French & Bell, 1990)	
Action research (in management and business economics) (e.g. Rothwell 1995, Gummesson, 1988)	

The documentary data in this study is composed of strategy plans, minutes of meetings of the board of directors, correspondence with financiers, technology roadmap plans, product and customer information, internal personnel managing related memos, budgets, business forecast summaries, cash flow information, and other management reporting and annual financial statement materials, all of which constitute a sound data collection foundation as defined in qualitative research methodology guide books (see, e.g. Koskinen et al. 2005, p.92-93).

Here, the fourth option, surveying, is not present. However, an informal form of surveying is interviewing. Accordingly, the researcher of this study collected actor data among the three associations by interviewing, collecting documented stories and referable research studies of successful and less successful business consultants, serial entrepreneurs, co-entrepreneurs, profit-seeking entrepreneurs, members of the board of directors, venture capital firms, business angels and other intellectual capital contributors driven by a profit-seeking orientation.

Furthermore, interviewing is a widely used access method and included in most of the research strategies applied in management and business economics studies, like case study research strategy. However, as Koskinen et al. (2005, pp.104-129) put it,

interviewing could be considered as a comprehensive research approach, especially when embodying a rich set of different ways of doing interviews. Components such as in-depth, structured, semi-structured, informal, group, elite and tandem interviews packaged together would produce the core of versatile interview orientated research design.

As any of the intervention-driven research orientations - both action and organisational development research approaches - postulate that a researcher should take an active role inside the investigated firm (Gummeson 1988, p.33). These two research-orientation options are intertwined to a certain degree, as stated by Rouda & Kusy (1995, p.255); "Action research is a process which serves as a model for most OD interventions". For this reason they are introduced here together.

For French and Bell (1990, p.99) the action research approach is a "process of systematically collecting research data about an ongoing system relative to some objective, goal, or need of that system; feeding these data back into the system; taking actions by altering selected variables within the system based both on the data and on hypotheses; and evaluating the results of actions by collecting more data." Action research is a feasible access method when deriving research based on a limited number of cases (Gummeson 1988, p.13).

Considering the Machine Vision System Firm case (see Table 26, first line and Subchapter 5.3.2), the researcher of this study participated in the board of directors meetings and shareholder meetings in 2008, which brought about a sound understanding of the ownership and long term strategy planning goals. In fact, my role was characterised by the organisational development definition given by French & Bell (1990). They define it as: "a long-term effort led and supported by top management, to improve an organization's visioning, empowerment, learning, and problem-solving processes, through an ongoing, collaborative management of organizational culture-with special emphasis on the consultant-facilitator role and the theory and technology of applied behavioural science, including participant action research".

In practise, the creation of the restructuring plan and the practical action within the Machine Vision System firm case in June 2008 meets the criteria of the nine-step OD-model suggested by Rothwell et al. (1995, pp.51-69). Indeed, it is an application of the action research of organisation development involving the steps of: (1) entry, which is finding prerequisites for change within an organization; (2) start-up and contracting - identifying of the critical success factors and the real issues; (3) assessment and diagnosis - collecting data in order to find the opportunities and problems in the organisation; (4) feedback – organisational learning of findings (by the consultant) based on an analysis of the data; (5) action planning - creating an implementation plan and raising activities that have the most leverage to effect positive change in the organisation; (6) intervention – carrying out the change process; (7) evaluation - verifying success and identifying further needs for new or continuing OD activities; (8) adaption – ensuring the implemented actions remain ongoing activities within the

organization; (9) separation – managing a successful exit of consultants from the organisation.

Beyond the OD and action research options, Gummesson (1988, p.35) highlights multiple roles available for a researcher capable of contributing to an organisation under investigation through consultancy work. The combined researcher/consultant may take a role somewhere between expert consultant and process consultant which can be as an analyst, project participant, catalyst, organisational development consultant-interventionist, change agent, board director and management for hire role (Gummesson 1988, p.37). On the right side of Table 5 are the options available for accessing data grounded on a sample perspective.

Organisational research is derived by identifying continuously repeating occurrences found from speeches, beliefs or practises (Alasuutari 1989). Following Smircich (1983), organisational research involves five main concepts: the comparative studying of management practises, the company culture, the cognitions of organisations, the symbolism of organisations and the subconscious processes of the organisation's perspective.

A second method subject to the sample approach is narratology. Central to narratives is a plot describing the passage of particular events involved in the object of interest. In this respect a narration is a story. The use of narratives following the sample approach logic emphasises capturing the interpretations of individual people appearing in the stories. In this respect, the members of an organisation and their behaviour are the object, not the phenomenon, behind the stories (Koskinen et al. 2005, p.193).

Boje (2001, pp.1-2) makes a strict separation between a story and a narrative. A story is an ante-narrative, which is an informal and incoherent form of a narrative. Here, 'ante' refers to the order of appearance. First, there is one or many stories, i.e. ante-narratives, which are aggregated and cultivated by a researcher for a more coherent and consistent form of true narrative. Boje, moreover, introduces eight forms of ante-narrative analysis options: deconstruction, grand narrative, microstoria, story network, intertextuality, causality, plot and theme (Boje 2001, pp.10-11).

The use of narratives offers an efficient practise for collecting events from the business growth cases for further investigating behavioural aspects of the organisation's members. Narrative fragments, stories, could be collected, for example, by in-depth interviewing. However, the participant role offered for the author of this study an optimal position to repeat certain themes frequently once the new questions appeared in mind. Following Boje (2001, p.10), causality and theme orientated ante-narrative analysis was used here. Causalities became visible by asking why questions. In turn, the theme ante-narrative was complemented by frequently asking growth and change related what questions.

One option for elaborating occurrences available in the research data is event structure analysis, abbreviated as ESA (Toivonen 1999, pp.159-167). In this approach, the research data is organised by sequential and parallel events and analysing the causalities

embedded within those events. Finally, a longitudinal flow of events is formed. However, this effort is time-consuming due the imperatives of causality. Because the outcome from an ESA is a structured narrative, it is an interim result from this study's point of view and less attractive as further analysis tools will be needed for deriving the end results. Therefore, a life-cycle analysis of the firms' evolution at the three levels, the investment, strategy and operational management levels, is considered, as discussed further in Ch.5.

Ultimately, selecting an appropriate set of analytical methods is a mix of sample and fact orientated methods - those dependent on the data sources: "During the data collection, especially when arising new data source opportunities, it may turn feasible to apply new methods" (Eisenhardt 1989, p.539).

The summary of the preferred methanol is discussed here next. The first choice before nailing any further decisions is deciding the main approach. In this study it is the qualitative approach rooted in the interpretive research tradition.

The chosen research strategy, which is the overall analytical orientation of this study, is best expressed by the concept in Fig. 6, where the three main stages are: (1) exploration - description by induction, (2) exploration – generic conception (mostly) by induction, and (3) prediction – model building by deduction. Aligned with the prerequisites of each of these three stages the best fitting analysis methods are exercised.

The first stage (exploration-description) stays partially hidden for the reader of this thesis because only the outcome from the data collection is explained here, in Chapter 6. In turn, due to the case study research orientation the number of diverse methods applied during the first stage is outstanding compared to that in two next stages. Indeed, the study uses a relatively rich set of access methods and the methods of deriving case descriptions as referred in Table 5. Also, the comprehensive access methods like organisational development and action research, organisation culture research and narratology orientated research are exercised.

The next two research stages, the exploration – generic conception and the prediction – model building, are exercised in Chapters 7 and 8. As the course of researching is based on developing the interim research results either by induction or deduction and using them as the hypotheses for the next analysis task(s), the stage two or three does not manifest any particular analysis method. A more detailed description of the deliberate research strategy is available in Subchapter 5.1.

3 INTELLECTUAL CAPITAL OF INDIVIDUALS AND ORGANISATIONS

The main goal of this chapter is to find a theoretical foundation for intellectual capital, which is, moreover, the central terminology basis for the purposes of this study applied both in the analytical concept chapter (4) and in the analysis chapter (5). The first subchapter (3.1) is the introduction to the theoretical scope of the dawn of intellectual capital. For this reason, resource-based theory, which is a precursor of intellectual capital theory, is first briefly described. In fact, the resource-based view is a significant theoretical foundation for this study, as the daily operations of firms more likely manifest themselves in terms of resources, resource fragments, rather than intellectual capital.

The resource-based view has, indeed, a mediator role in the analysis work (Chapter 5) between the organisations' operational level acts and transfiguring them into the manifestations of intellectual capital. Moreover, it enables not only articulating resource dependencies but also resource presences better than intellectual capital terms. Consequently, in this study these two theories are strongly complementary: when the resource-based view is rooted more in the firm's operations and functions, the intellectual capital takes more of a capitalising view.

The search for the main research components of intellectual capital typology is discussed in the three subchapters dedicated to human capital (3.2.), structural capital (3.3) and relational capital (3.4), called from now on subcapitals. The purpose of this typology is to serve as the principal conceptual framework in Chapter 5.

The common thread in following the discussion of subcapitals in their subchapters here is certain presentation logic. The starting point is the appearances of subcapitals manifesting potential value and less structured forms of the subcapital in question. Then, the discussion shifts towards the appearance of structured and realised value, and, moreover, asset-like value. Accordingly, this view reveals the divergent grades of each of the subcapitals. For this reason, the human capital subchapter begins with a discussion of human knowledge, ending with entrepreneurial capital, which is according to this study the most structured and business- orientated form of human capital. However, the idea of structuration becomes more salient when discussing structural and relational capital. The former is composed of less structured organisational knowledge which will receive structured forms in process capital, and, moreover, ownership relations. Lastly, relational capital benefits from less concrete social capital and achieves its utmost point of structuring within institutionalised business relations.

Subchapter 3.5 summarises the discussion of intellectual capital and bridges this chapter with the next one, which is dedicated to the dynamism and value adding of intellectual capital in business growth.

3.1 AN OVERVIEW AND RATIONALE FOR THE INTELLECTUAL CAPITAL FRAMEWORK

Barney (1991) was among the first to express the link between the resource-based view and intellectual capital. He claimed that companies are a collection of resources and capabilities constituted on the physical capital, human capital, and organizational capital owned or controlled by a firm that can be used to conceive of and implement strategies. Another link goes through competitive advantage, which is central to the resource-based view. As stated by Roos & Roos (1997, p.8): “[I]ntellectual capital is the most important source for sustainable competitive advantages in companies; an important managerial responsibility is to manage the intellectual capital of the company better”.

3.1.1 Resource and Knowledge Based Views of the Firm

The resource-based view and competitive advantage were implicitly present when Schumpeter (1934) depicted the paths of renewing firms with his five ways of innovating. Coase (1937) questioned the concept of firms solely as an economic object and searched for the essence of firm dynamism from the intellectual capacity held by individuals and powered by coordination (1937, cited by Granovetter in Dosi et al. 1998, p.63).

Albeit Wernerfelt (1984) was the first to coin the term “resource-based view”, though it is widely regarded that Edith Penrose was the spiritual founder of the resource-based view when she defined firms as resource bundles, acquiring their strategic distinctiveness in terms of these business critical resources (Penrose 1959).

Wernerfelt (1984) and Barney (1986) described companies as a collection of resources and capabilities difficult to imitate, which are the foundation of sustainable competitive advantage. Following Barney (1986; 1991), resources that are simultaneously rare and valuable may generate competitive advantage. These resources are also hard to imitate, irreplaceable and hard to transfer, so they will sustain the advantage. Moreover, Dierickx et al. (1989) found them untradeable and immobile. Reed & DeFillippi (1990) stated that causal ambiguity makes these resources hidden and complex to identify, therefore increasing the barriers to imitation. Competitive advantage is central, too, in creating above-normal or even more supranormal rents in the long run (Peteraf 1993).

At the beginning of the 90s interest in applying RBV in explaining theory of the firm was evoked for example by Conner (1991) and Kogut and Zandler (1992). Foss criticised them for neglecting the opportunistic perspective, which was, in fact, the heritage of transaction cost economics (Foss 1996). His irritation becomes quite understandable when reading what Kogut and Zandler stated (1992, p.394):

“Opportunism is not a necessary condition to explain why technology is transferred within a firm instead of the market [this means that the factors of production are preferably insourced due to control reasons]. Rather, the issue becomes why and when are the costs of transfer of technology lower inside the firm than alternatives in the market, independent of contractual hazards [not by evoking controls for self-seeking interest]. The relevant market comparison, in this sense, is the efficiencies of other firms”.

Kogut and Zandler (1996) suggested company outlines being constituted on coordination, learning and social identity. Conner and Prahalad (1996) argued for firm growth governance to be explained by two polar type contracting mechanisms, internal and market contracting. Besides Foss, other critical voices accused the resource-based view of paying too much attention to the firm internal perspective (Bontis 1999, p.440). Dyer & Singh (1998) proposed enhancement of the restricted view by replacing the unit of analysis with that of groups of firms.

Knowledge is admittedly central to the resource-based view. Conner and Prahalad went further in saying that the “knowledge-based view is the essence of the resource-based perspective” (Conner & Prahalad 1996, p.477). Also, there are other scholars who have migrated from the resource-based view further on by emphasising the essence of knowledge in organisation-wide value creation by sharing and re-combination (Nonaka & Takeuchi 1995; Grant 1996; Spender 1996), organisational learning (Senge 1990; Argyris 1992), dynamic capabilities (Teece 1998) and core competence (Prahalad & Hamel 1990; 1994). Furthermore, Teece (2000, pp.8, 12) pointed out that when knowledge assets are grounded in the experience and expertise of individuals, firms provide the physical, social, and resource allocation structure which gives rise to knowledge to be shaped into competences.

Not only firm internal bonding, but connectedness through groups (Nelson and Winter 1992) and social networks (Granovetter 1985) constitute knowledge-based value creation for firms. Although social bondings are central for new knowledge creation, the most precious knowledge in an organisation often cannot be passed on (Levitt 1991) and is not reducible from the organisation level to the group or individual level (Nelson & Winter 1982, p.63).

Firms gearing towards shaping individual knowledge and experience into competences should deploy organisational structures, processes and facilitating resources (Kirjavainen & Laakso-Manninen 2000, pp.12, 22; Teece 2000, p.12). Yet, the RBV key concepts, resource and capabilities are not fully exchangeable with the concepts of strategic knowledge and competences; but they have a strong overlap, and moreover, explain the creation of sustainable advantage for firms.

For Teece (2000, p.8), strategic resources were a synonym of dynamic capabilities. They are most likely to be resident in firms that are highly entrepreneurial, with flat hierarchies, a clear vision, high-powered incentives, and high autonomy (to ensure responsiveness). The economic rents arising from these socially complex and “costly-to-copy attributes of the firm” constitute the fundamental drivers of performance

(Conner 1991, p.121). However, the way they are configured and deployed will dramatically shape competitive outcomes and the commercial success of the enterprise (Teece 2000, p.12).

Following the rise of in- and outsourcing resources, core competence was the concept to re-define firm boundaries (Prahalad & Hamel 1990; 1994, pp.223-232). This gave a new name to hot spot areas of firms' strategically important resources, but leaves the firms to identify themselves. Practical advice is to aggregate a fragmented list of firm capabilities into 15 – 25 core competences (ibid. 1994, p.224). "Competencies have to be "core", no doubt; they have to be "distinctive", too; and they must also be "in demand"". But above all, competencies have to be applicable, and that can never be known for sure without trying" (Prahalad & Hamel 2004, p.279).

More recent discussion around competence stresses its strategic dimension, which is required for new business creating (Kirjavainen & Laakso-Manninen 2000; Camuffo & Gerli 2005, p.9). Among all the qualified competences of a firm, thus making distance from the underachieving ones, Kirjavainen & Laakso-Manninen (2000) suggested classification of competences ranked into enabling competences (lowest rank from the strategic point of view), mandatory fundamental, present strategic and future groundbreaking competences, as shown next here, in Fig 7.

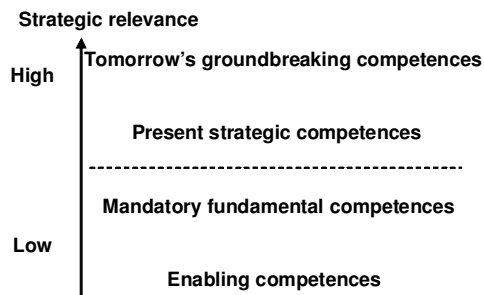


Figure 7: Competence hierarchy and strategic relevance (Kirjavainen & Laakso-Manninen 2000)

A third view besides the resource and knowledge-based view comes from strategy management literature, which has contributed to defining the dominant competitive forces of the firm (see for example Chandler 1962; Ansoff 1965; Mintzberg 1994). Also the business concept definitions by business growth scholars since Normann (1976) up to recent writers such as Chesborough (2003) have enriched the view on dominant resource areas of companies. Until the 1980s competitive advantage was suggested as the foundation of the firm's success by Porter (1980). It is a configuration of a firm's lifecycle, size, industry, business concept, strategy, size of the market, and prevailing competition.

3.1.2 Intellectual Capital Framework

Sveiby (1997b) emphasised the accounting perspective of intellectual capital by constructing the first balance sheet presentations with Edvinsson and Malone (1997), which considered intellectual capital value (following Sveiby intangible assets). As seen in Figure 8, Sveiby (1997b) divided the company's total asset value into tangible and intangible assets (belonging to the main group of non-current assets). The latter captures intellectual capital divided into external structure, internal structure and individual competence explaining the difference between the book value and market value of a particular company rated in the stock market (in order to state the whole balance sheet presentation, liabilities are added by the author).

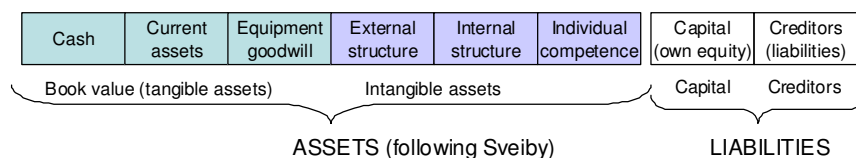


Figure 8: Company's total value divided into tangibles and intangibles (Sveiby, 1997b)

Management accounting scholars were another group contributing to the formation of intellectual capital theory in addition to the strategic management-orientated intellectual capital research stream. These two disciplines are frequently said to constitute the stock or static and the flow or dynamic approaches to intellectual capital assessment in respective order (Ricceri 2005, pp.12-13).

Considering the accounting stream, Johnson and Kaplan (1987, p.202) were the first representatives who argued that the company's value, besides its tangible assets, is grounded on intangible asset value: "Stock of innovative products, the knowledge of flexible and high-quality production processes, employee talent, and morals, customer loyalty and product awareness, reliable suppliers, efficient distribution networks".

Kaplan and Norton, in turn, developed a performance management system for managerial use in controlling and managing firm operations. Their Balance Scorecard was first introduced in 1996. This design connected four perspectives into one monitoring framework (i.e. knowledge development perspective, infrastructure perspective, customer perspective and financial) (Kaplan & Norton 1992; 1993; 1996). Balance Scorecard, BSC, was a source of inspiration for Sveiby, who mentioned, together with Edvinsson & Malone, the first of the architectures in designing an intellectual capital system.

Most of the intellectual capital literature defines it by drilling down to the three main categories (except Edvinsson & Malone 1997): human capital, structural/organisational capital, and relational/customer capital (Bontis 1999, p.445; Brooking 1996; Martin-de-Castro & Lopez-Saez 2008; Edvinsson & Malone 1997; Roos & Roos 1997, p.13; Stewart 1997; Sveiby 1997a; 1997b). And yet the list of intellectual capital concepts would be prolonged by Intellectual Capital Audit (Brooking 1996), Calculated

Intangible Value (Stewart 1997), the Austrian Intellectual Capital Reporting system, called Wissensbilanz (Koch et al. 2000; Bornemann & Leitner 2002), and others discussed further here.

As seen in Figure 9, the three subcapitals are termed with different names depending on the IC-model. The main level subcapitals in Sveiby's Intangible Asset Monitor, IAS, are labelled as external, internal and individual competence. Edvinsson and Malone (1997) disagreed with the triplet format. Instead, they stated two main level subcapitals, structural and human capital, the former dividing into customer and organisational capital. This study relies on triplet configuration and uses the names in Fig. 9. Precisely they are relational, structural and human capital, the constituents of intellectual capital.

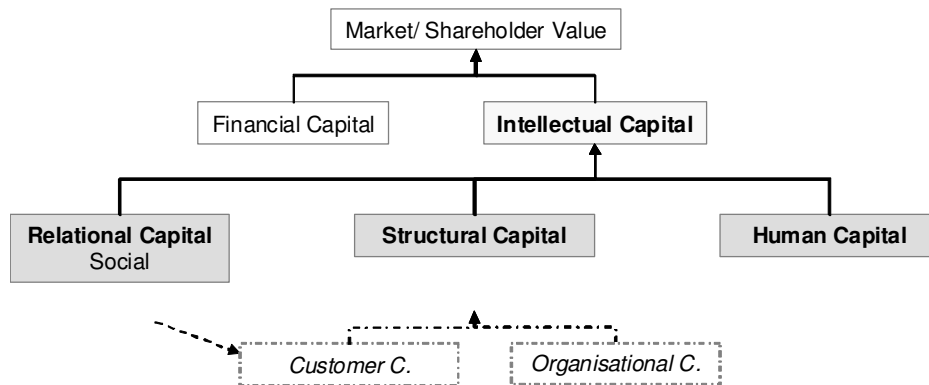


Figure 9: Categorisation of intellectual capital and linkage to the firm's total value

Industry specific IC-models or models manifesting their dynamic character are divided into more than just three subcapitals, or they embody more sublayers. For example, Roos & Roos (1997) added two sublevels beneath the main level: those of renewal and process capital, linked to structural capital in their dynamic intellectual capital model. The overall objective of their study was to develop and later test a process model of intellectual capital (Roos & Roos 1997, pp.8-9). For them, the process model meant a model that takes into account a dynamic view of intellectual capital, a concept that was capable of showing how intellectual capital grows/declines over time. Their study revealed the triplet structure (Human, Customer/Relational, Organisational/Structural capital) on the main level, but suggested organisational capital to be divided into two more capitals: (1) business process capital and (2) business renewal and development capital. All the capital categories had, moreover, 4-5 subfactors.

Rooted on the Intellect model by Euroforum, a Spanish intellectual capital model, CIC-IADE (2003), is based on five subcapitals: human, technology, organisational, business and relationship capitals. In fact, business capital is one form of relational capital. Here, the CIC-IADE model emphasises the difference between strategic partners that are tied through business processes (customers, suppliers, allies, etc.) and other associates connected with less formal bonds.

Martin-de-Castro & Lopez-Saez (2008) derived quantitative research within technology firms, which is discussed later from the reliability point of view. Their model was grounded on the CIC-IADE-model developed by Buenos-Campos (1998). The results suggested a triplet model, where human capital was centered on innovativeness and experienced capital, the substitute of HC, receiving an outstanding weighting value (41%) from the total value of intellectual capital. This capital reflected well with business renewal and development capital as well with HC (Roos & Roos 1997, p.13).

Another concept comes from German-speaking countries. A proposal for accounting and reporting purposes was designed by the Work Group “Accounting and Reporting of Intangible Assets” of the Deutsche Schmalenbach Gesellschaft für Betriebswirtschaft eV (DSG). The system was design especially for the telecom industry and the development effort carried on until 2003 (cited in Gerport et al. 2008, p.38). The IC-categorisation here comprises seven capital domains: human, customer, supplier, process, innovation, location, and investor capitals. The fit with the triplet concept goes by linking the last four to structural capital, whereas customer and supplier categories are linked with relational capital.

There are other advocates for investor capital. Näsi (1990) introduced the discipline for the growth venture process, where ownership management is one of in total four disciplines explaining the perspectives of venture growth. Johannessen et al. (1999), in turn, considered stakeholder capital one of the components embedded in IC.

Bontis (2000) developed a business performance system based on intellectual capital definitions within two industry sectors in Malaysia. Montequín et al. (2006) developed an intellectual capital measurement system to measure the maturity of a firm for adapting a knowledge management implementation and capability for achieving advantage from this effort. EFQM-related intellectual capital concept has been designed by Martín-Castilla & Rodríguez-Ruiz (2008). Accounting management-orientated research is not discussed here.

Rooted on Barney’s organisational competitive advantage study (1986b), Klein (2008, p.2) suggests organisational culture and leadership as capital, whereas Bontis (1999, p.450) would preserve them outside as drivers of intellectual capital, not, in fact, a factor of intellectual capital.

3.1.3 Explanatory Power of Intellectual Capital Models

Opinions considering intellectual property as belonging to intellectual capital are voiced from two camps. Following the majority of theorists, intellectual property such like patents, copyright and trademark is a part of intellectual capital (Brooking 1996; Roos

& Roos 1997; Stewart 1997; Teece 2000¹; Ståhle & Grönroos 2000). Other voices, in turn, exclude intellectual property from the definition of intellectual capital and consider it as an intangible asset, a legal property (Bontis 1999, p.630). In this study, intellectual property is considered as a highly cultivated and structured form of knowledge, which is predominantly like an asset but requires human capital for renewal and further development.

In fact, the role of dynamism in intellectual capital systems is found difficult to explain thoroughly (Ståhle & Grönroos 2000). The static IC-models (Brooking 1996; Stewart 1997; Sveiby 1997b) are silent on subcapitals like innovation or renewal and development capital. On the other hand, one intellectual capital research line considers the interdependency of subcapitals in an intellectual system. Among the first movers were Roos & Roos (1997), accompanied by other scholars like Bontis (2000), Nahapiet & Ghoshal (1998), and DeCarolis (2002).

Whereas strategy-rooted intellectual asset monitoring systems are limited in explaining the reinforcing role of individuals, they moreover fail to capture a holistic view of unstructured human capital (Roos & Roos 1997), which is tacit knowledge. The dualistic character of human capital conceals both human knowledge as an asset and individuals possessing knowledge appropriate for the creating of new knowledge. Moreover, indicators such as motivation and task capital become necessary for IC-systems (Roos & Roos 1997).

A lack of dynamism is encountered also when stretching the view beyond the boundaries of the firm. This is a mandatory perspective for this study as the focus here is on explaining the intentional investing in intellectual capital. As the venture capital process describes, investment for a particular firm is especially carried by external actors raising both financial and knowledge-based assets and capital. Related research arising from the intellectual capital tradition is here mostly concentrated on investigating value adding through interaction within business networks where the interrelatedness between social and entrepreneurial capital is a frequently met point of interest (Audretsch and Keilbach 2005, p.457-458; Saxenian 1990, pp.96-97). Hence, sources answering specifically to the problem of investment-like intellectual capital value adding in firms are not available.

Nor are there satisfactory IC-concepts appropriate for growth technology firms ranging from the early stages to the more mature stages of growth. However, Liang & Lin (2008) studied the dynamism of intellectual capital at the four stages of the firm life-

¹ Teece defines intellectual property to belong to intangible assets together with knowledge and competences: “intangible assets, of which knowledge, competence, and intellectual property are the most significant” (Teece, 2000).

cycle: those of the growth, maturing, and stagnation stages (only 3 here). They argued that customers, innovation, process and human capital best stand for the main capitals characterising the categories of total IC-value. Furthermore, Liang & Lin claimed that, "...overall, IC provided the most value-relevant information in the stagnant stage and the lowest value-relevant information in the growth stage." Hence, the latter claims to apply the whole set of subcapitals instead of one monolithic measurement of total IC within the growth stage.

Following Roos & Roos (1997), it is necessary to make a strict distinction between subcapitals and the factors including in them. In their model, the level beneath the subcapital presentation level is formed of factors, which are termed also as variables in other models (Martin-de-Castro & Lopez-Saez 2008; Liang & Lin 2008), or subfactors (Moon & Kym 2006). Nevertheless, whether termed variables, subfactors or indicators, they are reflected in the survey questions (Martin-de-Castro et al. 2008; Liang & Lin 2008; Roos & Roos 1997) as shown in Table 6, which is taken here as an example: "[T]he vehicle for measuring intellectual performance is the set of indicators used for each intellectual capital category. It is these indicators that permit measurement, not the categories." (Roos & Roos 1997, p.18).

There are still other problems involved in the indicators. Considering strategy management research, Spender and Grant (1996, p.8) highlighted "that the variables which are most theoretically interesting are those which are least identifiable and measurable." Transferring the statement into the intellectual capital arena is valid (Moon & Kym 2006, p.1) and manifests that not all essential factors are necessary covered.

Moreover, Roos & Roos (1997, p.21) pointed to the analytical difficulties in operating with indicators: "Selecting the right indicators among the almost limitless number of potential ones; ranking the importance of indicators for a specific category; ensuring high precision for indicators; establishing reliability of numerical values of indicators, and; tracing all sources of error or noise in the logic used to identify indicators, which may otherwise lead to erroneous or irrelevant indicators". They also highlighted the tendency problem involved in deriving appropriate indicators which may derive from preferring strategic tendency, intellectual categories tendency or founding indicators in intercapital flows (1997, p.20)

Ultimately, the indicators of intellectual capital represent the most detailed level of an IC-system (Roos & Roos 1997, p.17). Hence, their role in building a reliable IC-system is pivotal. Martin-de-Castro et al. (2008, p.29) took 12 indicators in their model building as shown in Table 6 below. Their model was constituted on quantitative research within 49 small and medium size technology firms in diverse industries in Spain. The actual study was based on surveys including a 12-item questionnaire standing for the elaborated 12 indicators. Other quantitative IC-researches applying quite the same number of indicators grounded on surveys are like the study by Subramanian and Youndt (2005, pp.455-456).

Table 6: Indicators of three modes of intellectual capital

Indicators of human, relational and structural capital			
	HUMAN CAPITAL	RELATIONAL CAPITAL	STRUCTURAL CAPITAL
1	Experience in industry	Reputation on behalf of external agents (customers, suppliers, competitors, and the general public)	Organisational culture
2	Innovativeness and knowledge	Customer loyalty	Production development and management
3	Team working capabilities	Collaboration with partners	Dissemination and respectfulness of firm values and beliefs
4	Long experience in the firm	Supplier relationship	
5		Environmental responsibility	

However, these studies do not answer the question: what is the right number of indicators? On one side, Roos & Roos (1997, p.15) stated that increasing the number of indicators will not increase the accuracy of an intellectual capital system: “It was difficult to come up with a listing of more than five indicators for any one factor, based on the suggestions provided. Additional indicators suggested were not measuring different “dimensions” of the factor considered. In some instances we ended up with only two indicators (Roos & Roos 1997, p.15). Specifically, they applied 18 – 28 indicators in the two cases in their study and ended finally on 18 indicators or 2nd level subcapitals in their IC-model (ibid, pp.13-15).

3.2 HUMAN CAPITAL

The human capital definition by Roos & Roos 1997, p.8) is perhaps one of the shortest: “[I]ntellectual capital is the sum of the "hidden" assets of the company not fully captured on the balance sheet, and thus includes both what is in the heads of organizational members, and what is left in the company when they leave”.

The characterisation of the components of embedded human capital becomes substantially long like the one by Meritum Guidelines for Intellectual Capital Statement (2002), which is a composition from different sources. Human capital includes the knowledge, skills, experience and abilities of people. Some of this knowledge is unique to the individual, some may be generic. Regarding the latter, the examples are innovation capacity, creativity, know-how and previous experience, teamwork capacity, employee flexibility, tolerance for ambiguity, motivation, satisfaction, learning capacity, loyalty, formal training, and education (Meritum 2002, p.63). In addition, Roos & Roos (1977) add task management; Kaplan and Norton (1996) employee sustainability; and Hudson (1993) genetic inheritance and attitudes about life and business. The discussion here is followed at the component level by the Danish Guideline presentation (Danish Guideline 2003), with competence added.

3.2.1 Knowledge Perspective - Less Mobile Characters of Human Capital

The human mind is related with three *mental modes*: affection, cognition and conation (Snow et al. 1996), which together form our personality and intelligence (Snow et al. 1996). Cognition is central to any knowledge-based working and it is given more emphasis here. However, conation is also included in the subchapter discussing entrepreneurial capital.

Cognition is divided into the two knowledge categories, procedural and declarative knowledge. The former provides foundation for our intelligent actions and is frequently called know-how - knowing how to perform practical tasks in a particular situation. Nahapiet & Ghoshal (2002, p.676) defined it as “know-how of ways of doing acts that require sequential motion and control”. Procedural knowledge, moreover, includes the capacity to cope with unexpected situations by strategies and tactics.

Declarative knowledge, in turn, considers the processes of recognition, thinking, reasoning, and deduction that happens in human minds and does not necessitate acts, but rather problem-solving and decision-making (Snow et al. 1996). Sometimes it is called know that, and know-what (Nahapiet & Ghoshal 2002, p.676). Dai and Sternberg (2004) explain that declarative knowledge and strategies and tactics constitute the concept of intellectual functioning that refers to complex, higher-order forms of cognition such as reasoning, problem-solving, and decision-making: “[Intellectual functioning...] denotes: “(a) [A]ny act of generating or utilizing knowledge or strategies, or both, for practical or purely intellectual purposes by an intentional system; and (b) the effectiveness of such an act in achieving specific desired outcomes. Defined as such, it distinguishes itself from mere cognitive operations” (Dai & Sternberg 2004).

Creativity, one of the special mental ability factors following Snow et al. (1996), is also frequently stated as one of the main contributors of individuals within an economic context (Bontis 1999, p.445; Mintzberg 1994, p.299-300). Creativity is the ability to produce work that is both novel (i.e. original, unexpected) and appropriate (i.e. useful, adaptive concerning task constraints) (Sternberg & Lubart 1999, p.3) as well-being an essential part of our everyday life (Runco & Sakamoto 1999, p.62).

The structure of conation involves motivation and volition. Intention and volition are related with personal motives that drive, direct, and select one’s behaviour towards a certain action and goals and away from others (Spencer & Spencer 1993, p.8). Motivation is inherently a part of human nature. Sources of motivation are not static but can change across individuals, activities, the surrounding context, and time due to external stimulus conditions (Condry & Stokker 1992, p.1; Wise 2004, p.159), which makes organising the environment and incentives of a firm important. The third, affection, is connected with our values, attitudes, traits of temperament and moods (Snow et al. 1996).

Plato expresses knowledge in four terms: *episteme*, *techne*, *phronesis* and *metis*. Episteme is commonly held abstract and general theoretical knowledge (Baumard, 1999, p.22).

Techne is the capability and capacity to accomplish tasks and is congruent to what we understand by skills and know-how and has relevance to decision-making and behavioural situations and models of human beings. *Phronesis* is social wisdom acquired through socialisation and is a result of expertise and social practise, and, moreover, deeply rooted in individual practical experiences, thus difficult to share. Individually held *phronesis* guides interacting in a meaningful way within the organisational context (Baumard 1999, pp.20, 23, 53, 63). *Metis* is the human capability to integrate knowledge in a visionary way from diverse sources, and even more, improvising in an uncertain and unfamiliar situation (Baumard 1999; Näsi & Neilimo 2006).

Michael Polanyi was among the first advocates of discussing personal knowledge in terms of its tacit nature. Considering the unarticulated and articulated sides, knowledge is usually divided into tacit and explicit knowledge in the knowledge management literature (Polanyi 1967, p.4; Niiniluoto 1989; Nonaka & Takeuchi 1995). The relationship of explicit and tacit knowledge is parallel with the relationship of the pre-logical phase of knowing in the form of inexpressible knowledge cultivated into expressible knowledge. In brief, Polanyi states: “We know more than we can tell”. Tacit knowledge forms 95% of our knowledge base (Niiniluoto 1989).

Polanyi notes the focal role of language as a medium rooted in the tacit mental process of a human mind: “Nearly all knowledge acquired is based on language. The operations of language rely ultimately on our tacit intellectual powers. These inarticulate acts of intelligence strive to satisfy self-set standards and reach their conclusions by accrediting their own success” (Polanyi 1962). With respect to the means of communication, Nonaka mentions three characteristics of knowledge creation. First, the inexpressible is expressed in figurative language and symbolism. Second, personal, inadequately expressed, tacit knowledge is disseminated. Third, new knowledge is born and it has ambiguous expressions, crystallised later at the group level in discussions and experience-sharing (Nonaka & Takeuchi 1995, p.61).

3.2.2 Competence – Performing Side of Human Capital

From the economic perspective, OECD’s definition captures the more mobile elements of human capital: “knowledge, skills and competences and other attributes embodied in individuals that are relevant to economic activity” (OECD 1998, p.9). Competence is explicitly present only in a few models: notably, those of Sveiby (1997b), and Kaplan & Norton (1996; 2004). Moreover, competence is dynamic in nature, providing the holder with intellectual reasoning practical skills, and, moreover, the capability of finding complementary knowledge for resolving problems and executing the required actions: “[I]ndividual competence is people’s capability to act in various situations” (Sveiby 1997b). Expertise and competence do overlap to a certain degree. Yet, competence is a broader concept embodying expertise, knowledge and intelligence (Näsi & Neilimo 2006, p.251).

The firms' human capital related success factors are founded on two sets of competencies: (1) threshold competences that apply to both average and superior performers, and (2) differentiating competences that apply only to superior performers (Camuffo & Gerli 2005, p.9). A threshold competence is a person's generic knowledge, motive, trait, self-image, social role, or skill essential for performing a job

Most of the definitions of competence link personal capabilities with job performance: "[A] person's set of competencies reflect his or her capability. They are describing what she or he can do, not necessarily what he or she does, nor does all the time regardless of the situation and setting" (Spencer & Spencer 1993, p.23).

Definitions of competence of individuals in business organisations like those stated below in the table (Boyatzis 1982; Blancero, Boroski & Dyer 1996; Dweck & Elliot 2005; Mirabile 1985; Ulrich et al. 1995) share a common view assuming that competence is an itemisation of knowledge, skills, attitudes or other attributes. Furthermore, they underlie effective or successful job performance and are the elements that differentiate the best, and other, performers (Camuffo & Gerli 2005, p.9).

Table 7: Definition of competence

Individual cognitive aspects			Goal orientation aspect	Organisational aspect	Reference
Knowledge	Skills	Abilities		Other attributes required to perform future behaviour	Blancero, Boroski, and Dyer, 1996, p.387
Knowledge	Skills	Abilities			Ulrich, Brockbank, Yeung, and Lake, 1995, p.474
Knowledge	Skills	Abilities		Behaviours required for successful performance of job duties	Mirabile, 1985, p.13
Body of knowledge	Skills	Traits	Motives	Aspect of one's self-image or social role	Boyatzis (1982, p.21)
		Ability	Sufficiency or success	Quality of effectiveness	Dweck & Elliot, 2005

The visible side of competence is organisational performance, which is included in all of the definitions. In turn, knowledge, abilities and skills form the hidden side. Acts, in turn, are delineated by the context and purpose they are executed for: "To define a competency, we must determine what the actions were and their place in a systems and sequence of behaviour and what the results or effects were and what the intent or meaning of the actions and results were (Spencer & Spencer 1993, p.22).

Hence, competence is dependent on the context and personal qualities and the alignment between these two factors: "We have to understand the individual's specific behaviour that was effective, we should know what capability the individual has brought to the situation (i.e. the job in the organisational environment) (Ibid, p.23).

McClelland distinguished competence from intelligence, which underlies predicting job performance and personnel selection (McClelland 1973). He also influenced McBer in Hay Group's work in creating the job competence assessment system, JCA, that is an

accurate approach to predicting job performance and success (Spencer & Spencer 1993, p.3).

Boyatzis (1982, p.21) defines a job competency as “an underlying characteristic of a person, in that it may be a motive, trait, skill, aspect of one’s self-image or social role, or a body of knowledge which he or she uses, which is causally related to the achievement of effective, or better, work performances”. His definition of competency is general and does not reflect either individual or specific organisational perspective clearly enough. A motive is “the things a person consistently thinks about or wants that cause action” (ref).

Spencer and Spencer (1993) focused on identifying “competency” variables, which could predict job performance and were not biased. This investigation work was two-fold. They first derived a generic competency dictionary for the 21 competencies found most often in differentiating superior from average performers in middle- to upper-level jobs (1993, pp.19-90). Second, they more interestingly presented findings on the competencies that predict success in sales, technical/professional, helping and service, managerial, and entrepreneurial jobs (Spencer & Spencer 1993, Part IV/pp.157-235). Because the list is long and detailed, it is not summarised here.

Finally, it should be noted that different competences predict outstanding performance in different roles, and there is a limited number of competences that predict outstanding performance in any given job/role. Thus, a trait that is a "competence" for one job might not predict outstanding performance in a different role (Spencer & Spencer 1993, p.23)

3.2.3 Entrepreneurial Capital and summary of Human Capital

The discussion here concentrates on defining human capital, which is eventually summarised in Table 8, next here. Entrepreneurship is suggested as one of the human capital factors (Erikson 2002, p.277; Moon & Kym 2006, p.259). Hence, it is justifiable to speak about entrepreneurial capital as an independent component of human capital. From a regional economics activity perspective, entrepreneurial capital is seen as a vital source nourishing new business firm creation and economic performance (see, e.g. Audretsch & Keilbach 2005, pp.457-458; Harmaakorpi 2004; Harmaakorpi & Melkas 2005; Ucbasaran et al. 2008).

Entrepreneurship research carried out in the 80s concentrated on defining personal traits and qualities that differentiate an entrepreneurial actor from business managers and other business development actors. Following the studies, entrepreneurs are innovative (Schumpeter 1934; Stewart et al. 1999), risk-taking (McClelland 1961; Welsh & White 1981; Sexton & Bowman 1985, p.13; Stewart et al. 1999). They have a need for achievement (McClelland 1961; Stewart et al. 1999), a desire for independence (Dunkleberg and Cooper 1982; Stewart et al. 1999) as well as being optimistic and growth-oriented (Dunkleberg & Cooper 1982).

However, these trait studies were criticised, as they pass over the outcomes, concentrating on the means, not on the ends, of entrepreneurial actions. Consequently, Gartner et al. (1988) turned their attention towards the process of entrepreneurial acts that enables new organisations come into existence. As they noted, “who is the entrepreneur is a wrong question” (ibid), and should be replaced by, “what are the outcomes by entrepreneurs?”

The first definitions of entrepreneurship discuss two acts: opportunity recognition and an act of volition or intention (Stewart et al.1999, p.192). This view was echoed also by Schumpeter, who defined entrepreneurship as “the pulling together of previously unconnected elements for an economic purpose” (Schumpeter 1979).

Following Erikson and Nerdmum (2001, p.283), entrepreneurial capital is a combination of three capacities, which are: “combining (and co-ordinating) scarce resources; recognizing (identifying) new market opportunities; and seeing ventures (projects) through to fruition opportunities”. In brief, entrepreneurial capital is finding new business opportunities, exploiting resources cost efficiently and deploying an opportunity to become a true business.

Alsos and Kolvereid (1998) and Alsos and Carter (2004, p.2) defined new business creation in terms of an entrepreneurial process. In their definitions this process comprises discovery, recognition, generation and exploitation phases. Sarasvathy, Dew, Velamuri & Venkataraman (2003) suggested that opportunity recognition refers to identifying feasible combinations within existing technologies and markets. In turn, discovery defines a process where only one of the variables exists, i.e. market or technology.

The available sources of an opportunity discovery, following Block and MacMillan (1993, p.99), are firms, industries, markets, and the external environment of the actors working therein. Also research institutes and university research may form a feasible source for discovering opportunities (Etzkowitz & Leydesdorff 1997).

Identification is dependent on one’s capabilities to match the technology against actual or emerging market demand. Therefore, the identification is a dyadic process between enabling novel technology and the market. As Roberts (1988, p.12) claims, technological innovation (i.e. opportunity) is defined as the product of an invention and exploitation.

Although human capital present in entrepreneurial intentions is found advantageous in reaching positive outcomes in terms of organising business activities and growth, it may also appear as a counteracting force. At the early stages of growth an entrepreneur is the driving force in pacing the firm’s success, whereas at the more mature levels of growth his or her capabilities may appear insufficient for leading the company and cause a company to fail (Argenti 1976, pp.123-4, 157-60; Richardson et al. 1994).

Nominating entrepreneurial capital as capital is not self-evident. As a real capital it has to be effective in creating financial wealth and entail an impact on cash flow. Following Erikson (2002, p.276-282), the tie between entrepreneurial capital and financial

performance comes from pursuing future business opportunities and the affordance of higher commitment in ongoing business activities than would be reached by non-entrepreneurial roles, such as managerial ones (Stewart 1999, p.204).

Table 8: Summary of human capital factors

HUMAN CAPITAL			
Main factors	Indicators	Definition	More detailed appearances
Human intelligence foundation	Creativity, declarative and procedural knowledge, processing capabilities, volition, emotional foundation	Less dynamic features, as discussed in 3.2.1	
Knowledge	Tacit and explicit knowledge	Dynamic and stock knowledge founded on personal intelligence, as discussed in 3.2.2	Knowledge ladder indicating accumulated experience embedded in knowledge
Competence and skills (one can handle...)	Practical; Decision-making; Execution; Planning; Controlling skills	Capability to execute desired organisational tasks	
Entrepreneurial capital and motivation	Commitment; Level of activity (busyness); Motivation; Seeing new opportunities; Managing business projects	Finding new business opportunities, exploiting resources cost efficiently and deploying an opportunity to become a true business	Entrepreneurial process, discussed in 4.2.

Entrepreneurial activity fosters market entry activities and spotting a proper customer segment and pacing product development activities. In sum, entrepreneurial drive is winning time and gaining positive cashflow: “To survive and thrive, entrepreneurial firms must have high completion rates of new products that meet not only their budget constraints and sales objectives, but their scheduled timeline as well” (Schilling & Hill 1998).

3.3 STRUCTURAL CAPITAL

Structural capital as defined by Roos & Roos (1997, p.8) is “knowledge that stays within the firm at the end of the working day”. Structural capital that persists in a particular firm independent of employees’ human capital is valuable when making human capital more practical, manageable, transparent and capable of dissemination through the organisation (Bontis 1998, p.4; 1999, p.447). Structural capital not only converts individually held knowledge to organisation-wide property but also pursues structures that enable an increase of the firm’s internal efficiency of managing and achieving contributions from knowledge. This, in turn, is expected to bring cost advantages and more profitable businesses in the long run (Bontis 1999, pp.445, 447).

In fact, structural capital could be considered in two ways by separating the actual content from the enablers. In practise, this means considering the transformation of knowledge from individually held unstructured knowledge to fully materialised outcomes like products and services, whereas enablers create the foundation for the transformation process. Accordingly, with these notions structural capital here is

divided into three subchapters, 3.3.1 – 3.3.3, as follows: (1) structuring of knowledge into organisational knowledge; (2) management structures and process capital providing the foundation for organisational efficiency; (3) property and ownership perspective of governing knowledge-based assets. This approach is not too far from the three-fold definition of human capital. In fact, the following pairs of structural capital and human capital can be seen quite easily: organisational knowledge – human knowledge, process capital – procedural knowledge, breaking through competence and ownership capital – wealth creation intentions found in entrepreneurial capital

The transformation from vague and unstructured human capital to organisational knowledge and even assets is reinforced in the technology management literature that claims a shift of knowledge moving from the invisible towards the visible (Itami 1987). The example by Thierauf (2001, p.44): “one image is worth a thousand words, and a prototype is worth several thousand words” is also apt for illustrating this continuum.

The transforming of pure knowledge from human-centered into shareable and transferable organisational knowledge, and, moreover, codified knowledge-based assets can also be found in three layer business organisation models. Organisation theories discuss organisation structure designs divided into strategy and operation management levels (Hatch & Cunliffe 2006, pp.296-308; Nonaka & Takeuchi 1995) and a third one, infrastructure level (Marchand et al. 2002). The three-layer-structure is also reinforced by the knowledge management literature that speaks about strategic, capability learning and routinised learning levels (Ciborra & Andrieu 2002, pp.577-579).

Once defining the enabling perspective of structural capital, Figure 10 below, is also composed of those three layers (Marchand et al. 2002). First, the upper-most layer on left, represents knowledge possessors and processors, bearing strong human capital relatedness due to its individual emphasis. Making computer aided market analyses, new product concepts, financial analysis and strategic plans are examples of this area. The right-hand upper-most area stands for the customer service related strategic systems which are not discussed here due to their inter-organisational character.

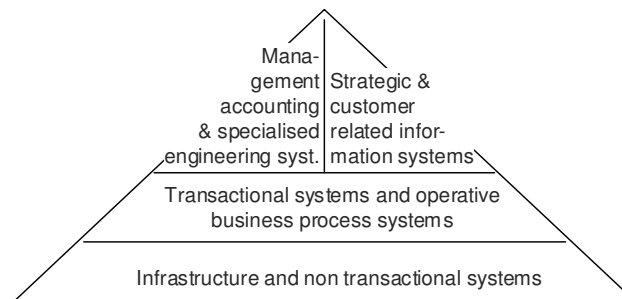


Figure 10: Information systems hierarchy (Marchand et al. 2000)

The middle layer is dominated by transactional systems which are closely integrated with functional workflows, like sales and marketing, purchasing, accounting, production and human resource (Hatch & Cunliffe 2006, p.297). Consequently, knowledge here is more structured than in the layer above and humans work more on a collective basis. Furthermore, they are obliged to derive their daily operations following the patterns

encoded in the systems. Therefore, the middle-layer contributes significantly to enabling structures and disciplines which constitute process capital, as discussed in subchapter 3.3.2.

The bottom level stands for infrastructure. Structural capital found here consists of automatised information flows of IT-systems, non-transactional IT-systems (office systems), etc., which are more like assets than capital. Compared with structural capital definitions, the top of the information pyramid captures organisational capital, which is constituted from individual and informal team working. For example, strategy planning is here, which belongs to the strategic processes of organisational capital (Roos & Roos 1977, p.13), and by definition, to structural capital.

More evidence for the three layer description available in the intellectual capital literature is claimed by the structural capital definitions, where, for example, sales and marketing and production processes belonging to business process capital and renewal capitals (Roos & Roos 1997) or any information system driven procedures (Meritum Guidelines 2002, p.63). The bottom level is defined by codified routines, procedures and technologies (Roos & Roos 1997; Meritum Guidelines 2002). For example, automatised routines like cash flow operations (Roos & Roos 1977), supporting infrastructure, knowledge service centre (Meritum 2002) and technology (Bontis 1999) are situated here.

3.3.1 Organisational Knowledge

Structural capital, unlike human capital, is a manifestation of knowledge-based intellectual resources held by organisational teams, groups, functions, and by a company, not only individuals. Ansoff (1965, p.9) argued that the flows of knowledge in organisations are driven by teams and groups and are vital for taking advantage from knowledge. Based on the empirical analysis of 18 known knowledge management approaches, Bodrow (2007) stated that the knowledge of humans, teams and groups is driven by eight pivotal knowledge management tasks: using, sharing, generation, integration, identification, acquisition, development, storing.

These eight processes can be found from knowledge creation cycle leveraging knowledge towards more meaningful and valuable forms. New knowledge of organisations following Nonaka & Takeuchi (1995, p.62) goes through four steps: socialisation, externalisation, combination and internalisation. Ståhle & Grönroos (2000) re-termed these steps sympathised, conceptual, systemic and operational knowledge. The first step is dominated by pre-understanding of the problem at hand. Here, a team or a group of individuals cross over the social and cognitive barriers. Second, the problem is conceptualised, enabling a more efficient communication and sharing within the group. Third, members rearrange and combine new knowledge in order to express explicitly the found solution for the problem. Finally, new knowledge is exercised through members and disseminated through the organisation (Nonaka & Takeuchi 1995; Nonaka et. al. 2000).

The end result of the knowledge creation cycle is codified new knowledge like designs, procedures, and also new organisational tacit knowledge as fuel for the next knowledge creation cycles. Besides Nonaka, there are other authors who reinforced this stepwise process. From the organisational learning perspective, for example, Crossan et al. (1999, p.525) discuss the steps of intuition, interpreting, integrating and institutionalising as being much alike externalisation, combination and internalisation. Further, Matusik (2002, p.606) found the accumulation of new knowledge dictated by several processes: knowledge creation; knowledge transfers within the firm; and dissemination into the external environment of firm private proprietary knowledge.

Obviously, one of the main drivers influencing positively on the formation of new organisational knowledge is the commitment of employees to objectives set by the firm's strategic intentions. Simmons emphasised the importance of alignment within the firm and individual intentions. The bigger the overlap is the better employees utilise knowledge and align their attitudes towards the company strategy (Simons 1995, pp.24-28; Gratton 2000).

Alignment is fertilised by the soil of positive attitudes. Moreover, the firm may become more susceptible to knowledge sharing. Davenport (1997) suggested five properties paving the way for organisational knowledge sharing: (1) common language and schematic convergence; (2) belongingness and consciousness of organisation practices and policy; (3) roles and responsibilities of individuals; (4) trustful relations; equal incentives for rewarding knowledge sharing; and (5) corporate values are aligned with knowledge sharing.

3.3.2 Process Related Structural Capital

Based on findings by resource-based advocates Kogut and Zandler (1996), Martin de-Castro et al. argue (2008, p.32) that the purpose of structural capital is to provide an appropriate context for communication, cooperation, adhesion and identity. Bontis suggests that infrastructure assets referable to structural capital as defined here are those technologies, methodologies and processes that enable the organisation to function. Examples include methodologies for assessing risk, methods of managing a sales force, databases of information on the market or customers, communication systems such as e-mail and teleconferencing systems (Bontis 1999, p.448). In turn, as shown in Figure 9 (subchapter 3.1.), Roos & Roos (1997, p.13) divide structural capital into two subcategories: (1) business process capital and (2) renewal and development capital, breaking down further into five factors each, as expressed in the table below. A process view is also dominantly seen in the former, as there are processes like production processes related to the latter.

Central to process-related structural capital is harmonising organisational behaviour and streamlining the flow of knowledge engaged with different operational processes. As stated in the previous subchapter, the processes may be less or more supported by information technology. The major part of organisational practises and working patterns

do not necessarily need sophisticated IT-solutions, but just guidelines, documented, for example, in the quality assurance system. When adapted seamlessly into the organisational work processes, a particular information technology solution may become an integral part of the firm's structural capital.

Table 9: Organisational capital referable to structural capital

Process related Structural Capital	
Martin de Castro et al. (2008, p.32)	Communication, cooperation, adhesion and identity
Process-related structural capital, following Bontis (1999, p.448)	Technologies, methodologies and processes
Business process capital of organisational (cf. Roos & Roos 1997)	Flow of information; flow of products & services; cash flow; co-operation forms, strategic processes
Renewal and development capital of organisational c. (Roos & Roos 1997)	Specialisation, production processes, new concepts, sales & marketing and new co-operation forms

The structural capital accomplished through practises, attitudes, values and commonly accepted norms forms the invisible foundation of a firm that guides organisational behaviour. Besides the normative practises, an organisational flexibility is a manifestation of structural capital, too (Meritum Guidelines 2002). Moreover, flexibility may be a source of competitive advantage once the supportive culture allows individuals to try new ideas, fail with them, learn from mistakes, and try again (Bontis 1999, p.447).

Structured organisational practises and normative control may also become an obstacle to taking advantage from the human capital of organisations (Bontis 1999, p.447). Especially new technology firms as they move ahead fuelled by entrepreneurial drive do not necessarily need organisational structures (Hatch & Cunliffe 2006, p.297). Yet, soon after establishment on the main market, they inevitably encounter a shift from the creative to the discipline management mode (Greiner 1972; Ansoff & Stewart 1967). Eventually there is a question of balancing these two directions, not just favouring one over the other.

Small firms need flexibility for strategic change as new opportunities arise (Mintzberg 1994). The empirical literature reveals that incumbent firms are most vulnerable at this point of technological change, or when they are required to make changes in products or processes that force them to change their internal organizational architecture and routines. (Mathews 2003, p.1172; Christensen C.M. 1997)

3.3.3 Ownership capital and summary of Structural Capital

Subchapter 3.3.3 discusses of ownership capital, which is a mandatory factor of structural capital, especially when speaking about growth companies. The summary of ownership capital is not present separately, but it is included in Table 10, where is also the summary of structural capital, including organisational knowledge and process capital.

Basically, ownership capital can be seen as the spectrum of less and more formal means of managing ownership, the owners of a firm apply for managing their stakes in an investee firm need. Ultimately, these ownership management devices are targeted on gaining the future returns granted by the owners' invested financial, tangible and intellectual assets.

The discussion here considers the two main perspectives of ownership, which are the object of owning, here IC, and the managing of the object of owning. More precisely, the first theme emphasises the increasing attractiveness of intellectual capital through the structuring continuum from individually held hidden knowledge, human capital, through organisational knowledge of structural capital to knowledge-based assets. In other words, the object of ownership becomes more tangible and also more attractive from the investment point of view. This structuring process can be found once a vague idea is transformed to a well articulated concept and, depending on the type of idea, further on, intellectual property such as patents or written strategy plans. However, the concept of assets escapes the definition of intellectual capital, as fully structured knowledge is not considered here as intellectual capital, but rather assets.

The second view, ownership management, is discussed here together with this continuum of structuring of intellectual capital towards asset. The second theme ends with a brief look at principal-agent theory, which enlarges the view of ownership management from managing intellectual capital to ownership of financial and tangible assets besides intellectual capital.

The first perspective is dominated by what is defined as human creativity. One of the introduced IC-models (see 3.1.2), the Accounting and Reporting of Intangible Assets of the Deutsche Schmalenbach Gesellschaft für Betriebswirtschaft, furthermore involves innovation capital as one of the seven subcapitals. As stated by Leitner & Warden (2004), "[I]n the end, the R&D results of firms are incorporated in products". Examples here are copyrights, patents, topography rights, trade and service marks (Teece 2000; Bontis 1998, p.3).

Teece suggests (2000, p.72) three innovation types from the asset point of view, as stated in Figure 11, next here.

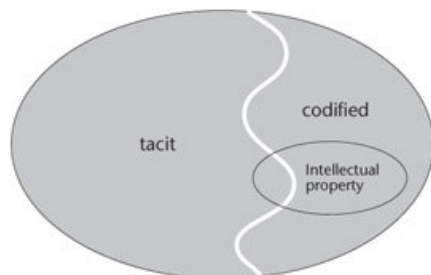


Figure 11: Components of intellectual knowledge (Teece 2000)

First is tacit knowledge. It is, by definition, difficult to articulate, and consequently, hard to pass on unless those who possess the know-how can demonstrate it to others. It is also hard to protect using intellectual property law. Codified knowledge is easier to

transmit and receive and is more exposed to industrial espionage. Sometimes it is easier to protect using the instruments of intellectual property law (Teece 2000, p.72).

The idea of this structuring continuum is not only occupied by the phenomenon, where assets are derived from human capital held by individuals, but also from organisational knowledge of business organisations. The latter is evidenced in the way that business companies transform their non-core business activities into more structured processes appropriate for outsourcing and attaining of increased organisational performance and cost savings. Here, the opportunity of automising routine work and organisational processes has enabled organisations to leave those tasks for the specialised operator. Moreover, it has given rise to the business process outsourcing market (Melby 2001), which is a derivative of information technology outsourcing (Willocks et al. 1999; Vinning & Globerman 1999). In practise, it is not only information technology but codified processes on top of the IT that have been given to an external business party to operate. Partnership management practises like outsourcing benefit significantly from the foundation created by transaction cost economics (see, e.g. Willcocks et al. 1999; Kern & Willcocks 2000).

The second perspective, ownership management becomes important once the knowledge is codified or the firm is dependent on human enablers to create competitive advantage. In traditional business economics of trading tangible goods, the control over the firm was more straightforward than in the knowledge-based business economics of today. The more intellectual capital dependent the offerings served to customers are, the more effort is needed for patrolling borderlines of the firm in order to prevent knowledge property leakages (Boisot 2002, p.76).

Knowledge workers tend to become more skilled and professional along their career paths due to the accumulation of personal experience and knowledge. They not only handle multiple knowledge sources with ease but also master their work environment, tools and systems, and relations across firm boundaries. Indeed, they are like one-man business entities inside companies. These people are valuable human capital for any firm. Unfortunately, when provided with entrepreneurial propensities, they may leave to establish their own firm.

Sometimes highly performing employees yield outstanding results. This may increase their sense of owning extraordinary capabilities and knowledge, thus manifesting the status of a kind of 'guru'. In fact, a particular knowledge worker, once reaching a substantial professional level, has shifted from a worker role towards being an owner of tools of knowledge production. Balascon and Sayer (1995) proposed an 'intellectual capitalism paradigm', which denotes a shift of the power of 'tools of production' from owners to managers, and then to 'talents of the people'. Moreover, they claim that the possessors of the intellectual tools of production – knowledge workers – will come to exercise effective power over the business environment they are involved in. Eventually, this theory suggests that humans capable of creating economic value will move towards more independent roles in mastering their human capital.

At least an increased need of ownership of the tools of production is compatible with the desire for independence, which is one of the attributes of an entrepreneur. Obviously, this paradigm may be also considered a driving force of organisational employees to move on as entrepreneurs and possibly to further stages of financing industry as pointed out by Harrison et al. (2004). Ownership eventually matters once structuring knowledge towards assets becomes feasible, and therefore the potential value residing in knowledge gears up into tradeable forms of technology.

Ownership management can be found acting at least on two levels: first, the shareholders hold power over the firm, but on the micro-level firms are nested one-man-quasi-firms, grounded on the individual professional. Especially when ownership influences an increase of opportunism (Brown et al. 2000), ownership management becomes pivotal to alleviate conflicting interests among the owners and key employees. Interestingly, Boisot questions the role of shareholders as the only group of investors (2002, p.76). Moreover, he suggests employees to be contributors to the firm's stock of intellectual capital and raises the question: "should they be considered on a par with external investors in the firm?" Osterloh et Frey (2005, p.7) beyond this and claim that knowledge investments, in particular firm-specific investments, are similar to financial investments, especially when they are the essential basis for the sustainable competitive advantage of a firm.

Especially growth-orientated technology firms are dependent on intellectual capital investments, which give rise to the need to manage the contributions produced by pivotal knowledge workers. The engagement of intellectual capital providers in venture capital context is expressed by partnership where the vestment schedule plays a pivotal role. It is the period a key participant of the firm is contracted to exercise value adding compensated by shares or stock options. This guarantees to investors and the market that the entrepreneurs will stick around, rather than converting and cashing in their shares ([www.glossary of venture capital terms.com](http://www.glossaryofventurecapitalterms.com) 2011). The need for a partnership period in contracts is associated with the risks of general uncertainty, asymmetric information, project complexity, and potential hold-up between the venture capitalist and the entrepreneur (Kaplan S.N. & Stromberg 2004).

The discussion on ownership management stays incomplete if a broader sense is not considered rather than organisations monitoring their human capital possessors, key employees. In fact, intellectual capital possessors tend to move to an investor role, where their stakes in the investee firm are not only intellectual in nature but financial, too. For example, fund raising in assistance with VC-investors may necessitate a symmetric risk sharing with current owners, i.e. intellectual capital possessors, and external investors. Sharing risk may be completed on behalf of the current owner by investing money in the company's shares.

With respect to technology growth companies, the agency theory is an applicable method for analyzing the factors beneath the relationship between VC-investors and current shareholders, where the latter stand for primarily intellectual capital funding agents and the former, financial investors (Rasila 2004).

As stated by Lipsey & Crystal (1997), the principal-agent problem arises within the firm when ownership and control are separated and the self-interest of agents, here the intellectual capital possessors, may lead them to act other than in the interest of the principal(s). The problem is to design monitoring or incentive systems that will make these agents act in the best interest of the shareholders, that is to say, principals. Moreover, the monitoring and incentive system can be characterized by three perspectives on managing the relationship between the principal or principals, like the financial investors here, and agents, the current shareholders with lack of financial capital. And yet, these three perspectives are a feasible to define the ownership capital embedded in the relations of new investors and current shareholders.

The first of the three frequently suggested perspectives present in principal-agent relations is the difference in their attitudes towards risk. Second, the goals may be disparate, but nevertheless they are explicit or unarticulated priorities. Third, monitoring the agent may be expensive or difficult for the principal (Fama and Jensen 1983b).

Although venture capital related literature is relatively rich in discussing the principal-agent problem, the intellectual capital tradition is relatively lacking in insights into this area, although some valuable concepts are found. A cross-over, mostly grounded on venture and management accounting theories by Näsi (1990), suggests four perspectives central to venture firms. More precisely, they are financial, entrepreneurial, management and ownership disciplines. Also the earlier mentioned German DSG intellectual capital framework mentions investor capital from the structural capital perspective (Koch 2005).

Instead of emphasising the structural capital perspective of ownership management as in mastering firm governance, vesting key employees, or managing investment procedures, the majority of intellectual capital frameworks link owners and ownership with relational capital. More precisely, they emphasise the value adding perspective of investors and other stakeholders in their investor capital definitions (CIC-IADE 2003; Roos & Roos 1997). For example, Johanssen et al. (1999, p.274) define stakeholder capital as the wealth-creation potential inherent in the company's network of strategic alliance partners, customers, suppliers and distributors.

However, in this study ownership capital is considered as structural capital, as it is dominantly focused on firm internal objectives such as wealth maximisation and the devices for managing the continuance of the mutual interest among founder-shareholders and new financial investor-shareholders.

Table 10: Summary of factors of structural capital including ownership capital

Main factors	Indicators and Definitions
Organisational knowledge	Conceptualised and shareable human capital, i.e. explicit knowledge Organisation's business intelligence, including low-codified market, business, partner, competitor, technology, analysis knowledge Codified databases Artefacts, when not considered as assets but appropriate for reverse engineering
Structural capital of management and business processes	Normative non-IT supported processes like guidelines, work patterns, etc. Divergent business processes: product, sales & marketing, distribution, HR, technology management, etc. Automated information flows (cash flow management, invoicing, etc.)
Ownership capital	Relationship care among shareholders – firm internal informal relationship Incentive management – bonding the founders in the new investment round Investment management – contractual devices taking care of a successful investment Firm growth related firm governance of the board of directors – long term strategy related governance.

In conclusion, ownership capital comprises the contractual devices of monitoring relationship among shareholders, the incentive management dedicated especially to keeping current owners motivation high in successive new investment rounds, the governance involved in investment management, and firm growth related governance controlled by the board of directors.

3.4 RELATIONAL CAPITAL

Following the definition available in the Meritum Guidelines (2002, p.63), relational capital is defined as “all resources linked to the external relationships of the firm, with customers, suppliers or R&D partners [...]”. Moreover, the extension of this definition considers the link with other subcapitals: “[...] [I]t comprises that part of human and structural capital involved with the company's relations with stakeholders (investors, creditors, customers, suppliers, etc.), plus the perceptions that they hold about the company (ibid). Finally, the Meritum Guidelines give examples of relational capital, those of: “image, customers' loyalty, customer satisfaction, links with suppliers, commercial power, negotiating capacity with financial entities, environmental activities [...] etc.” (ibid)

Intellectual capital frameworks are almost always the main factors held by relational capital. Following Roos & Roos (ref), relational capital comprises four elements: (1) customer, (2) supplier, (3) network partner, and (4) investor relationship capitals. The DSG-model, Deutsche Schmalenbach Gesellschaft für Betriebswirtschaft shares the definition by Roos & Roos, except for the network partner relationship capital. In turn, relational capital following the CIC-IADE-model (2003) consists of business and relationship capital, where the former represents relationships in making business transactions and the latter other contributable relationship favourable for creating business.

Sometimes the use of concepts of relational and social capital is confusing, as the latter arises from the social sciences (see, e.g. Coleman 1988; Jacobs 1961; Putnam et al. 1993, Putnam 1996) the former, in turn, is derived from intellectual capital theories. In social capital literature the relational capital is considered as relational perspective embedded in social networks as one of the main components, or relational embeddedness following Granovetter (1992).

In fact, the dynamism embedded in relational capital is relevant to the formation of new relations and existing ones becoming even stronger. Yet these occurrences are founded on social activity. From this perspective, social capital is a pivotal resource of relational capital. New business relations do not appear all of a sudden, but are grounded on the social contacts of business people.

The study here follows the idea embedded in Figure 12 beginning from the bottom (social foundation) and proceeding towards formality within relations. This view has the same approach as used throughout the subchapters on intellectual capital, which proceed from vague to visible, unstructured to structured, and potential intellectual capital to realised intellectual capital feasible to become an asset. Just as human and structural capital and also assets become structured, so also relational capital is characterised by an asset view, especially when contractual devices are used.

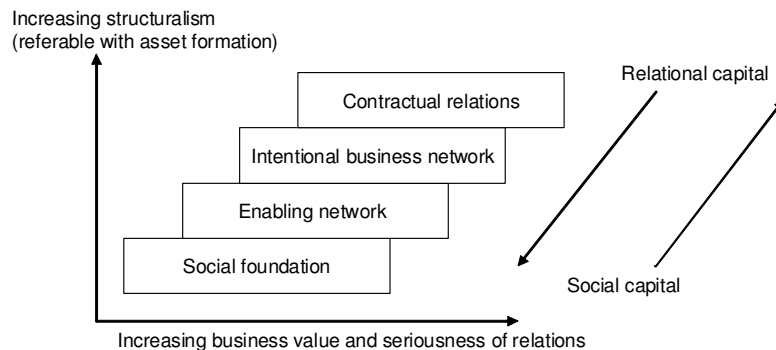


Figure 12: Relatedness of social and relational capital

Therefore the first 2nd level subchapter examines the social foundation of individuals, followed by the business network view with a social emphasis. In fact, not all social contacts are business relations, but they have the potential to become intentional business partner relations, especially when substantial seriousness between business partners develops and strong devices for controlling risks are needed. At this point, the flexibility of the relationship is lost to a certain degree, and the relational capital is structured in an asset-like format, as explained in the last, second level subchapter here.

This study first examines social capital, and this is followed by the business relationship perspective. The first subchapter considers the behavioural foundation of social and relationships. Next, network structure is examined and its business-enabling perspective is assessed. The third subchapter is dedicated to business relationships carried within networks and the relationship among them.

3.4.1 Social Foundation and Behavioural Perspective

Social capital is acknowledged as an important factor in accessing new knowledge and maintaining a firm's knowledge stock. As stated by DeCarolis & Deeds (1999) and Dierickx et al. (1989), social context may be conceptualised as flows of knowledge into an organisation that ultimately form the substance of a firm's knowledge stocks. Prerequisites for interconnected agents making contributions from a specific network are first that they know each other, and, second, they possess knowledge (Nahapiet and Ghoshal 1998, p.252).

The first notion of social capital was the claim by Jacobs (1961, p.138), "[I]ndividuals build networks on a personal level that are valuable social capital". Consequently, social capital is present only in the relations between actors and is owned collectively by the members of the organisations, groups or other entities that these actors belong to (Coleman 2000, p.16; Burt 1992, p.9).

Coleman defined social capital as the ability of people to work together for common purposes in groups and organizations (Coleman 1988, p.95; Dasgupta & Serageldin 1999). Moreover, he considered social capital by its functions. It is not a single entity, but a variety of different entities with two elements in common: they all consist of some aspect of social structures and they facilitate certain actions of actors – whether personal or corporate actors – within the structure. Like other forms of capital, social capital is productive, making possible the achievement of certain ends that in its absence would not be possible. Like physical and human capital, social capital is not completely fungible, but may be specific to certain activities (Coleman 2000, p.16).

Common to all definitions, social capital is defined in terms of networks, norms and trust, and the way these allow agents and institutions to be more effective in achieving common objectives (Jacobs 1961, p.138; Putnam et al. 1993, p.167; Putnam 2000; Lin 2005). Many writers ascribe the ability of individuals to cooperate and make exchange to relying on trust (Fukuyama 1995; Lin 2001). Moreover, it is mentioned as the most influential behavioural component of social capital (Fukuyama 1995; Putnam et al. 1993; Putnam 1996, p.167; Putnam 2000). Trust is based on commonly shared norms (Paldam & Svendsen 2000, p.342). In turn, social norms are constituted on religious or justice values and they are created and transmitted through cultural mechanisms (Coleman 1986). Zaheer et al. (1998, p.143) formulated their concept of trust on three dimensions: an expectation of a partner's reliability with regard to his obligations, predictability of behaviour, and fairness in actions and negotiations while faced with the possibility to behave opportunistically.

Trust may even become ignored when the economic self-interest of an individual is met, the ease of cooperation is high (Granovetter 1998, p.82), and flexible orientation among the partners in a particular network is achieved (Gulati & Singh 1998, p.308). Contractual mechanisms are less used in social networks engaged in exchanging knowledge or other less risky objects. Detailed and formal contracts are considered a hindrance to the growth of trust (Nooteboom 1999; Fairtlough 1994).

Instead of stronger behavioural control devices such as sanctions, a social capital component may become necessary when alleviating opportunistic behaviour (Lin 2001). Sanctions may appear like a threat to losing one's reputation (Granovetter 1992, p.44; Burt 2001, p.202). Intimate relationships, like friendship, inherently embody a hindrance to cheating the other.

The increase and maintaining of reputation in the social network as well as in economics follows a certain logic based on the increased publicity of the relationship between two parties. The more public the cooperation becomes the bigger is the threat of negative reputation when corrupting the linkage. When making acquaintance, two persons comply with strengthening trust in public, which, in turn, endows reputation and facilitates entry to future relations among their mutual community. Further progress in deepening a particular relationship leads towards increased privacy and lock-in between partners as well as lowered risk of trusting the other to cooperate (Burt 2001, p.207).

The history of capitalism includes consistent examples of rebellious attitudes against the capital market, which inspired the English historian E. P. Thompson (Granovetter 1998) to develop the concept of moral community. In his study, he described the collective action of eighteenth century villagers to affect the price of grain. As there were no trading regulations on those days, the growers or marketers sought the best possible price. Especially during bad times, when the grain producers applied oligo-political measures, local populations took violent exception to profit maximising.

Firms provide a normative territory to which members identify (Kogut & Zandler 1996, p.506), and, furthermore, share common norms. In networks, norms constitute the policy of what is acceptable and not. The stronger the relations among a particular community are the more pervasively the norms are disseminated (Granovetter 1973). From this point of view, Granovetter expressed trust as constituting the foundation of moral economy. More precisely, the standard of norms in a particular community is reflected by the quality and value embedded in a group's operations. The bigger the option for opportunism by the group holding economical or other power is the tighter are the normative standards and safeguards against self-seeking interest.

Consequently, moral economy is provided by a self-regulation that balances the degree of applying those behavioural controls (norms, anti-opportunism means) in respect to the actual demand. This is as Granovetter argued (1998, p.80): "the moral economy question is the degree to which a group's operations presuppose a moral, community in which trustworthy behaviour can be expected, normative standards understood, and opportunism foregone".

3.4.2 Social Capital Enabling Business Networks

Reciprocal relationships for accomplishing mutual affairs between parties are central to social capital (Bourdieu 1965, p.249; Nahapiet & Ghoshal 2002, p.674). Reciprocity denotes that two engaged individuals are motivated and capable of bilateral value

exchange (Coleman 1988, p.598; Putnam 2000). The irreducible component of a network is a bi-directional contact, knowing each other (Coleman 2000, p.16) or also called here a personal relationship (DeCarolis 2002, p.700).

Besides the multitude of personal relationships, social capital in networks also embodies the structural aspect which is characterised by comprehending the role of the membership of individuals within a network, and, furthermore, accessing resources mobilised through those ties in the networks (Lin 2001, pp.24-25, 43). In fact, this arrangement captures the micro- and macro-social relationship, where the former represents individual values and the latter environmental values and norms prevailing in the context the parties are operating in (Coleman 1986, pp.1322-1324).

The above introduces the three essential features of structural capital: (1) the organisational level that is the network; (2) the personal connectivity level that are the threads of a network; and (3) the resources shared and changed for pursuing desired goals by individuals.

In networks the shift from general social activity towards a market driven business relationship goes by intensifying the multitude of exchange acts between parties in the presence of gaining of economic wealth (Coleman 1986, p.1324). Between the edges of less intentional social contacts vs. trading, Tichy et al. (1979, p.509) considered that four types of exchange occurring in networks suggested four types of exchange: (1) expression of affect; (2) influence attempt; (3) exchange of information; and (4) exchange of goods or services. Accordingly, a shift towards business relations goes from the first to the fourth type. Tichy et al. (1979, p.508), moreover, analysed the parameters of business network: those defined by size (number of participants), density (number of actual links), clustering (the number of dense regions in the network), openness (external links), stability, accessibility (density of individual links held by one person), and centrality (the control used for guiding the network).

Not surprisingly, intentional business relations benefit from social components, not only from exchange options. Following Jansen et al. (2007, p.37), the product and service offerings to customers may involve added value like authenticity, extra surprises, quality on demand, feeling of belonging and participation. Reversely, the reciprocal values are such as money, information, loyalty, relations, ideas and co-creation.

Strong and weak bondings appear in interpersonal linkages. In general, interpersonal linkages are categorised in weak or strong connections (Granovetter 1973). The strength can be defined with the frequency of connectedness of the people who share mutual goals and availability. Weak ties of a particular person are the relationships with other people “whose very existence [he had] forgotten” (Granovetter 1973, p.1372).

Weak ties are central for creating new purposeful knowledge, which is the starting point for new innovations (Singh et al. 1999). From the network typology point of view they are located in the cross-connection points between two groups or networks with diverse business ambitions and knowledge background. The disparity of these two domains ensures that the knowledge resources are unobtrusively redundant and more like

additional than overlapping. Although cooperation would likely be achievable and the two groups are aware of each other, inertia prevails in the form of lack of insightful understanding of the technology beyond the group regimes. Burt called this phenomenon the structural holes of social capital (Burt 1992, pp.25-30).

The concept of structural hole is characterised by lack of complementary knowledge exchange and inefficiencies, cognitive in nature. Burt (1992; 2000, p.208), moreover, stated that an actor capable of spanning both domains tied weakly would create a competitive advantage. Structural hole may offer an opportunity for leveraging an employee into the career path (Granovetter 1973, p.1371) or grant a spin-out firm opportunity for an innovative team.

Granovetter, moreover, observed that focusing only to the strength of ties, ignores other important attributes describing the content of relations (ibid, p.1378). Later on, he identified that the strength of a tie is subject to “time, emotional intensity, intimacy, and reciprocal services” (Granovetter 1973, p.1361). The time component appears in at least two ways. As Jacobs (1961) noted, a relationship is developed gradually, whereas the belongingness to a particular network implies time spent on behalf of the members. Time spending, following Tichy et al. (1979, p.508), is reflected by the intensity of the relation between individuals strengthening the relationship. Following Beugelsdijk & Smulders (2003, p.2), network participation is a time-consuming process, which calls for working and learning time and therefore tends to be negatively correlated with growth, as it accumulates costs due to participation.

The quality of ties does make sense with authorisation and norms. Following Putnam (2000), weak ties represent ‘bridging social capital’ in which bonds of connectedness are formed across diverse social groups. Weak ties can be more effective because they entail access to a wider and more heterogeneous set of connections and making contacts between different groups. A strong tie implies greater solidarity among the participants. They also tend to increase the connectedness to detriment by limiting the degree of freedom of the network members within it (Granovetter 1973, p.1378). Strong ties or bonding social capital occurs within homogenous groups (Putnam 2000; see, e.g. pages 22-24). Homogenous groups tend to inherently cultivate behavioural control and norms.

Whereas strong bonding is useful for the ‘insiders’ of a particular group of social community, a network, it may imply an exclusive position and low connectedness for new entrants (Granovetter 1973; Putnam 2000). This is proven also by Fukuyama, who noted that “the strength of the family bond implies a certain weakness in ties between individuals not related to one another” (Fukuyama 1995, p.56).

Consequently, the circulation of fresh ideas and healthy self-criticism in the presence of strong norms and belongingness between members may limit openness to information, reduce searching for alternative ways of doing things and downsize capacity for innovation (Granovetter 1973; Nahapiet & Ghoshal 2002, p.676). Seen from a more macro-level vantage, weak ties play a role in effecting social cohesion (Granovetter 1973, p.1373).

Vertical bonding is a concept by Putnam (2000) to emphasise an increase of intensity in relationships not only along the horizontal structure of the relations but also vertically among multiple organisational hierarchy levels. Individuals or groups of networks are characterised by divergent roles and power. A star denotes the highest number of connections. A broker connects two groups or networks. A gatekeeper is a powerful individual who connects an individual or a group to the external domains. An isolate is an individual separated out from the network (Tichy et al. 1979, p.508-509). Like business organisations, these definitions suggest vertical levels that do not necessarily interact like equals.

The vertical perspective of networks is described by the concept of linking social capital that refers to relations between individuals and groups in different social classes with deviating power, social status and wealth. An individual who accesses different groups of higher social strata with ease holds substantial linking social capital (Cote and Healy 2001, p.42). Woolcock (2001) extends this to include the capacity to leverage resources, ideas and information from formal institutions beyond the community.

3.4.3 Relational Governance of Intentional Business Relations and Summary of Relational Capital

Voluntary knowledge sharing is much about learning and using network partners as the occasional sources for inspiration and innovation and resembles much more a social network than a business network. In a more intentional business network, business firms receive intellectual assets through customers, who are frequently an important source of knowledge (Bontis 1999; DeCarolis 2002, pp.700-701). Not only customers but also other network actors, like suppliers, deliver knowledge incorporated with their services and products.

An archetype of business relationships is unquestionably the supplier – customer relation. A particular firm is not only in a relationship with customers but linked with suppliers, R&D partners, investors, alliance partners, community members, regulators, competitors (Roos & Roos 1997, p.13; Meritum Guidelines 2002, p.63) and marketing channel partners, governmental authorities and industry associations (Bontis 1999, p.448). Consequently, the control and risk aspect should be considered covering them all.

Unlike social contacts, business partnerships are related with the economic value of exchange. Following Tilly et al. (1999, p.509), the objects of exchange in networks are knowledge and goods, i.e. products and services. Following Jansen et al. (2007, p.37), the product and service offerings in a supplier customer relationship are compensated not only by paying the invoices but the supplier is granted information, loyalty, relations, ideas and co-creation by customers. As products are derivatives of knowledge, they certainly conceal fresh ideas and know-how. Ultimately, knowledge is always accompanied by exchange transaction despite the type of object of exchange. Hence,

highly valuable intellectual capital is present in the flows of knowledge between network participants (Bontis 1998, p.67; Bontis 1999, p.448; DeCarolis 2002, p.699).

Business relations are not immune to social capital, and benefit from it. Identifying the social and economic value of each other is mostly complex, and perhaps not even necessary. However, this study is interested in the appearances of relational capital, and, furthermore, on the main factors present in business relations. For this reason, the intertwined nature of social and business relationship aspects, as well as their special characters, are discussed next. Although only one type, the customer relationship, is taken for the example here, it will give a comprehensive view of the social embeddedness of business relations in respect to any other serious business relations.

Figure 13 below illustrates the life cycle of customer relationship development. The dynamism included in the evolution of a business relationship begins with trialling the consistency between parties. Then, moving towards a closer cooperation takes place. Finally, a buyer and a supplier will become dependent on each other.

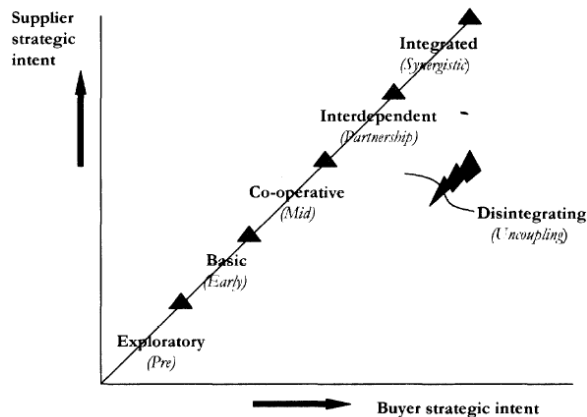


Figure 13: Progress between supplier and customer towards integrated relationship (Millman & Wilson 1994)

What was said about linking, bonding and bridging are also equally present in the early evolution of a customer relationship at the first stage, the exploratory stage. The practical arrangement of supplier-customer relationship involves first contact between the supplier's sales person and the buyer's prime contact responsible for purchase management. Moreover, the exploratory stage is characterised by weak ties. The supplier tries to figure out the business opportunity and buyer's actual demand, whereas the buyer ascertains the potential supplier's capabilities.

The basic stage, which is the second one, is characterised by executing the actual first business transaction. Once the positive buying decision is done, it typically considers a minor purchase with low risk to the buyer, but it is an important change for the supplier to show its efficacy. Following McDonald (2000, p.24), this stage is emphasised by investigation of the supplier and finding out the actual demands of the buyer to ensure better fit between offerings and needs.

At the cooperation stage the buyer is satisfied with the supplier's performance, and a stable buyer-supplier relationship is established. As the buyer becomes more communicative, the relationship involves new persons on both sides, the sales person and the purchasing manager. In accordance with the bonding concept, this is a sign of shifting from a weak tie connection to a stronger bonding (ibid.)

The interdependent stage emerges when the buyer has become dependent on the supplier's offerings. This necessitates the supplier not only selling products but transferring added value that is mostly knowledge and product support service. The ties are now strong and involve common working practises, product tailoring for customers, and joint marketing activity. Breaking the relationship is costly and time-consuming (Ibid). In other words, the switching cost has become high and partners are locked-in (Shapiro & Varian 1999, pp.135-136).

The final, integrated stage, involves inter-firm operations involved in different functional teams. Close product cooperation between parties is a good example of the integrated mode here (Chesborough 2003; Tapscott 1996). Like the previous, interdependent stage, this stage involves vertical linking, where both the organisations are connected not only by horizontal strong ties but vertical ones, too.

McDonald et al. (1996) and McDonald (2000, pp.26-27) call this evolution from the exploratory to the integrated relationship as a shift from a tie to a diamond relationship. The tie here depicts a narrow connection (the knot in the tie) based on one-to-one person bonding and a diamond connection as a rich bonding, where the organisational cross-cut surface is large.

Contracting versus relational contracting based on trust is pointed out as contrary ends of relational governance (Haugland 2003). Trust is pivotal for social theories, but also important in explaining interorganizational behaviour of business institutions (see, e.g. Williamson 1985; Zaheer & Venkatraman 1995; Zaheer 1998 et al.) and referred to as relational governance. Putnam et al. (1993) further suggested that social capital of high levels of trust diminishes the probability of opportunism and reduces the need for costly monitoring processes.

However, choosing external partners with complementary technologies and building a cooperative relationship based on trust and mutual respect can be problematic (Dodgson 1992). Trust and norms, where the latter is by definition invisible building blocks of trust, may be a less obligatory control mechanism, as they do not necessarily trigger contractual penalties in a case of undesired misbehaviour. Coleman claims that "where a norm exists and is effective, it constitutes a powerful though sometimes fragile form of social capital" (1988, p.S104). They may appear as too abstract control devices (Gulati 1995).

Following the business firms' relationship evolution continuum present in Figure 13, firms typically begin a relationship by cooperating in less strategically central areas and build up a body of experience in working with a partner over a period of years (Gulati 1995). A relationship heading towards the more serious levels of making business calls

for contractual measures. This is because the reciprocity in its economic forms is vulnerable and subject to a control mechanism and safeguards when modes of human misbehaviour arise from unexpected and unavoidable changes, implying a negative impact on ends. Consequently, the explanatory power of social capital is reduced significantly, paving the way here for the contractual perspective (e.g. Lin 2001).

The formation of a key account relationship, as illustrated, entails the essential aspects of a business relationship and is, therefore, an exemplary description of the repertory of the control devices applied in diverse stages. Transaction cost economics characterises the control of a particular business relationship by the concepts of uncertainty, self-seeking opportunism, knowledge asymmetry involved in bounded rationality and safeguards (Williamson 1985).

Uncertainty is the risk of business failure in a particular transaction, either due to misbehaviour by either of the partners or an unfeasible or an incomplete content of delivery. The latter is proportional to the bounded rationality of the buyer, who is not able to articulate and define actual needs to the supplier. It may also turn out that the buyer is incapable of comprehending all the features and implications embedded in the solution or product his or her firm is buying. Following transaction cost theory (ibid.), this is expressed in terms of asymmetry, that is the superiority of knowledge held by the supplier over the buyer. In turn, the presence of asymmetry may evoke opportunistic behaviour on the part of the supplier, especially when the probability for future gains is in any case minor. On the buyer side, safeguards like collaterals would be useful to alleviate the supplier's tendency to self-seeking behaviour (Williamson 1985).

The explanatory power of transaction cost theories is vital, especially with idiosyncratic products where the role of specialised knowledge is crucial and customers are locked in easily with suppliers. A business setting like this is referable with the two highest appearances in the KAM-model illustration. On there, most of the complexity is involved in avoiding the use of costly control mechanisms (Williamson 1985). However, securing the continuity of mutual affairs may become important when the reverse applies, such as a threat of the premature closure of an emerging relationship by either of the partners. Smart business partners may increase their relationship safeguard in terms of finding substitute suppliers, and therefore avoid so called lock-in with only one supplier (Shapiro & Varian 1999, pp.135-136).

Transactional versus relational exchange is a direct cause of choosing between the two alternatives – contractual and relational governance. Trust and contractual safeguards are to a certain degree substitutes (Arrow 1971, p.220). As suggested by Granovetter (1985, p.487), functional substitutes for trust would eliminate in advance the rise of disputable problems between parties and also give an alternative for costly contracting. He suggested crafting credible commitments such as improving bonding, applying hostage tactics (holding something that is valuable for the other), agreeing upon information disclosure rules (a threat of revealing valuable information by the other) and agreeing on specialised dispute settlement mechanisms.

In Fig. 14, next here, Lambe et al. (2000) introduce the idea of transactional and relational exchange. The latter being grounded on trustful relationship across the firm boundaries, and comprising two forms: a pure and a semirelational (interimistic) exchange. In contrast to this, transactional exchange has two modes, discrete and repeated transaction, the latter coming closer to relational exchange. Following Haugland (2003, p.11), relational exchange is characterised by role integrity, preservation of the relation, harmonisation of relational conflict and supra-contract norms. Integrity stands for the overlapping roles where each party may be responsible for functions traditionally undertaken by the other party. Other norms typical for relational contacting are: voluntarily restraint in the use of power; informal conflict resolution; solidarity; maintaining flexibility by renegotiations, and, when necessary, raising the voice (Haugland 2003, pp.11-13).

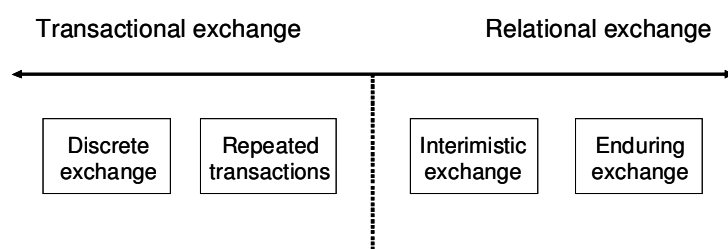


Figure 14: Structural capital of relations, formal vs. informal exchange (Haugland 2003)

The applicability of either relational or transactional instrumentation depends on the quality of the business relation. Low cost and infrequent trading advocate the favouring of a transaction mechanism (Ghoshal and Moran 1996, p.42), whereas an intensive relationship implies relational exchange. Next here, Table 11 summarises the factors involved in relational capital.

Table 11: Summary of relational capital

Main factors	Indicators	Definition
Contractual Relations	Contracts, trust	Formal contract based relationship
Intentional business networks	Transactions with outstanding financial value Diverse non-written rules and practises. Strong bonding	Mixed contract and trust based network relationship.
Business network structures	Business transactions of mostly low financial value. Vertical bondings Less strong horizontal bondings Articulated and controlled behavioural code	Social capital enabled medium or weak business relationship
Social Capital	Business transactions are just knowledge change Weak bondings (from business partnership point of view)	Unwritten trust, norms and sanctions – everybody knows how to behave

The presentation is divided into three intensity levels of firms and actors operating in networks. The role of social capital contributes to relational capital, but it is not considered as a component of relational capital, but rather more a pervasive force enabling subcapitals to work more efficiently.

3.5 TOWARDS VALUE ADDING VIEW – SUMMARY OF IC

The concept of intellectual capital as discussed in the previous four subchapters is founded in this study on human, structural and relational capital. Figure 15 below presents this concept appearing first as the three subcapitals, and then dividing into the 2nd level subcapitals and factors which were discussed in each of the subchapters. The second level aspects called appearances are taken here from the summary presentation tables at the end of each of the subchapters. It should be noted that the 2nd level subcapitals have correspondence with the intellectual models composed of more than three subcapitals (see 3.1.2). The factors stand for a more detailed anatomy of the 2nd level subcapitals but are available at the end of the subchapters in the summary tables. The figure also points to the order of 2nd level subcapitals shifting from less concrete and unstructured potential intellectual capital towards more structured forms.

The first, and one of the most important, notions in respect to the hierarchy in Figure 15 is that the subcapitals (relational, structural and human capital) are not isolated from each other, but cross over each other. It is as Leitner & Warden (2004, p.36) claimed - that intellectual capital does not form a hierarchy where the components are additively constructed from bottom up, but rather they cross over each other.

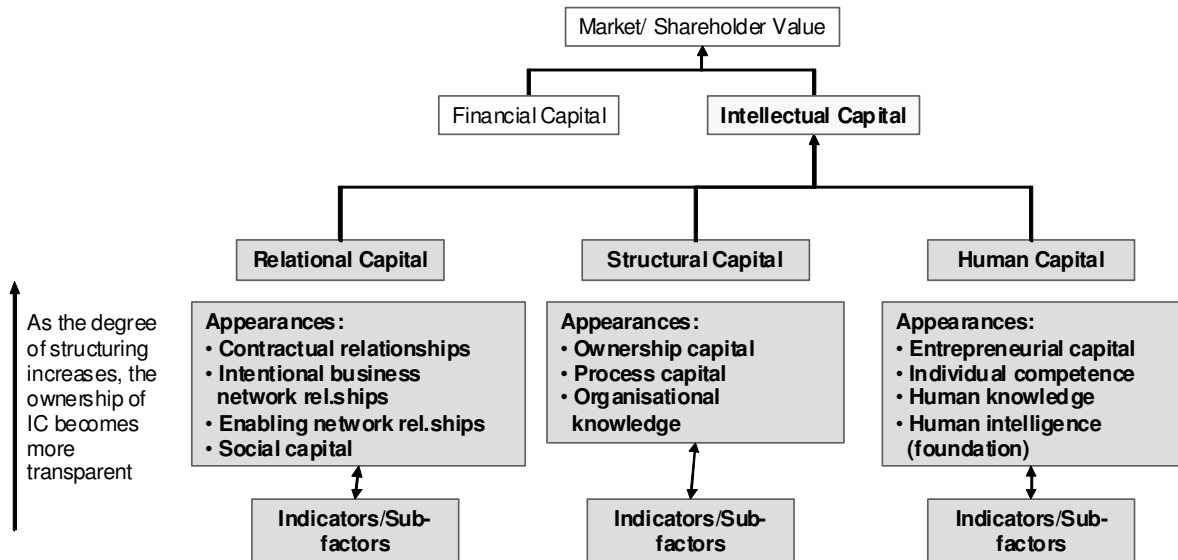


Figure 15: The intellectual capital framework

The crossover among subcapitals entails two connotations. First, there is the overlap between subcapitals, and second, they are complementary to each other. In fact, the latter, the complementary view, leads to a consideration of the cause-effect mechanism embedded in intellectual capital, which is central to Chapter 4, especially in Subch. 4.2.

The crossover view is seen in the multifaceted character of the holders of intellectual capital. It would be tempting to consider individuals only on a human capital basis, apply structural capital only inside the firm boundaries and relational capital within firm external bondings. As discussed in Subchapter 3.4.4, relational capital also holds the

structural element manifested in terms of contracting, and human capital is pervasive in other subcapitals. Nevertheless, the crossover, the operational body, i.e. individual, firm, or network, is mandatory for comprehending the essence of the three subcapitals from their primary domain perspective.

This dualism expressed in terms of the crossover and complementary connotations is also captured by the two dominant modes of knowledge-based resources in the way how they work within organisations. They are static and dynamic, the former representing the stock and the latter the flow perspectives of knowledge (Kogut & Zandler 1992; Dierickx et al. 1989, p.1506). Moreover, the flow of intellectual resources is seen to be an important element of the firm's strategy (McGaughey 2002).

Attempts to give a distinctive identity to subcapitals was promoted by Bontis (1999, pp.445-449). He pointed out that human capital is knowledge embodied by individuals and shared voluntarily, with no guiding mechanism on behalf of the organisation. Consequently, the knowledge property of an organisation in this situation is driven solely by individuals and their human knowledge repositories, i.e. human capital. Once the guidance and management systems for controlling and organising knowledge streams between employees and among teams are efficiently used, then structural capital is present to support the use of human capital. Connecting a particular organisation with human capital available to external partners requires relational capital. It is the management vehicle enabling human capital to be transferred across the business network.

Bontis focused his attention especially on the quality of receiving, utilising and sharing of knowledge, where the voluntarily organised human capital nodes in the absence of structural capital are best. Structural capital raises communication partially on a more bureaucratic level, thus limiting the volume of exchanged knowledge. In turn, relational capital brings together partners across the business network to work again voluntarily, but the temporal intensity would be low due to the physical distance (ibid.). Table 12 summarises these dimensions - essence, scope and parameter in relation to subcapitals.

Table 12: Definition of intellectual capital essence, scope and parameter

	Human Capital	Structural Capital	Relational Capital
Essence:	Intellect	Routines	Relationships
Scope:	Internal within employee node	Internal organisational links	External organisational links
Parameter:	Volume	Efficiency	Longevity

In turn, the key parameter to comprehend the essence of human capital is volume, which can be measured, although it would be complex, by measures of size, location and time. The essence of structural capital is cultivating internal routines, ways of doing tasks, and, especially, sharing knowledge, which is to say focusing on efficiency. It can be measured as a function of longevity, i.e. relational capital becomes more valuable as time goes on (Bontis 1998, pp.65-67; Bontis 1999, pp.445 - 450).

4 INTELLECTUAL CAPITAL RELATED VALUE ADDING

Intellectual capital systems do not clearly indicate the nature of knowledge from unstructured intellectual capital to structured intellectual property asset, as seen in Chapter 3. Moreover, the intellectual capital models do not clearly indicate how the different forms of IC are used in the value creation process, even though an explanation of their interaction is crucial (Leitner & Warden 2004). Nevertheless, these two views are central when researching investing by intellectual capital. The structuring degree of various intellectual capital qualities would obviously make sense in investing by intellectual capital. A proposition for further theoretical consideration here is that the less structured forms of intellectual capital like tacit knowledge do not necessarily manifest themselves in terms of investable capital. In turn, the more structured forms of intellectual capital are more appropriate for investable capital. Lastly, when structuring has achieved the level of intangible asset, the empowering quality of intellectual capital has been disposed of.

Besides the structuring process, Chapter 4 is interested in the cause-effect impact within the three subcapitals. Accordingly, the focus area here is centered on scrutinising the process of value creation by intellectual capital arising from both intellectual capital and resource-based theories. Hence, both the structuring level of intellectual capital and also the types of subcapitals in the overall intellectual capital value adding process are the two centric dimensions considered here.

The mission of Chapter 4 is developing a theoretical framework for describing the growth of technology businesses from an initial level to mature firms. Subchapter 4.1 looks at new business creation from the micro-perspective. Here, the continuum from business opportunity to fully materialised business operation is, in fact, considering the structuring process from the very first vague business opportunity observation through the intermediate stages to the creation of assets.

Subchapter 4.2 is dedicated to the intellectual capital value adding concepts advocated in intellectual capital and related theories. The main emphasis here is considering the interaction between subcapitals and their underpinning factors. From the framework developing point of view, the value adding is considered as a chain of micro-level occurrences. However, unlike Subchapter 4.1, it takes a business creation view where the emphasis on economic wealth creation for the chosen business object, a nascent or a mature business firm.

Subchapter 4.3 focuses on the investability of intellectual capital. Here, the intellectual value chain is assessed from the capital investing point of view. Consequently, the

essence of investment-like intellectual capital value adding is ultimately regarded here from the theoretical point of view, which is one of the research questions of this study.

Subchapter 4.4 adds two other perspectives for the micro-growth process definition disclosed in the first two subchapters. They are namely the macro view of business growth grounded on diversification and industrial value chain concepts (4.4.1) and the venture stage models highlighting the path of new business firm evolution from business embryos to mature firms. Subchapter 4.5 before the summary discusses the intellectual capital value adding actors found in the arena of growth technology firms. The range here goes from financial investors capable of bringing advisory capacity to pure intangible resource providers.

4.1 BUSINESS CREATION VIEW – MICRO VIEW

The main contribution of this subchapter is to introduce the successive acts of new business creation. Regardless of the firm type, whether a nascent new technology firm or an established multi-unit company, the steps of creating new business seem to follow same path, where the step of new business opportunity discovery represents a starting point for new business creation. Next, business opportunity recognition is both an intuitive and deliberate act of finding the most interesting objects from a myriad of alternatives. The exploitation step is preparing for the actual generation of new business operation. Generation is undertaken to make the plans real. Ultimately, deployment is understood as the commitment to execute new business at all organisation levels and also to secure the customers' loyalty.

Presentations of the new business creation continuum are rather easy to find in business management literature. Some examples are discussed first here before defining the anatomy of each of the steps in subchapters 4.1.1 – 4.1.3. In technology management, Roberts (1988, p.13) suggested four stages pivotal for creating new technology business: (1) reacting to new knowledge; (2) generating technical ideas aimed at new and enhanced products, manufacturing process and services; (3) developing those ideas into working prototypes; and (4) transferring them into manufacturing, distribution and use.

In entrepreneurship literature the previous first three stages are found, for example, in Alsos and Carter (2004), where the discovery is followed by recognition and then generation. Exploitation is considered as acquiring knowledge-based resources from internal and external knowledge sources. Generation is defined as engendering tangible outcomes, services or products or their components.

Putting together these two approaches, an opportunity is cultivated for new business through the stages of discovery, recognition, exploitation, generation and deployment, which are discussed in detail first and presented in summary form in Table 13 at the end of this subchapter.

4.1.1 Business Opportunity, Discovery and Recognition

An innovation by nature claims the need of different intellectual capital qualities for building business. Schumpeter (1942, pp.82-85) suggested five sources for innovations: (1) introduction of a new good not yet present in market; (2) a new method of production; (3) entering into a new market; (4) conquering a new source of supply of raw materials or half-manufactured goods; and (5) carrying out of a new organisation. For example, innovation type 2 calls for a technology-orientated talent, whereas type three demands a sales and marketing talent.

Bright ideas embodying business potential to become a radical innovation are based on inventions (Leifer et al. 2000). By invention, Schumpeter meant precisely a precursor of innovation. For him, invention was like e.g. electricity, railways etc., which offered the launchpad for new patterns and ideas, and furthermore, innovated practical applications (Schumpeter 1942, p.132). Drucker (1985, pp.27-32) pointed out innovation opportunities emerging from internal events (unexpected success/failure/outside event; incongruity; process change) from the industry in question (changes in industry structure or market structure), and from the macro-economic context (population changes; changes in perception, mood, and meaning; new knowledge).

The most novel ideas are undeniably radical innovations opposite to incremental innovations entailing less market potential (Abernathy and Clarck 1985; Tushman and Anderson 1986). The majority of radical innovations are based on research. For these it is very likely that there is no or just a thin technological foundation with no preceding experience of making related applications and of reactions by the market (Garcia & Galatone 2002). Just one particular application of a certain technology research effort, like Mr. Nakamura's LED-research², may offer a foundation for an application portfolio derived from a groundbreaking invention.

Where the discovering of radical business opportunities would most obviously be located in research institutes and universities (Etzkowitz & Leydesdorff 1997), there are other feasible sources like firms, industries, markets, and the external working environment of the actors, as stated by Block and MacMillan (1993, p.99). More precisely, innovations spotted in industries may take divergent appearances due to their origin in firm operations. Any of business management, production machinery, distribution channels or raw material procurement, etc. may produce a reason for executing that particular business process more efficiently or with higher quality. Tucker (2002) proposed innovations categorised by a 3*3 typology posing two dimensions. The first dimension is related with the ontology of the innovation, comprising the types of the product, process and strategy innovations. The second

² Discussed in the beginning of the introductory chapter in this study

dimension is the economic importance of a particular innovation, which may appear in the types of incremental, substantial or breakthrough innovations.

Although the concept of innovation would claim to be nominated as the starting point of creating new business, there are certain restrictions with regard to equalising innovation with business opportunity. First, a business opportunity is the initial point of business creation and it may be founded on more than just one innovation. Incremental innovations claim more in terms of product or service improvements rather than remarkable business opportunities leading to new business creation. Third, the time taken to embed a technological innovation into the business opportunity may take several years. Thus, it is not uncommon that 10 years would be spent on introducing commercial product concepts after the beginning of a technology research project. Or even more than this, as stated by Drucker: “an innovation may not reach its full maturity until twenty years later” (Drucker 1985, p.126).

In sum, an innovation or a ‘bright idea’ may have two implications: (1) a minor improvement in the current technology enhancing customer relations and giving competitive advantage; or (2) a major idea feasible for constituting an identifiable new market. Hence, the former has more like a protective character – staying in business – and the latter an expansive character.

The act of discovery at best creates new knowledge and it is founded on an organisation’s collective cognitive capabilities: those relying on individual learning (Bontis 1999, p.441). Although individuals play a pivotal role in knowledge creation, it is, however, dependent on social networks because technology-related knowledge is not reducible from the organisation level into the group or individual level (Nelson & Winter 1982, p.63).

Sarasvathy, Dew, Velamuri and Venkataraman (2003) suggested that opportunity recognition refers to the process of combining existing technologies and markets, whereas discovery describes the process where only one of the variables exists, i.e. market or technology.

A more meaningful way of tapping external sources is searching for and collecting strategic knowledge that paves the way for creating new product and service enhancements. Lane & Lubatkin (1998) specified the term absorptive capacity to express components of new knowledge creation such as recognition of valuable external knowledge, assimilating this knowledge and applying it to create new knowledge and commercial ends.

Recognition is the end result of successfully derived discovery. Moreover, it observes the available optional opportunities, selecting from the mass of alternative choices and identifying their appropriateness for further elaboration.

4.1.2 Exploitation and Generation

Exploitation is the means of acquiring the required intangible and tangible resources for business creation. Firms have two ways for acquiring new knowledge-based resources: either by learning and/or acquiring complementaries (Ghoshal & Moran 1996, p.42; DeCarolis 2002, p.701). Huizing and Bouman (2002, p.185) argued that learning occurs constantly in organisations: “[P]eople do also learn from combining resources which enhance them to access, deploy and develop their knowledge more through”. Simon (1991, p.176) states that “all organizational learning takes place inside human heads; an organization learns in two ways: (a) by learning of its members or (b) by investing new members who have knowledge the organization didn’t previously have.”

Instead of buying the needed technology complementaries, absorbing is an influential capability for companies acquiring knowledge resources. Cohen and Levinthal (1990, p.128) defined absorptive capacity as an “ability of the firm to recognize the value of new external information and apply it to commercial ends”. Mathews (2003, p.1168) emphasised the search and acquisition of external knowledge resources as the precursors of the absorption act. Absorptive capacity is proportional to the tacitness of knowledge. The more tacit the quality of knowledge offered by outer parties is, the more favourable the internal sources of a particular firm become (Tallman 2003, p.496).

From the operational point of view, exploitation may take on different appearances like imitation, replication and emulation. Imitation is the most effortless absorption strategy, which allows firms to discover and simply copy another firm's organizational routines and procedures. In turn, replication involves transferring or redeploying competences from one economic setting to another. Since productive knowledge is embodied, this cannot be accomplished by simply transmitting information (Teece & Pisano 1998, p.167).

The third way of exploitation is emulation, which occurs when firms discover alternative ways of achieving the same functionality (Teece & Pisano 1998, p.167). Following Penrose (1959), emulation is a synonym for allocative efficiency that enables people to identify opportunities in different ways and make new combinations from available resources.

Besides the uses of internal intellectual resources, firms need to develop their own balance between internal and external sourcing of technology (Roberts 1995, p.54; Bontis 1999, p.449). The latter becomes feasible through absorbing new knowledge from partners and customers (Matusik 2002, p.612) and suppliers (Croom 2001). Furthermore, Mathews (2003, p.1157) addressed the importance of blending internal resource accumulation with external resource leverage and thereby deepening the dynamic capabilities that are costly and time-consuming for competitors to duplicate or imitate.

Among the means of exploitation, blending is suggested by Chesborough (2003). In his paradigm shift of open innovation networks he claims that firm boundaries are no longer stable and innovation management not only takes place inside the firm but also

in networks. Once applying an open innovation strategy, companies obey three modalities of managing their IPRs: those of preserving them on their own, collaborating with trusted partners and sharing freely (Chesborough 2003; see the case of Intel).

This study defines exploitation as acquiring and recombining complementary intellectual resources from two sources, which are the firm's internal learning and the firm's external sources. Moreover, it is defined here that acquiring would take the forms of absorbing from external sources or allocating present resources in new ways by replication and emulation.

Generation is the next step as discussed in the entry passage of this subchapter. Although generation may take invisible forms like generating ideas, in this study this particular term concerns the concept of generating concrete technology outcomes, which are the developing of workable prototypes (Roberts 1988, p.13).

With respect to the mechanism of generating new resources, Nahapiet and Ghoshal (2002, p.678) pointed out that there are two generic processes: combination and exchange. Following Penrose (1959, p.46), combination appears in the presence of new incremental innovations, whereas exchange occurs between complementary parties aiming at economic wealth creation. Huizing and Bowman (2002, p.185), in turn, emphasised this idea by two perspectives of taking knowledge advantage: those of allocative efficiency and dynamism of utilising knowledge. The former considers more effective use of knowledge-based resources, and the latter enhancing the access, deployment and development of knowledge which is parallel to the idea of resource absorption.

Consequently, it is defined here that generation is a process of generating new technology in terms of combination and exchange from the resources acquired by exploiting internal and external sources. Furthermore, the volume of using external sources and exchange with external partners is indirectly proportional to the newness of the particular technology. For example, radical innovations are grounded more on internal learning (research) than combination or exchange.

4.1.3 Deployment

Deployment is simply shaping the allocated dynamic resources, intangibles and tangibles, into the form of a new business characterised by entrepreneurial and strategic elements (Teece 2000, p.12). Deployment of a particular business opportunity takes different forms depending on the nature of the business opportunity. Christensen, Madsen and Peterson (1994) defined a (business) opportunity as a new profit option through: (1) the founding and formation of a new venture or (2) the significant improvement of an existing venture.

Also Singh (2001, p.11) agreed with the previous twofold definition: “[...] an entrepreneurial opportunity should be defined as a feasible, profit-seeking, potential venture that provides: (1) an innovative new product or service to the market, (2) improves on an existing product/service”. However, Singh added a third alternative: “an

entrepreneurial opportunity [...] imitates a profitable product/service in a less-than-saturated market” (ibid.)”. (*numbering added by author*).

Undoubtedly, the first option requires more organisational resources than the second one. Consequently, a new venture may call for creating a full business organisation infrastructure, even if big established companies are able to utilise their present structures like channels, customer base, etc., whereas an entrepreneurial endeavour needs divergent supplementary services (Kirzner 1997). The process of creating new firms is, however, not an isolated action by a single entrepreneurial actor. Moreover, it involves assistance and agents from the regional milieu. Hence, this process is supported by a number of different factors and forces, legal, institutional and social actors (Hofstede et al. 2002).

The organisational arrangement of the needed resources for deploying generated products into the market is based on two polar types: the all-inclusive, self-sufficient business firm type vs. contract-based cooperation with other firms (organisational entities) as stated by Conner & Prahalad (1996, p.478). Moreover, they also stated that the continuum of blending internal and external dimensions establishes forms of alliances and joint ventures of permutations from those two polar types (ibid. p.478).

An alliance, by definition, is “as any interfirm cooperation that falls between the extremes of discrete, short-term contracts and the complete merger of two or more organizations” (Contractor & Lorange 2002, p.486). As stated in Figure 16, a relationship between supplier and customer may be loosely connected (on the left side), but takes more intensive forms of partnership (in the middle), and is finally based on the ownership relation (on the right) (ibid. p.487).

Alliances are typically found among the modalities of relationships of close partners in the subsequent positions in the value chain. Moreover, alliances capture several governance models such as relational contracting, licensing, logistical supply-chain relationships and joint ventures (Gulati & Singh 1998).

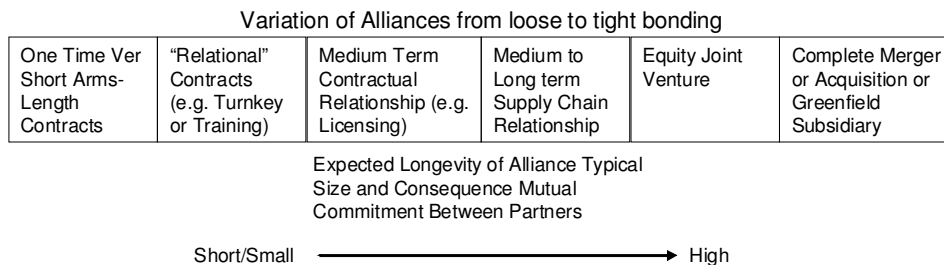


Figure 16: Types of alliances (Contractor & Lorange 2002)

Alliances also have a social capital aspect, as they extend the capability of tapping new innovations beyond the firm boundaries. The capability of tapping new innovations is greater within firms that are capable of establishing alliances beyond their own technology domain (Burt 2001).

Deployment is defined here as: (1) striving for generated technology outcomes of the organisation into the market, and (2) by an appropriate organisational form of running the business suitable for this (these) particular outcome(s).

4.1.4 Summary

The sequential acts of discovery – recognition – exploitation – generation – deployment constitute the new business creation process as shown in Table 13.

Table 13: Summary of the perspectives on entrepreneurial capital

Comparison of business creation process with entrepreneurial capital				
		Business creation	Technology and innovation management continuum	Entrepreneurial capital
	Steps (down here)	This subchapter, 4.2.	Roberts 1988	Erikson & Nerdum, 2001
1	Recognition involving discovery, identification and selection	Comprehending the very essence of the idea from market and technology perspectives and finding alternative business ideas	Reacting to new knowledge	Recognising new market opportunity
2	Exploitation	Designing a re-combination of resources for creating a new business	Generating technical ideas aimed at new and enhanced products, manufacturing process and services	Seeing ventures as the fruit of businesses
3	Generation	Developing new service/product offerings for customers	Developing the chosen ideas into working prototypes	Managing scarce resources
4	Deployment: 1) firm internal and 2) customer related	1) Gathering resources for creating a new business endeavour; and 2) related with that endeavour, delivering and implementing services to the customers	Transfer to production, distribution and use	Managing scarce resources

This process chain may be considered also as a value chain of entrepreneurial acts. Out of curiosity the definition of entrepreneurial capital is taken in Table 13 below to highlight the entrepreneurial character of new business creation.

4.2 INTELLECTUAL CAPITAL VALUE CHAIN IN BUSINESS CREATION

As defined in the summary in Subchapter 3.5, the subcapitals of intellectual capital are not isolated from each other but interact together. In this subchapter this view is deepened and with a look at the interdependencies of these components in creating business value from three theoretical perspectives: (1) resource based view; (2) intellectual capital value chain and interdependency of subcapital views; (3) strategic intangible resource view. The objective in this subchapter is presentation of the intellectual capital value chain comparable with the previous concept – the business creation process (4.1.).

Subchapter 4.2.1 laid down the basic view of intellectual resource value adding taken from the resource dependency view theories of Kogut & Zandler (1992). Their concept

is a good reference point for the intellectual capital value chain and interaction models stated in the next subchapter, 4.2.2. The following subchapter, 4.2.3 examines management accounting emphasised intellectual capital value chain models, where the Kaplan & Norton's concept is discussed. Unlike in the other subchapters, a dedicated summary presentation is discussed in Subchapter 4.4. This is because a synthesis of not only, the three theoretical perspectives disclosed here in Subchapter 4.2, but also the business creation process concept presented in Subchapter 4.1 is considered here, too. This choice makes sense as they both look at value creation from the micro perspective

4.2.1 Resource Based Value Adding View

The concepts posited in the writings of Kogut & Zandler (1992) and Conner & Prahalad (1996) suggest that value adding based on firm internal and external resources towards customer focused value constitutes a flow that can also be considered as a value chain. A three faceted construct manifesting this point of view by Kogut & Zandler (1992, p.385) is shown in Figure 17.

On the left-hand side in this diagram, the organisation possesses two kinds of knowledge stocks. First, there is declarative knowledge like cost information and similar codified knowledge, and second, procedural knowledge, that is to say, know-how. These two stocks of knowledge are relatively static and provide the foundation for running current businesses (ibid. p.384).

From these two knowledge stocks, engaged with internal learning from occurrences within the organisation and imported knowledge from external sources, firms recombine new capabilities (middle box). Furthermore, the combinative capabilities enable the recognising of new technology opportunities (right-hand box). Deployment of the opportunities is materialised in new products and services - either incremental ones or more far-reaching, risky businesses.

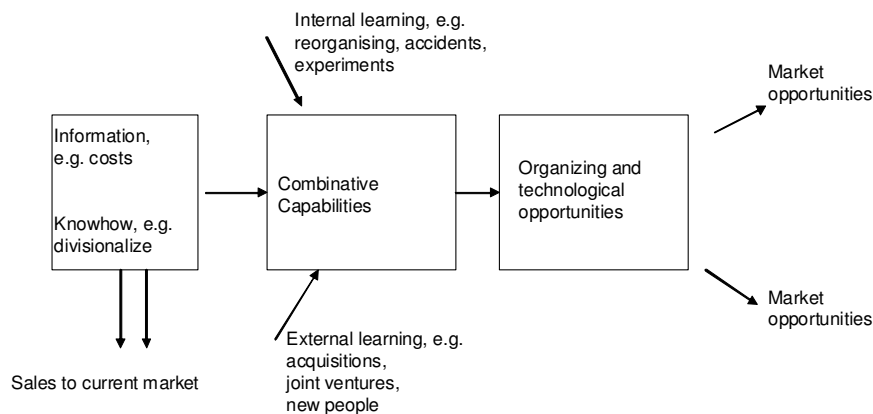


Figure 17: Intellectual resources and firm expansion (Kogut & Zander 1992)

Cooperation implies individual practises becoming organisational principles and mutually shared organisational knowledge (right-hand box) that is a prerequisite for

further organisational acts. Indeed, a manifestation embedded in Figure 17 is the continuum of privately held knowledge becoming organisational knowledge capital, which is, by definition, (see Subchapter 3.3.) structural capital. From the business growth creation point of view the value chain goes from resources and capabilities to seeing new technology opportunities. They, moreover, are deployed in new products and services exploiting recognised market opportunities

Furthermore, this view stresses dynamic stocks that constitute the engine of the firm to capture new external intellectual resources or use the stocks it already possesses for creating competitive advantage. Ultimately, the value chain is not only a description of value creation for customers, but also a description of value adding, where the external sources combined with firm internal human capital create first organisational knowledge and structural capital. The structural capital in the form of new business, boosted by relational capital (not present in the figure), finally enables the capturing of customer revenue, that is to say, financial capital.

In respect of combinative capabilities, Makadok (2001) identified two elements here, resources and capabilities, which hold divergent properties. The former represents assets that can be picked and combined, whereas capabilities are subject to resources. Hence, capabilities use resources for designing and constructing organisational systems capable of increasing productivity. Moreover, this view proposes capabilities to belong to an organisation as an integral part and that those resources may be acquired from both external and internal sources.

Specifically, Amit and Shoemaker (1993, p.35) stated that: “resources consist [...] of know-how that can be traded, financial or physical assets, human capital, etc. [...] (whereas) capabilities [...] refer to a firm's capacity to deploy resources”. For Teece (Teece & Pisano 1998), capabilities reflected a company's ability to combine resources for aligning them in the ways that promote superior performance regardless of the rivalry confronted due to competition.

Carmeli and Tishler (2005, p.300) considered this ambiguity of resources and capabilities as follows: “resources as a general term is taken to include three main constructs - resources, capabilities, and competencies, which have been variously defined in the strategic management literature, making it difficult to generalize across studies”.

In sum, the presentation in Figure 17 is a description of the value adding of intellectual resources from firm internal and external knowledge resources towards creating new business, products and services for recognised markets, and, ultimately, generating cashflow and financial value. Moreover, it is a starting point for the value chain presentation involving human, structural and relational capital transforming to the financial value as shown later in Subchapter 4.2.3. Before that the interplay of subcapitals is discussed in the next subchapter.

4.2.2 Business Creation and Subcapitals

Nahapiet and Ghoshal (1998) studied the impact of social capital in the generation of new business, as illustrated in the figure below, Fig. 18 (ibid, p.251). In their study, they claim four factors central to the process of combining and exchanging intellectual capital to create new business with network partners: (1) combination capability; (2) motivation to combine/exchange IC (with partners); (3) anticipation of value through combination/exchanging intellectual capital; and (4) access to parties for combining/exchanging intellectual capital.

Factors 1 and 2 are preconditions of the partnering process for moving to the factual exchange stage. Factors 3 and 4 define the act of exchange, which is, per se, the creation of new business.

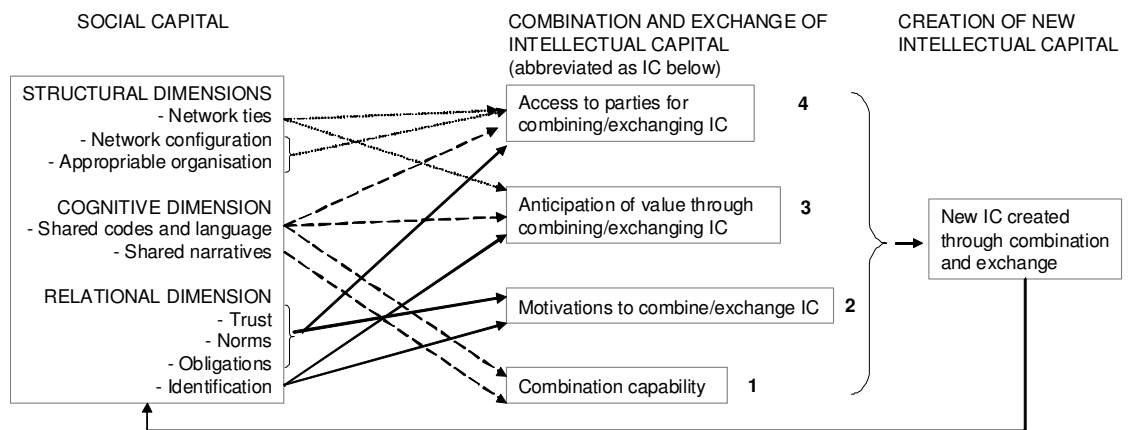


Figure 18: Social capital involved in creation of intellectual capital (Nahapiet & Ghoshal 1998)

Following their study, the motivation to resource combine/exchange with partners is solely influenced by the relational dimension (trust, norms, obligations, identification). Trust, norms and obligations impact, moreover, on accessing the partner's intellectual resources, whereas the identification subfactor influences anticipation of the value available for exchange. Moreover, identification means knowing the partners' identity and resources. It is also a new component for this study, as it was not discussed in the relational capital (3.4) subchapter.

Also, Nahapiet and Ghoshal in their model emphasise the role of communication (shared language and shared narratives) effecting combination capability. Shared language contributes to anticipating the value of available intellectual capital as well as accessing it. In turn, the variable of network ties is connected with the variables of access (see ref. no. 4) and anticipation (see ref. no. 3), whereas the network configuration and the appropriate organisation subfactors affiliate only with the variable of access.

In sum, Nahapiet & Ghoshal (1998, p.250) noted: “[N]ew intellectual capital is created through combination and exchange of intellectual resources (within a particular relationship), which may exist in the form of explicit and tacit knowledge and knowing capability. [...] [W]hat we observe is a complex and dialectical process in which social capital is created and sustained through exchange (of knowledge required for new business opportunities between parties) and in which, in turn, social capital facilitates exchange. [...] moreover, besides social capital facilitating the creation of new intellectual capital it was itself also reciprocally reinforced.”

When comparing the two presentations, Nahapiet and Ghoshal, unlike Kogut & Zandler, do not try to explain the market opportunity/orientation here, but stay with a more holistic view in discussing the creating of new intellectual capital. The most obvious similarity between these two models is seen in the dynamism of combination and exchange, which is found in the combinative capabilities-block in Kogut & Zandler’s model. Moreover, the concept by Nahapiet & Ghoshal above stands for a value chain presentation, where social capital³ (trust, norms, identification...), the social aspect of human capital (cognitive communicative skills) and network structure are enablers for formatting new human capital and organisational knowledge. Also, they are engaged with the combination/exchange acts which are a manifestation of new business creation.

Their concept suggests also the presence of structural capital embedded in organisational knowledge and offerings for customers. The additional contribution for the Kogut & Zandler model is the notion of social capital appearing contributable for observing and capturing new knowledge, and secondly, introducing a more fragmented view in explaining the combinative capabilities.

Next discussed here is the model by DeCarolis (2002, p.703), which argues that the creation of entrepreneurial opportunities is been contributed to by social capital and organisational knowledge. Here, social capital has an impact on creating organisational knowledge due to the contacts held by individuals enabling new knowledge creation. Organisational knowledge, in turn, embodies a bi-directional relatedness with entrepreneurial opportunities. It can be understood, first, by the accumulation of experience along entrepreneurial acts which enriches organisational knowledge, and second, accumulated knowledge contributing to the entrepreneurial process.

There is certain congruence between the combination and exchange blocks of Nahapiet and Ghoshal’s model with the entrepreneurial opportunities available in the DeCarolis presentation. Moreover, the organisational knowledge-block by DeCarolis is bi-

³ Instead of Nahapiet & Ghoshal’s relational capital, these factors (norms, trust, etc) are considered social capital by the definition presented here in Subchapter 3.4.1.

directional, with the entrepreneurial opportunities therefore bearing some similarity with the new IC accumulation (the right-hand block in Nahapiet and Ghoshal's model), which has feedback to social capital. Eventually, looking at the factors in the social capital block by DeCarolis, as shown in Figure 19, they are based on the Nahapiet and Ghoshal model.

The organisational knowledge by DeCarolis suggests much the same that is expressed in the left-hand block in Kogut & Zandler's presentation holding the current organisational knowledge base. DeCarolis' entrepreneurial opportunities-frame, in turn, has its counterpart in the Kogut & Zandler framework's combinative capabilities block, and partially in the organising and technology opportunities block.

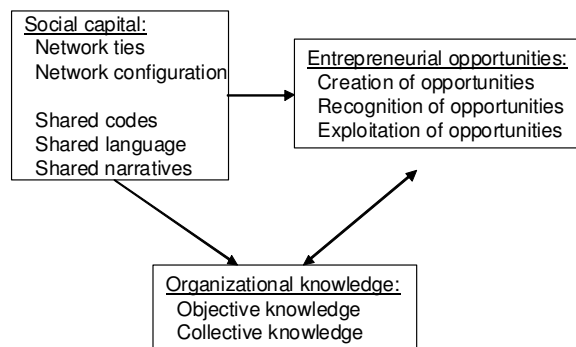


Figure 19: Model of relationships among social capital, intellectual capital, and entrepreneurial opportunities DeCarolis (2002, p.703)

With regard to the notions stated here by Kogut & Zandler and Nahapiet & Ghoshal, the novel aspects here are: (1) explaining the concept of combination and exchange in terms of entrepreneurial creation, recognition and exploitation of opportunities; (2) entrepreneurial opportunities benefit from accumulated knowledge, and vice versa; (3) the emergence of entrepreneurial opportunities is influenced by social capital.

In particular, Alsos & Carter (2004, p.4) deepened the view of entrepreneurial experience related to entrepreneurial opportunity recognition. Their study is rooted in Carter's earlier studies (2003; 1998) focused on explaining portfolio entrepreneurs' higher success rate in launching new businesses. Consequently, the emphasis here is on covering both tangible and intangible resources. More than a cause-effect relation between human capital resources and opportunity identification, their concept holds the presentation of entrepreneurial abilities and entrepreneurial network subject to human capital. Needless to say, the entrepreneurial network is not a synonym for social network, but more for a business network following the definitions discussed in Subchapter 3.4.3 (dynamism of business relations).

Alsos & Carter's concept is similar to that of DeCarolis, as both feature opportunity recognition where identifying new opportunities rests on knowledge accumulation from

previous experiences. Opportunities, here, are enabled by entrepreneurial capabilities and access to the entrepreneurial network as stated in Figure 20.

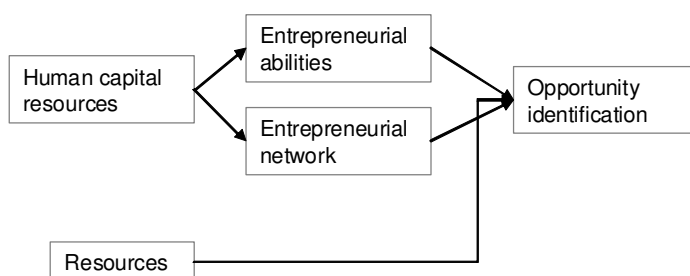


Figure 20: Interdependency between opportunity identification and resources (Alsos & Carter (2004, p.4)

In sum, the new issues here are: (1) making a difference between the social and intentional business network, which is to say, following Alsos and Carter, an entrepreneurial network; (2) the essence of tangible resources in the creation of a business opportunity.

Other scholars add some interesting fragments of reciprocity between different appearances of intellectual capital. For example, human capital with an entrepreneurial emphasis is seen to create a link with other capitals like the relational capital of strengthening firm reputation (Shaw et al. 2008, p.3), personal relations and trust, i.e. social capital, in the venture firm context (Davidsson & Honig 2003; Watson et al. 2003). Human capital is also dependent on structural capital: “[H]uman capital is practically useless without the supportive structure of an organization, structural capital that can utilise and nurture his or her skills” (Bontis 1998, p.71; Edvinsson & Malone 1997, p.190).

Organisational capital has an impact on human capital when it comes to incremental innovation development, and, in turn, social capital entails a positive contribution to radical innovations (Subramaniam & Youndt 2005, p.450). The latter becomes sensible with what was said about the structural holes of social networks earlier in Subchapter 3.4.2. Radical innovations are more likely to be available from external sources than inside a firm, which claims for a dependency on social capital. The former postulates utilising internal stocks of knowledge of obviously sufficient sources for product development purposes and minor innovations. Subramaniam and Youndt (2005) continue: “[I]nterestingly, social capital played a significant role in both types of innovation, as it positively influenced incremental and radical innovative capabilities.

In particular, Audretsch and Keilbach (2005, p.457-458) studied the relatedness of entrepreneurial capital with social capital and suggested the former belongs to the latter: “Entrepreneurship capital is a specific type of social capital and refers to the capacity of a society to generate entrepreneurial activity”. Especially the dominant role of social capital over entrepreneurial capital becomes salient in dense business networks. Like in

the region of Silicon Valley entrepreneurial opportunities were flooding in and entrepreneurs were offered abundant new opportunities that emphasised the essence of social capital to the detriment of entrepreneurial capital (Saxenian 1990, pp.96–97).

4.2.3 Strategic Resource Orientation and Accounting Perspective

The link between the Balance Scorecard performance monitoring concept by Norton & Kaplan and intellectual capital theory was aptly expressed by Martin-de-Castro & Lopez-Saez (2006, p.26): “[T]he different categories of intellectual capital are representatives of different types of intangible resources and capabilities and could be considered as strategic resource and capabilities”. Certainly, this link is due to the influence of intellectual capital system development in the 90s promoted by Kaplan & Norton (see Subchapter 3.1.3).

The Balance Scorecard concept is composed of four strategic resource area perspectives: (1) learning & growth, (2) internal process, (3) customer and (4) financial, explaining the generation of shareholder value, as presented in Figure 21. Each of these main categories is divided into subareas, and furthermore into more detailed presentations in terms of tasks or subprocesses standing for the basis of defining the bottom level presentation, the indicators. Indicators in turn, are devices for firm performance measurement.

Ultimately, a firm holds a plethora of indicators, which are aggregated hierarchically into a four field performance presentation (Kaplan & Norton 1996, pp.47-146; 2004, pp.66-68). As stated by Kaplan & Norton (2004): “[T]here are literally hundreds of processes taking place simultaneously in an organization, each creating value in some way”. The problem of how to develop strategies for managing the multitude of value adding pieces is equal to the complexity of taking advantage of the organisational synergies across the company (ibid. 2006).

Basically, the Balance Scorecard is a strategic management tool and it is not that much interested in measuring capitals as such, but more for example, in how efficiently the customer expectations are met and how the internal processes underpin exploiting advantages from organisational and individual intangible assets. However, the common denominator with the intellectual capital system is the objective of explaining the overall financial efficiency involved in operations.

For the purposes of this study the concept here is interpreted as a value chain presentation, where each of the stages captures the idea of internal client-server concept. The preceding stage enables the next stage to accomplish the acts belonging to it. Moreover, the stages are a pathway to how an organisation creates value from its intangible assets (Kaplan & Norton 2004, p.11). As Näsi & Neilimo (2006) summarised, the pivotal mission of strategy maps (Kaplan & Norton 2004), a derivative based on the Balance Scorecard concept, is to define the transformation process that leads from intangible resources to measurable customer and financial outcomes.

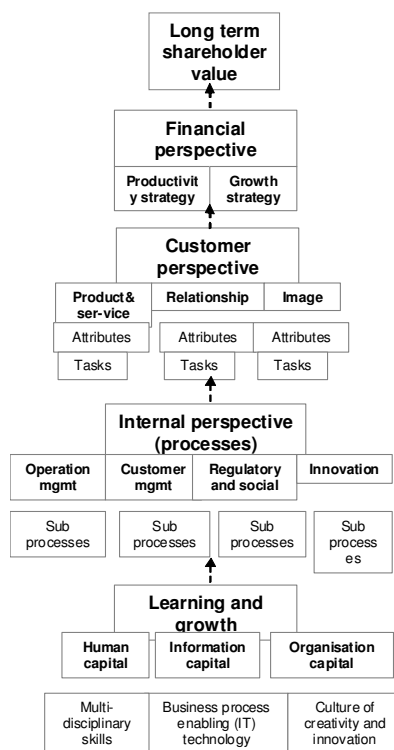


Figure 21: Interdependency of intellectual resources (Kaplan & Norton 2004)

The 1st stage on the bottom in Fig. 21, learning & growth represents a collection of factors like human skills enabling personal knowledge processing and acting; second, IT-technology and processes enabling the deriving of organisational routines efficiently; and third, an appropriate culture for producing creativity. The more effectively this first platform works the more capable are employees in striving for the organisational goals in the next stages. Also it enables the transformation of knowledge into more structured forms needed, for example, for market and customer opportunity analyses.

Next, the 2nd stage from the bottom, the internal perspective is centered on the firm internal management processes that are supply chain management, customer selection and management, R&D accompanied by product development and social responsibility and regulatory related processes. This is the perspective of streamlined operation management, and processes underpinning designing and developing new products, managing production schedules, and caring customer relations are all examples of the activities in this stage. These activities reflect many of the features belonging to the management practises of structural capital in the intellectual capital framework. And yet the relatedness of the internal processes by Balance Scorecard and structural capital is also suggested by the common determinants that are productivity and efficiency (Bontis 1999, p.445).

The next, 3rd stage is the customer perspective. It comprises the essential elements for attracting and satisfying customers, increasing loyalty by caring for their feelings, attitudes and opinions. These activities are centered on products and services, relationship and image. A satisfied and relaxed customer accruing a positive cashflow is

the most desirable outcome from the activities involved in the customer perspective stage. Although the previous stage comprises the customer relationship management task, it is, however, focused on cost-efficiency and productivity and thus belongs to the internal perspective. The counterpart in intellectual capital is relational capital, which is anchored on sustaining longevity of relations (Bontis 1999).

The upper-most block, financial perspective, captures the strategic emphasis of two alternative ways to increase profitability - those of productivity increase and business expansion. Financial and strategy representatives are the principal controllers of balancing the company's overall resource portfolio in accordance with making profit.

Finally, on the top the outcome from these four perspectives is increasing the long-term shareholder value. In other words, the diagram in Figure 21 is a value chain presentation of the underlying stages of transforming organisational and individual intellectual capital into more structured forms and finally creating financial value. Consequently, the client-server view is akin to the concept of interim markets, certainly here intraorganisational ones. This view becomes more understandable following Porter's idea of a firm as a value chain of core processes stretching beyond the firm boundaries through vertical integration until the end-customer (Porter 1985).

Financial accounting practises are not capable of fully judging intellectual capital qualities among asset value: "For example, intangible assets such as patents, specific knowledge, provision of access to a market, or tangible assets [...] are often important capital contributions, especially in the early phases of the life of a corporation" (Stolowy & Lebas 2006, p.371).

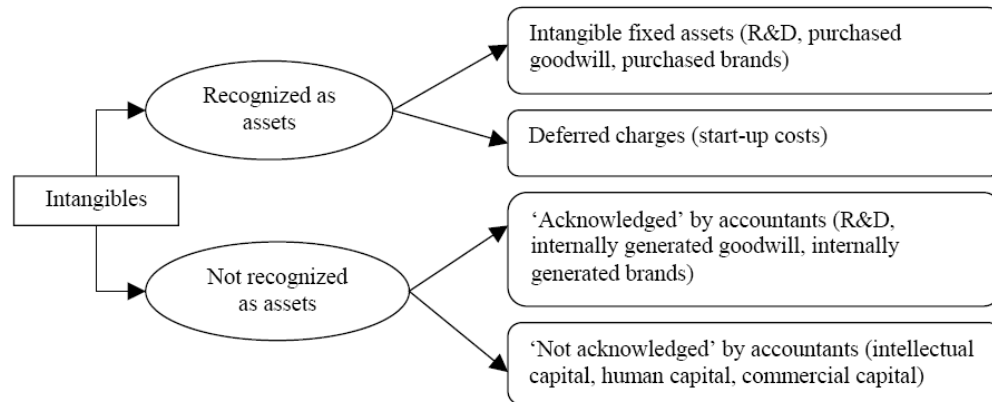


Figure 22: Financial accounting view of the capitalisation options of intangible assets (Stolowy & Lebas 2006)

Figure 22 (ibid.) presents a view of intellectual capital where less structured intellectual capital (human capital) gears from the lowest block towards tradeable intangible assets as expressed in the two uppermost blocks.

This notion is important for consideration of the capitalisation power of intellectual capital. In fact, Figure 22 conceals the idea of a particular continuum where less

structured and less powerful intellectual capital (see the lowest box entitled ‘not acknowledged by accountants’) is leveraged into the next level (acknowledged by accountants-block) holding visible intellectual capital like brand value and other resources belonging mostly to structural capital. The next two boxes comprise intangibles provided with trading value judging their financial value from the accounting point of view. This continuum logic provides the same idea as involved in Kaplan & Norton’s concept (Fig. 21, 4.2.3) where the unstructured and less visible human capital related with the learning and growth perspective transforms through the next stage’s financial value. Ultimately, the intellectual capital value chain presentation as discussed in Subchapter 7.4 here obeys this logic, although comprising seven steps instead of Kaplan & Norton’s four-stage model and the other models discussed in the theory part (Chapter 4).

The essential question of capitalising power and judging human capital as capital is answered here affirmatively. The conclusion here is that human capital is true capital, as it meets the six criteria listed above. However, among other subcapitals, it holds limited investability power, which is seen in its position in the intellectual capital value position as an enabler for the subsequent subcapitals. The next subcapitals, structural and relational capital, are judged without doubt as capital as they appear more visible and concretely than human capital and easily meet the investability criteria mentioned on the previous page.

4.2.4 Summary

The three-block Kogut & Zandler model presented in Figure 17 is taken here as the basis of discussions and deriving the comprehensive presentation of the subcapitals of intellectual capital working together. Their model is reshaped here based on the findings suggested earlier by Nahapiet & Ghoshal, DeCarolis and Alsos & Carter (in 4.2.2.) and Kaplan & Norton (in 4.2.3). This elaboration is depicted further here in Fig. 23, where the main blocks are denoted as the major elements of the value adding chain of firms’ intellectual strategic resources drawn from previous stages or external sources.

The main blocks are found horizontally in the middle in Fig. 23, referred as: Conception platform, Development, Deployment/ organisational set-up and Deployment/market perspective. Also, there are the business creation process definitions available in the text-blocks. And still, the notions of intellectual capital tradability discussed in the next subchapter are taken here to denote the four market perspectives at the end of dotted vertical arrows on the bottom of the illustration (Fig. 23)

Unlike Kogut & Zandler, who end their value chain presentation to customers at the point of reaching market opportunities, Kaplan & Norton stretch beyond firm boundaries up to the creation of and caring for customer relationships (Fig. 21). Accordingly, the concept in Figure 23 is added by a fourth block and somewhat parallel with the market opportunity in Kogut & Zandler’s model (see the two diagonal in Fig. 17). This view is interpreted here in a broader way to cover not only market

opportunities but generating value for customers. Hence, this fourth ‘box’ denotes the market orientation of relational capital (see Subchapter 3.4. on relational capital; Bontis 1999), implying customer care and maximising revenue from customers.

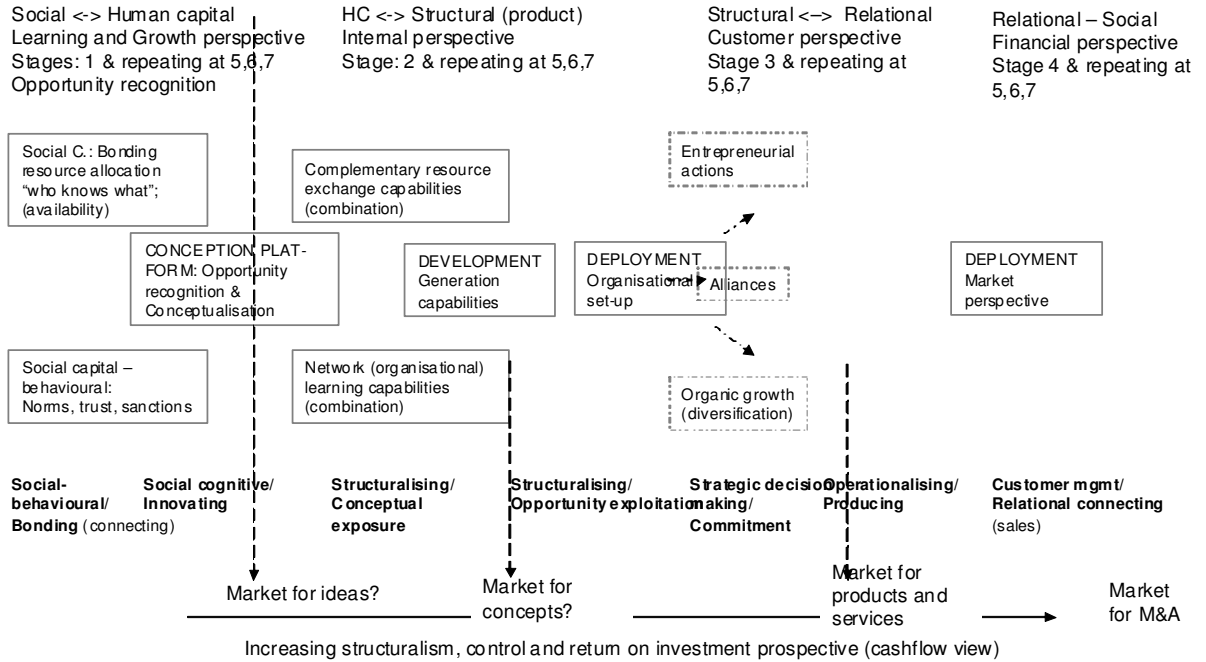


Figure 23: Summary of IC value adding from divergent perspectives

The first and the beginning of formation of intellectual capital is social capital, as shown on the left side in Fig. 23 by three blocks. Moreover, they are the bonding capability, behavioural control and cognitive capacity of individuals. So far, social capital enables accessing knowledge-based resources in networks accompanied by meta data of ‘who knows what he or she knows/possesses’, and finally producing individual knowledge which belongs to human capital. Human capital is here considered to link social capital and organisational knowledge, which is the next appearance on the right in Fig. 23. As stated organisational capital is structural capital due to the structuring of HC.

Then organisational knowledge takes more solid forms like new products, identified new customers/customer segments or restructured organisational operations. This step is very likely to be supported with external exchange of complementary assets as stated in Figure 23. Materialising the business opportunity calls for positive decision-making by business owners, leading towards the harnessing of a business operation. This act is interpreted here to belong to structural capital with ownership management emphasis.

The next manoeuvre is depicted by three operational alternatives in three dotted boxes standing for the options of alliance, organic extension within the current business organisation or separate entrepreneurial action. Moreover, these appearances of running businesses are manifestations of structural capital, as they call for the creating of new business structures.

Then sales and marketing takes place, which belong to relational capital. Deployment of the supplier's offering on the customer's side ties both parties together and increases the degree of institutionalisation. This act evokes the need for relational governance, which is a subcapital of relational capital. The avoidance of the trap of too strong bonding with one dominant customer and the presence of a variety of equal bonds is favourable for an emergence of social capital in business relations. Therefore, the presentation from left to right in Figure 23 is a kind of loop from social capital related with individual human capital to the social capital of relationships.

It should be noted that the figure does not suggest operating in successive modes like first conceptualising a product (in the conceptualising platform), then developing a product, marketing and selling the product and controlling the financial balance of customer incomes and costs. Rather than a relay model, this presentation puts stress on the interaction between and within the subcapitals of an entire intellectual capital value chain.

A second significance embedded in the figure is that of new business creation, as discussed in Subchapter 4.1. Moreover, Figure 23 stresses the essence of structuring knowledge. Here, the flow of new business creation begins at the stage of utilising dynamic knowledge related with recognising business opportunities. And next, knowledge is materialised in products. Finally, knowledge gets its fulfilment in services and products matching perfectly with customers' buying preferences. This chain viewpoint is expressed by zones separated with dotted vertical lines with titles in the top of the diagram in the each of the zones. Accordingly, the zones are linked with the maturity of knowledge-based contributions to become marketable items as stated at the bottom of Figure 23 and discussed next here in Subchapter 4.3.

4.3 INVESTABILITY VIEW - MARKET AND TRADABILITY VIEW

For this study the impact of intellectual capital on cashflow is important as it is an evidence of return on investment (in a positive case) and, moreover, witness to the investability of intellectual capital. As stated in Fig. 22, each of the main positions in the value chain enable, at least in theory, an entry point for investment-like intellectual capital value adding. Accordingly, an actor, individual or team, internal or external, who is capable of executing enhancements within the depicted resource areas of that value chain is ultimately able to improve the firm's financial performance.

The discussion carried on in Subchapter 4.3.1 is grounded on the value chain concept shown in Fig. 22. The point of interest here is the investment cycles that are the expected payback periods for the return on investment by intellectual capital. Some evidence to prove the response cycles of the three subcapitals, human, structural and relational capital, is introduced in Subchapter 4.3.1. The next subchapter, 4.3.2 highlights the tradeability of intellectual capital. The focus here is in the dosing of intellectual capital within investments. Subchapter 4.3.3 prolongs the tradeability discussion beyond the investment perspective, in defining, in general, the mechanisms

underpinning the trading of intellectual capital. Finally, subchapter 4.3.4 quantifies the investability of intellectual capital. Yardsticks for evaluating intellectual capital apart from any intangible resources are taken from business model concepts and definitions of competitive advantage.

4.3.1 Investment Cycles

According to Shenhar et al. (2001), nearly all internal business development projects are initiated to create change. They can, moreover, be identified by the four major project success categories: project efficiency, impact on customer, business success and preparing for the future. Because the first one is dedicated solely to assessing the worth of a development project itself, it is not considered here. In turn, the other three are relevant when considering intellectual capital investment view, as they are also in line with Kaplan and Norton's three non-financial perspectives.

Concerning the second, the impact of customer relationship related improvements is discernible in a few months. The concerns here are such as customer satisfaction and quality of service issues, reflecting the customer perspective in the previous model by Kaplan & Norton.

In turn, the third subject, business success, deals with operation management efficiency and is measurable within 12-24 months. It has a strong relevance with the internal processes stage in the value chain presentation as discussed in the previous subchapter.

Preparing for the future, the last subject includes factors expected to generate better performance in the future, within 3-5 years. It echoes some of the ideas captured by the learning and growth perspective.

Investment cycles related with the value chain view are discussed also by Kaplan & Norton (2006, p.47): “[T]ypically, the financial benefits from improvements to the processes in the four internal perspective themes (denoting the four main perspectives) occur over different time periods. Cost savings in improvements of the operational processes deliver (quick) benefits within six to twelve months. Revenue growth from enhancements involved in customer relationships accrues benefits in the intermediate term, twelve to 24 months. Innovation processes generally take longer to produce revenue and margin improvements, say 24 to 48 months” (Kaplan & Norton 2006, p.47).

Besides the growth implicated processes, the benefits from the regulatory and social processes are important for any firm. Although they do not create growth, they do enable the avoiding of business risks and poor image.

Other views on investment response times are argued by Neely et al. (2002), who noted that the level of financial performance achieved today is a function of decisions made 6 – 18 months, or even longer. Ali-Yrkkö (2008) studied the impact of R & D-projects. His survey consisted of 450 SMEs. The study found that an increase in firm

productivity is discernible within three to five years from the beginning of new technology research and development activities.

Once matching together the value chain presentation and cycle times discussed here, the following table, Table 14 below, posits that internal learning and growth have the farthest position in the value chain and accordingly the slowest positive impact on cashflow. This is understandable because of the number of different actors and stages creating individual transition points, which bear risks for financial value creation. In turn, the quicker investment opportunities are concealed in cost efficiency improvement within management processes.

Considering the customer perspective, Shenar and Kaplan & Norton do not share a common opinion. Following the former, improvements in customer relations yield financial profit increase within a few months, whereas the latter perceives double the amount of time is needed. This difference is explained by the different nature of improvements; either they fall in the area of fundamental improvements in caring for customers or more structural ones appearing like remedies to ease certain deficiencies in customer relationship management.

Table 14: Impact cycles of the organisational developmental investment projects

	Shenhar et al. 2001, Impact cycle after finishing the development project:	Kaplan & Norton, 2006 Cost savings from improvements in:	Ali-Yrkkö 2008
Customer service, satisfaction and quality of service related perspective	Measurable results at in a few months	Revenue growth within 12-24 months	NA (not available)
Internal process management and productivity and cost-efficiency	Measurable results in 12-24 months	Cost savings within 6-12 months	NA
Learning and growth perspective and building future growth	Measurable results in 3 to 5 years	Revenue and margin improvements within 2-4 years	3 -5 years

In sum, the earlier the position in the value chain is the higher the uncertainties engaged with investment are, and the longer the response time is in regard to positive cashflow impact.

4.3.2 Trading with Intellectual Capital

The discussion until here has considered the value adding perspective from the firm internal point of view. Apart from the emphasis in the previous subchapter on firms deploying their internal and absorbed external resources, this subchapter takes a more instrumental view of intellectual resources. Consequently, the investability of intellectual capital is discussed at a more general level without consideration of firm-specific characteristics.

Discussing intellectual capital as an investable asset as such is rare in the intellectual capital literature, but some notions are available. The first candidate discussed in this subchapter is social capital. As noted by Nahapiet & Ghoshal (2000, p.675; Arrow

1974), social capital as such is difficult to evaluate as a tradeable object, as friendships and obligations cannot be easily passed from one person to another. Due to its non-tradable nature there is good reason to believe that social capital is not appropriate for considering as investable capital.

But when connected with human capital, social capital becomes a valuable and capital-like property: "Social capital is the contextual complement to human capital", [...] "connected people do things better [...] and] enjoy higher returns" (Burt 2005, p.150). The impact of social capital on cash-flow is seen in the "rate of return in the market production equation", where economic gain is strived for: "[T]hrough relations with colleagues, friends, and clients come the opportunities to transform financial and human capital into profit" (Burt 1992, p.9). Moreover, for Burt social capital "is the final arbiter of success" (Ibid), because it enables firms to create innovative solutions, novel associations and productive linkages (Cohen & Levinthal 1990). As Pennings and Lee (1999, p.59) noted: "Social capital allows the firms to leverage their human capital thus extracting more quasi rent from that asset."

As a stand-alone resource like social capital, also human capital is difficult to exploit for profit-seeking purposes. As an example, research carried out in university laboratories is sometimes blamed for being a waste of money due to its think-tank type of brainwork in finding practical applications for new technology without reference to the market (Paasivirta & Valtonen 2004; Paasivirta & Saapunki 2005). Therefore, human capital, like any bright innovations, may turn out to be useless if the inventors are not connected to actual demand in the market.

Needless to say, structured forms of human capital, like patents and other IPRs are tradable and sometimes highly liquid (Daniele 2004, p.16). Yet, they are by definition assets, not intellectual capital, as long as they are not connected with research forces. Out of curiosity, the statistics collected by NEC corporation point out that only 2 – 5 % of intellectual property rights are high-grade innovations and attractive intellectual capital for further cultivation and planning sufficiently big business (Daniele 2004, p.16). The rest of IPRs are dependent on human capital, researchers' knowledge, or just rejected non-commercial innovations.

Sometimes innovations cannot be protected by IPRs, or their value is constituted predominantly by IPR-holders' tacit knowledge in addition to the protected technology. This is similar to Markman et al (2001, p.274), who suggested that innovation is most critical to achieving competitive advantage if the entrepreneurship is developing a high technology product or service.

For Burt, a high grade human capital possessor is the most productive one, manifesting high grade social capital: "the human capital explanation of the inequality (among heterogeneity of individuals) is that people who do better are more intelligent, more attractive, more articulate and more skilled" (Burt et al. 2005, p.152).

Organisational knowledge of structural capital alone will also lose a great deal of its commercial value. As an example of organisational capital, Teece (2000, p.8) stated that

“superior technology alone is rarely enough upon which to build competitive advantage”. Not surprisingly, organisational capital, belonging to structural capital by definition here, obtains contributions from social capital: “Social capital is instrumental in creating organisational knowledge – the collective knowledge of the organisation. Organisational knowledge contributes to the ongoing innovation processes in established capabilities and is the genesis of the opportunities in new market segments and new capabilities” (DeCarolis 2002, p.699).

Management disciplines and systems, the process capital of structural capital, have an investment-like impact on human capital, increasing the organisation’s performance. Innovating and product development benefit much from a structured environment and streamlined operation processes (Chesborough 2003). Also the norms and behavioural patterns of intra-firm structural capital alleviate individuals’ proclivity towards opportunistic behaviour, and, furthermore, entail cost savings (Williamson 1985; Ghoshal & Moran 1996, p.18; Grover & Malhotra 2003, p.462). However, the structural capital served outside or traded is frequently engaged with IT-systems or other process improvements.

Especially knowledge-intensive firms are eager to invest heavily both in relational as well as management structures. In order to encourage the development of strong personal and team relationships, high levels of personal trust, norm-based control, and strong connections across porous boundaries are needed (Nahapiet & Ghoshal 1998, p.260).

In sum, the value of individual subcapital which is captured apart from the entire intangible resource pool is relatively low. In other words, leaving out any of the three main subcapitals, human, structural or relational capital, implies eroding the enriching impact of the intellectual capital to a company growth. Adversely, once empowered by others a particular intellectual capital realises its full potential value in making business.

However, trying to figure out a financial value for any intellectual capital is complex due to the lack of a consistent valuation basis. First, as with any assets, also highly specific tangible and intangible assets are distinguished on the basis of their use and exchange value, as noted long ago by Marx (cited in Hennings 1987). Second, the intellectual capital value is embedded in the assets, or as stated by Marx (ibid.), the production-making factors, those bearing human capital.

4.3.3 Market Mechanisms for Investment-like intellectual capital value adding

Instead of searching for direct financial value, a feasible yardstick for the purposes of this study is the relative importance of intellectual capital for a particular business firm, and especially for any technology-orientated firms. More specifically, a common denominator for assessing the value of intellectual capital is screening its market potential and tradability, as pointed out by Gans and Stern (2003) in their discussion of “market for ideas”.

In fact, these two elements, market potential and tradeability, are akin to definitions of competitive advantage as discussed further here. The former is a yardstick for evaluating the attractiveness of certain intellectual capital qualities alone or bundled. The latter indicates the easiness of selling, delivering and implementation of intangible goods. The better the distribution to customers, obviously the more productised the items are. This is parallel to what Williamson denoted by complete market and incomplete market (Williamson 1985, p.16-30), where the latter is related to specialised assets. However, Williamson used the term asset specificity for an evaluation criterion to distinguish productised goods and commodities apart from idiosyncratic investment goods (*ibid.*).

Considering firms acquiring knowledge-based utilities which are meant to be used as the building blocks involved in the creation of competitive advantage, there is sometimes a lack of appropriate suppliers. Especially, the high degree of idiosyncraticism embedded on those building blocks precludes purchasing and, in a more general, trading and ultimately markets to work. At least the complexity of products increases the duration of the sales process and lowers costs, as the purchasing on behalf of the buyer becomes more complex. Like Dierickx et al. (1989, p.1505; 1989, p.1505) stated: “some (highly idiosyncratic knowledge based) factors are simply not traded on open markets”, and instead they had to be built by the firm by itself. This will also cause the problem of evaluating them. In the absence of the factor of marketing intangible intellectual products and services, there is no way to realise the value of them (Dierickx et al. 1989, p.1505).

The essence of intellectual capital is characterised also by means, not only ends, which makes its use in investments blurred. Buying food is a simple trading transaction that is mostly emphasised by the end: eating with no or low risk involved in buying it. Conversely, buying intellectual capital is characterised by means of acquiring it and taking full advantage of it, where the former stands for means, and the latter ends. Just as a particular entrepreneurial business opportunity has multiple ways of exploitation, so does intellectual capital (Shane and Venkataraman 2000). Moreover, the uncertainty involved in the means of investing intellectual capital is parallel with entrepreneurship, which is a heuristic process (Chesborough 2003, p.216), as discussed in the next subchapters.

The market for sophisticated and complex knowledge products is shifted from imperfect to perfect when their productising level is increased and they are easy to use without major learning, and even more, supplier support is less frequently needed. Ultimately, this cultivation process leads to products as commodities, which do not claim themselves to be building blocks of competitive advantage, but tradeable entities that can be outsourced. This is in line with advocates of core competence (see e.g. Prahalad & Hamel 1990; 1994), who suggest that firms tend to outsource resources that they can rent from the market more cost-effectively than holding them in their asset stock and payroll when it merely comes to human capital.

4.3.4 Competitive Advantage Creating Intellectual Resource

In building the firm's desired strategy position, there is no doubt that the foundation is competitive advantage. Moreover, it is a complex set of interacting factors comprising implicitly expressed elements that play a focal role in the success of the enterprise (Dehning et al. 2003). In turn, the accumulation of competitive advantage is based on individual intellectual resources: human capital (Wright et. al 1994; Barney 1996; Dierickx et al. 1989; Prahalad & Hamel 1990; 1994). In capturing these resources, a firm is led to the question of either to make or buy the needed human capital.

For the intellectual capital investor the target point is competitive advantage. Investing remains feasible as long as the intangible resources of an investor contribute to enhancing competitive advantage. The alignment between an investor: a person or firm, is determined, following Mathews (2003, p.1173-1181), by four criteria: marginal value contribution, resource complementarity, variety and transferability, as stated in the table below. They are, moreover, the fundamental criteria to be applied by firms in their strategic evaluation of resources for external acquisition (ibid, p.1173).

The first line in Table 15 below denotes comparison between the profit scenarios from two alternatives. Either a firm rents the desired production-making factors or it invests in making them by itself. If the net present value of investment calculations gives a higher return compared with successive annual profit grounded on rental choice, the favourable choice is the latter.

Table 15: Criteria of acquiring intellectual resources for creating sustainable growth

Criteria for acquiring intellectual resources (Mathews 2003)		
	Strategic perspective	Resource qualities
1	Value: costs vs. marginal contribution to value generation	Rental paid vs. net present value of resource marginal contribution to value generation
2	Resource complementarities	Absorptive capacity; synergies generation; access to variety
3	Resource variety	Access to variety
4	Resource transferability	IP regime; knowledge modularization and explication

Resource complementarities on line 2 refer to the complementarity between the additional resources and existing resource stock. Here, the absorptive capacity (see 4.1.2) has a pivotal role. The more adaptive the receiving party is for new resources, the quicker it will take advantage from it. Resource variety on line 3 captures the idea of the firm's superiority among its competitors to access and utilise available resources efficiently. The last line, the transferability of the resource, denotes the immaterial asset management regime of the generated new technology and its appropriateness for productising and trading.

Considering the link between resources and competitive advantage creation, Barney said that a firm's culture may provide sustained competitive advantage when being imperfectly imitable (among other pre-conditions) (Barney 1986b). Moreover, he developed four indicators for evaluating what kinds of resources would provide sustainable competitive advantages. Elaborated by Roos & Roos (1997, p.8), they are: (1) value creation for the customer, (2) rarity compared to the competition (3) imitability and (4) substitutability. As these elements are quite abstract in nature, their appropriateness turns out to be complex. To mitigate this problem, Barney (1991) argued that the best approach for studying competitive advantage is to address a firm's strengths and weaknesses in respect to competitors.

The potential value of resources and capabilities is re-enforced by sustainability factors. RBV asserts that these factors will allow companies to sustain a competitive advantage that competitors find hard to duplicate (Dehning et al. 2003). A landmark in defining the sustainability factors of competitive advantage was in the research of Dierickx et al., grounded on the previous studies by Barney in the 80s (1989, pp.1507-1509). As defined by them, the attributes of competitive advantage are: (1) time compression diseconomies (2) asset mass efficiencies, (3) interconnectedness of asset stocks, (4) preventing asset erosion, and (5) causal ambiguity. More recent literature has trimmed these attributes (see e.g. Dehning 2003, p.9), which are presented in the text below.

Time compression is an expression of the boundaries of drawing new knowledge-based assets in creating new products and services. For a given time period, duplicating the available knowledge (like skilled new employees) would not give a double output regarding marketable new products and service (Dierickx et al. 1989). Therefore, this attribute is dominated by learning capabilities.

Asset mass efficiencies or the role of history (Dehning 2003, p.9) in past success and the accumulation of intellectual assets give a better opportunity for success in subsequent business endeavours by lower costs compared with other companies possessing a "tabula rasa". This notion becomes obvious by refreshing what was said about the impact of experience and other intellectual assets and resources held by a portfolio entrepreneur.

The interconnectedness of asset stocks or socially complex links (Dehning 2003) denotes that instead of treating these stocks as separate entities, they bring added value when interconnecting across stocks. Nourishing R & D effort by ideas collected from customers is highly valuable cross-over work in organisations. Following intellectual capital terminology, human capital and relational capital are in this particular case intertwined.

Asset erosion is a typical phenomenon for any assets if they are not constantly fertilised and refreshed. Especially, human capital embedded in technology products will decay when no improvements are carried out. First of all, existing technology becomes obsolete as more cost-efficient and user-friendly solutions appear on the market (Porter 1980), highlighting the importance of continuous enhancement. Thus, prime movers

bear a relational competitive advantage until imitation by competitors in the long run narrows the gap. This perspective is sometimes called time-to-market or lead time advantage (Dehning 2003, p.9), which other competitors attempt to disrupt.

Causal ambiguity is a kind of myopia present in organisations when identifying all their intellectual capital stocks, which are important for creating new tradeable outcomes, products and services. This is closely related with tacit knowledge that, although uncontrolled and vague to understand, is a significant enabler for creating valuable outcomes.

Following Dehning (2003, p.9), path dependency is the sixth attribute of competitive advantage, which is described by the choices made during the early stages of (technology) project planning and implementation that have significant implications for expected outcomes. This notion is in line with the deterministic nature of causal ambiguity apart from stochastics (Dierickx et al. 1989) that arises from tacitness.

Ultimately, competitive advantage is the source that enables firms to receive return on investment. Therefore, competitive advantage could be used as a particular yardstick for the evaluation of the strategic importance of certain assets, tangibles and intangibles for a firm. A more sophisticated approach entailing quantitative analysis applies the return on assets (ROA) used as a measure for competitive advantage. This is also the most frequently used measure in the strategic management literature (Dehning et al. 2003, p.14).

Table 16: Summary of competitive advantage factors

Competitive advantage factors		
	Dierickx 1989	Dehning 2003
1	Time compression	
2	Asset mass efficiencies	Role of history
3	Interconnectedness of asset stocks	Socially complex links
4	Asset erosion	Time-to-market/ Lead time advantage
5	Causal ambiguity (tacitness of the accumulated organisational knowledge)	Causal ambiguity
6		Path dependency

Creating competitive advantage from innovations is a particular element of entrepreneurial capital – exploiting business opportunities. Drucker saw competitive advantage creation as subject to the entrepreneurial opportunities that can be derived from multiple sources, which he called innovation opportunities (Drucker 1985, p.31-33). Accordingly, the intellectual value of creators is: (1) IPRs becomes protected asset value; (2) the creators' knowledge is manifested through competitive advantage; and (3) the present tacit and protected knowledge offers a seed-bed for further elaboration of new innovations.

Normann (1976) accepted the central role of technology in his business concept definition, but added strategy and market. Furthermore, Chesborough (2003, pp.69-75)

defined six elements in his business model concept. This concept is not discussed (or defined) in detail here; however, insights into Chesborough's business model are introduced, together with the empirical material in Subchapter 8.2.2. Following their concept, the functions of business model are as follows:

- To articulate the value proposition, which is the value created for users like customers by offerings based on technology;
- To identify a market segment, which is a group of users to whom the technology is useful and for whose purpose it will be used;
- To define the structure of the firm's value chain, which is required to create and distribute the offering, and to determine the complementary assets needed to support the firm's position within this chain;
- To specify the revenue generation mechanism(s) for the firm, and estimate the cost structure and target margins of producing the offering, given the value proposition and value chain structure chosen;
- To describe the position of the firm within the value network linking suppliers and customers, including identification of potential complementary firms and competitors;
- To formulate the competitive strategy by which the innovating firm will gain and hold advantage over rivals.

Moreover, Chesbrough and Rosenbloom (2002) and Chesbrough et al. (2006, pp.64-65) stated that: "[T]he value of an idea or a technology depends on its business model (...)". The value is determined instead by the business model used to bring it to market. The same technology taken to market through two different business models will yield different amounts of value. An inferior technology commercialised through will often trump a better technology commercialised through an inferior business model. The business model defines what customer problems are being solved, and looks for external and internal ideas to solve them. It also specifies how some portion of that value will be claimed".

More recent studies related to business model concepts emphasise intellectual resources areas. Seppänen (2008, part 6, no page numbers; 2009) pointed out 36 resource fragments pivotal for the firm business model concept definition. Moreover, they are grouped into seven main categories: physical, organisational, relational, human, informational, financial and legal, where the intangible ones have a counterpart in the intellectual capital system. The informational category is parallel with organisational knowledge and consequently belongs to structural capital. The legal category refers to firm IPR governance dealing with ownership management.

4.4 BUSINESS GROWTH – MACRO VIEW CONCEPTS

In the previous subchapters the point of view was inside the organisation in finding the essence of growth and, moreover, of investing by intellectual capital. The focus here is now on macro level occurrences related to the growth of technology firms. The macro view is taken first in discussing the concepts of value chain, firm life-cycle and diversification options – all these views are engaged with business growth. Next, the venture capital stage model examines occurrences appearing on the macro level, too. Hence, the level of examining here is between the micro and macro view.

4.4.1 Value Chain, Diversification, Stage, Life-cycle

Displaying the sequence of production systems from the very first produced components to those aggregated to subassemblies, and then assemblies and customer products, is an expression of a technology value chain (Hatch & Cunliffe 2006, p.178). Just as the features of a simple customer product are dependent on customer preferences, so also are complex and stage-wise manufactured products by companies constituting value chains. As stated by Contractor & Lorange (2002, p.495): “these changes (customer preferences) are leading to a de-construction of the value chain into greater specialization, with different pieces of the value chain occupied by different firms cooperating with each other. These cooperating allies are more agile, more flexible or more responsive to demand changes, and can make different batches to smaller efficient scale than before”. Moreover, competition between value chains is not dictated only by the lowest cost, but variety and the speed of producing new offerings.

Following Figure 24 (Jokinen & Kangasniemi 2004, p.8), a particular value chain offers three major positions for the companies: (1) component supplier; (2) system supplier; and (3) main supplier.

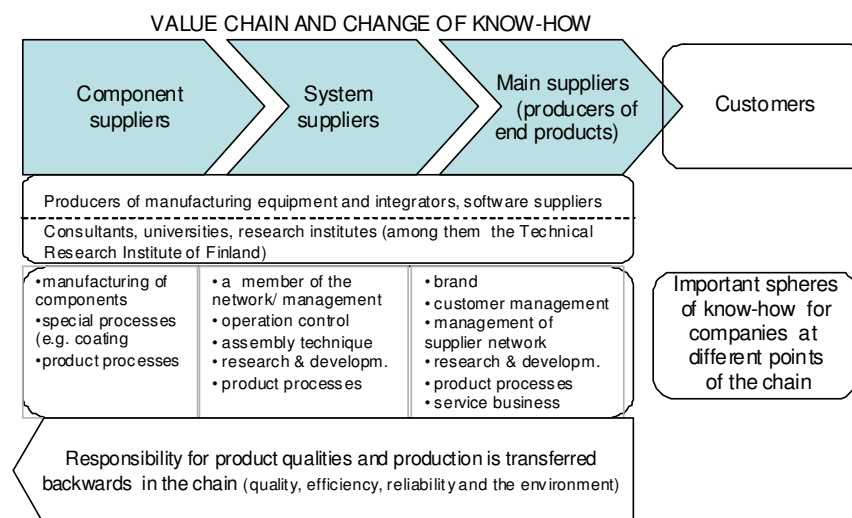


Figure 24: Value system and intellectual resource dependencies (Jokinen & Kangasniemi 2004)

Respectively, the business operation responsibilities increase from left to right. A component supplier is specialised in producing certain components and the operations are centered on the manufacturing, whereas the main supplier is oriented towards the end-customers among other operational duties.

Companies moving forward in a value chain are encountered by new technology imperatives. Either learning or acquiring or both are the means of capturing new elements of value adding, as expressed in the three subsequent bullet lists embedded in the boxes in the picture. The lowest long arrow pointing reversely to the left indicates the increasing responsibility of producing quality for the end-customers.

The life-cycle of a firm is a superior definition that defines the entire evolution of a firm from cradle to grave. In fact, there are several variations of the life cycle model addressing the product, market, and/or industry. Although the concepts are similar, they differ as to the number and names of the stages, as in the studies of Fox (1973): precommercialisation - introduction - growth - maturity - decline; Wasson (1974): market development - rapid growth - competitive turbulence - saturation/maturity - decline; Anderson & Zeithaml (1984): introduction - growth - maturity - decline, and; and Hill and Jones (1998); embryonic - growth - shakeout - maturity - decline.

The Penrosean twofold concept of growth reveals the two areas of growth: the expansive, and the visible, and the increase of firm internal efficiency. This point of view is seen as well in firm life-cycle orientated growth conceptions like the one explained by Greiner (1972). Following his life-cycle model, firms living in the first phase of their lifecycle are characterised by the innovation mode dominated by the market and a technology expansion. Next, a need for cultivating organisational disciplines and management practises arises from the profitability imperatives. Then, due to the increase in the organisation's headcount, new challenges involved in leadership and delegation practises are encountered. Both the second and third phases involve firm reorganisation acts.

Developing the theory of the consumer attitudes towards purchasing products into five categories, Rogers (1995), in fact, defined a growth path for innovations to become the foundation of an established business firm. With Rogers' original names followed in parenthesis with the names used by Moore (1999) and then the distribution percentages, the suggested customer segments are: (1) innovators (technological enthusiast) (2.5%); (2) opinion leaders or early adopters (visionaries) (13.5%); (3) early majority (pragmatists) (34%); (4) late majority (conservatives) (34%); and (5) laggards or late adapters (sceptics) (16%). Consequently, the growth path of an emerging technology business firm goes through the initial market divided into technology enthusiasts and early adopters, which is followed by the mainstream market crowded by early and late majority and then laggards (Moore 1999).

Moore's major finding was his proposal of the chasm situated between early adopters and early majority segments, symbolising a dividing line for growing technology companies to become established mainstream market players. The essence of chasm is

explained by different buying behaviour between the two segments beyond the chasm. The enthusiasts and early adopters are interested in new technology as such and would tolerate incomplete products, whereas the early majority base their buying decisions on technology maturity and other buyers' behaviour (Moore 1999).

The first two techno-orientated customer groups are easy to catch with technology-based sales arguments because they assimilate easier with the technology companies' people than the other groups do. The mainstream market, in turn, is delineated by pragmatists who do not identify with technology firm people but rather with other customers within the early majority group. Therefore launching onto the mainstream market goes by gaining multiple niche segments and of creating a reference point for pragmatists to become confident with the market offerings.

In fact, Greiner and Moore share a common opinion that firms shifting from the innovation mode to further stages of growth are faced with pressures to create and restructure not only their operation management issues but business model, too (see e.g. Moore 1999, p.24).

Among the first, Cooper conceptualised his stage-gate model, which comprises three centric elements: product management, technology risk mitigation and financial risk control (Cooper 1979; 1990). In general, firm growth stage models share a common underlying logic that is embedded in the transformation capability of business organisations to take the next leap up the growth ladder.

The product lifecycle concept is like the firm lifecycle concept because a firm is a bundle of products and services. Just as a product's life cycle undergoes stages of growth, maturing, and stagnation (Anthony & Ramesh 1992; Black 1998), firms also encounter the same episodes as noted in the life-cycle theory of the firm (Mueller 1972, pp.199-219).

Diversification can be linked with the stages of growth and decline in the lifecycle models. The former is taken first and followed by the latter. In fact, diversification is discussed mainly in strategy management literature. Diversification strategies are used to expand firms' operations by adding markets, products, services, or stages of production to the existing business. The purpose of diversification is to allow the company to enter lines of business that are different from current operations.

In strategy management literature, growth is mostly regarded as expansion in terms of the product or market diversification. Traditionally, (Ansoff 1957) four combined diversification approaches are introduced: (1) market penetration in existing markets within existing products; (2) product development within existing markets by new products; (3) market development into new markets with existing products; and (4) diversifying at the same time by new market area, customer and new products. This concept has inspired many strategy management scholars and is seen either explicitly (see e.g. Penrose 1959; Ansoff 1965; Hamel and Prahalad 1994) or less visibly (e.g. Porter 1980; Kogut & Zandler 1996; Mintzberg 1994) in their writings.

The modern innovation management thinking emphasises the reactivity to changes observed in the market entailing emerging new business opportunities (Chesborough 2003, p.216; Teece 2000). Firms may leverage substantial gain from new strategic innovations (Abraham et al. 2001, pp.21-26). While expanding the business portfolio with new business embryos, the course of a new technology firm may turn out to be troublesome, necessitating the rejection of current less profitable businesses (Rasila 2004). Hence, expansion is interrupted by rethinking the course and the firm's customer and product portfolio; yet the re-formulation of the business model and eventually the business strategy becomes necessary (Mintzberg 1994).

In other words, firms must be capable not only of growing but also downsizing their business portfolios when the profitability imperative calls for the divesting or closing of less profitable customers/markets and/or products. Consequently, firms are obliged to manage their market space bidirectionally (Näsi 1987; Näsi & Neilimo 2006, p.187), which means shrinking and expanding businesses for sustaining long-term profitability – that is to say, restructuring.

Romanelli & Tushman (1986) stated that the evolution of a particular organisation goes through periods of convergence and divergence related more to shifts in technology than issues of growth. Miller (1986) and Miller & Friesen (1984) directed their attention to the essence of the firm internal patterns in explaining the dynamism of growth, which is seen in the emergence of new configurations of firms' structures and strategies.

Especially growth ventures are compelled to handle internal and external pressures when surviving with scarce resources (Hoy et al. 1992; Covin & Slevin 1997). Based on the study by Hambrick and Crozier (1985), there are four major challenges facing growing firms: (1) the firm's [increasing] size, which produces disaffected employees and gaps in the skills and systems required to manage growth; (2) the sense of infallibility, which makes entrepreneurs less willing to change their strategies and behaviour even as competitive conditions change; (3) the internal turmoil associated with quickly integrating new people into the organization; and (4) the need for extraordinary resources to meet the demands of rapid growth.

When poorer times come and firms' business shrinks, flexible firms will survive despite decreasing revenues. However, in certain cases economic stagnation or other firm external reasons would push firms into a downturn, where an exit gate to the recovery stage and back to a growth track turns out to be impossible (Jansen et al. 2007, p.9). Finally, less successful turnaround firms may drift into an insolvency state (Koulu 2007; Laitinen & Laitinen 2004). It is important for firms' executives to constantly monitor the cost profile to ensure profitability. Jansen et al. (2007, p.9) noted that: “[A]fter a hesitant start-up of an organisation, success arrives. But after another period of time the success decreases and the decline begins”. In order to alleviate the stress and more even relax the situation, this occurrence demands competent leadership and courage, as the problem changes become more serious when the downward process continues (Jansen et al. 2007, p.8).

Following the research area, this study also considers the modalities of reinforcing companies through a firm restructuring operation. Restructuring would encompass not only streamlining the organisation's operation or introducing new disciplines, but also replacing some of or even the entire top management with new talents, which is called a management buy-in transaction, abbreviated to MBI. In this case, shareholders expect that a new CEO with a new top team would bring pace to the firm's growth and produce better results than the replaced team.

In the case of dissatisfaction over the demarcation line between owners and key employees, the latter would find the support of the owners insufficient, or for some other reasons they would like to buy a majority of the shares. A transaction where current key employees, probably the entire top management team, take the power in their firm is termed a management buy-out, MBO.

A leveraging buy-out, LBO, may become appropriate when the target firm, the investee, is in a troubled situation and needs both advisory and financial capital. Moreover, the investors see an opportunity to leverage the firm back onto a growth track and gain a return on their money.

The table next here (FVCA 2009) summarises the four modalities of restructuring an entire firm, including owners.

Table 17: Other optional restructuring venture capital acts involved in or between stages

STAGE-INDEPENDENT RESTRUCTURING OPTIONS OF VENTURE CAPITAL PROCESS				
		Mission	Appropriate tasks	Intellectual and financial capital
1	Management buy-out, MBI	Replacement of the current top management by a new management team	Multiple re-growth centered tasks	IC explanation not available in the VC theory
2	Turn around	Capital financing for a distressed firm in need of restructuring its business model and consequently gaining profitability. Advisory, business model restructuring activities Ownership restructuring	Multiple rescue centred tasks	Intellectual capital explanation not available in the venture theory
3	LBO, Leveraging buy-out	In certain cases the financing is structured in terms of LBO, leveraging buy-out, intending to minimise private equity to the detriment of creditors, thus yielding high returns with high risk	Multiple leveraging centered tasks	Intellectual capital explanation not available in the venture theory
4	MBO, management buy-out	The current top management buys out other shareholders not in management roles. Buyers gain a majority of shares and control over the firm	Multiple re-growth centered tasks	Intellectual capital explanation not available in the venture theory

Noteworthy in Table 17 is finding the different restructuring options applicable for a company seeking the re-direction into a new growth path.

4.4.2 Venture Stage Model

A stage model adapted especially to technology growth firms was defined by Kazanjian (1989, p.1489) and it considers four stages: (1) Concept and development; (2) Commercialisation; (3) Growth and; (4) Stability. The difference between the stage and life-cycle models is that the former focuses on the firm expansion, leaving out the further stages after reaching maturity like stagnation or decline. Moreover, the explanatory power of stage models is restricted to the growth of a new business that may take the form of a new business firm but also a firm internal business operation within business portfolio companies.

Stage orientated growth models borrow from stage-wise product development conceptions. A firm's readiness to move ahead is evaluated once new emergent market opportunities call for new operational preparedness, organisational structures and abilities (Kazanjian 1989, p.1489). For example, a stage-wise leap may be internationalising that involves firms playing in the domestic market first to strengthen their distribution channels (Melin 1992).

With respect to the growth of ventures, venture capital theory points to a common practice, which is dosing financial capital stagewise in investee firms. This practise is dictated by business risk controlling imperatives (Sahlman 1990). The way to success is divided into stages, beginning from the innovation stage up to the stage of a mature growth firm. Each of the stages could be considered as an investment judging one manageable entity for investors. A particular stage here is a place for investors to allocate their money, for example the third stage is characterised by a seed-investment, the fourth stage by start-up financing, etc., as defined in the right-hand column in Table 18 below. The stages are also the available exit points for investors. A successful growth firm attracts new investors at the later stages, offering a cash-out point for investors who joined at the earlier stages.

Based on pioneer academics in the field of the technology and innovation management (e.g. Rink & Swan 1979; Cooper 1990; Izuchukwu 1992; Teece 2000; Chesborough 2003), profit-seeking entrepreneurship and venture capital research (e.g. Ruhnka & Young 1987; Kazanjian 1989; Tyebjee & Bruno 1984; Bygrave & Timmons 1984; Sapienza 1992), more recent studies (Gompers 2005; Gompers et al. 2005), and practical guideline literature (Galante's Venture Capital and Private Directory 1996, pp.41-43; *ibid.* 1997, pp.61-63; McKinsey 2000; Gladstone & Gladstone 2002; Stathis 2004; Lauriala 2004; PriceWaterhouseCooper 2006; FVCA 2009), this study proposes the following venture capital stage model, ranging from the innovation stage up to a mature firm stage. The last stage is a starting point for heading through an initial public offer arrangement, IPO, into the open capital market and becoming a stock-rated company when desired by the owners. The other choice is to continue the life of a mature firm financed by other means.

The essence of Table 18, next, lies on the evolution of a business embryo to a mature firm and, especially, intellectual capital interpretation with the venture growth stages.

Table 18: VC-stage model with stages 1 – 2 elaborated by the business creation process view

DEVELOPMENTAL STAGES OF A GROWTH FIRM FOLLOWING THE VENTURE CAPITAL PROCESS				
	Stage	Mission	Appropriate tasks	Intellectual and financial capital
0	Discovery and recognition of business opportunities	Screening the business opportunity at the brainstorming level	Evaluation of the business idea; searching for more evidence of the worth of the business idea	Human capital with entrepreneurial capital; Social capital
1	Early conception stage	Elaborating product or service innovation into proof-of-concept level	Conceptualising the innovation Proposal for application areas Filing patent application	Human capital (analysis orientation here with less entrepreneurial drive)
2	Further conceptualisation stage of proving the business opportunity (pre-seed financing, allowances)	Business opportunity validation into the level of demonstrating an applicable product, an entry market and a founder team	Constructing a trial version of service/product Trialling with partner/test market Industry analysis and market potential assessment Preliminary business plan Acquiring seed financing Identifying management team	Human capital with Entrepreneurial capital
3	Product/ service development –and ramp-up a business (project)	Developing a product and/or service; Forming a team and ramping up a business project	Carrying out of product development tasks; Contacting the first potential customers Intensifying the relationship with trialling partner	Seed financing Human c. Social c.
4	Start-up - a firm has been running for a short period or is currently being established	Completing product development (prime product) and initialising marketing and sales; Taking the first sales deals	Enrolling of the elementary business operations; especially sales & distribution and production capacity development are central here	Start-up financing with Social capital (of relation c.) Increasingly market orientated relational c.
5	Early growth - a firm has successfully passed the product development stage and possesses feasible offering(s), products/ services	Initialising full scale manufacturing/ service production Signs of profitability increase	Production capacity enlargement Sales and distribution Financial admin. processes	1 st round financing with Both types of relational capital Human capital increasingly structural capital
6	Expansion/growth – fast growth prevails (2 nd round financing)	Demonstrating a profitable business and capturing the potential involved in expansion	Balancing costs and profits and reaching profitable business. Positive net result from operations	All subcapitals in place
7	Major expansion (Third-stage/mezzanine financing)	Reaching break-even and profitability and initialisation of major expansion	Growing fast after attaining credibility in the market Partner & alliances with appropriate distributors	All subcapitals in place
8	Established company in main market (Fourth/ Bridge financing)	Business maturity is attained and business is eligible for financed in public financial market		
9	Initial public offering, IPO			

The 2nd stage is dominated by thorough analysis work probably carried out by an external consultant. The next stages, 3 and 4, match with the definition stated earlier considering the generation and deployment steps in the business creation process.

As shown in the right-hand column there is a shift from human capital at the initial stages (1 - 3) towards a richer set of other subcapitals. At first, the initiator is empowered by an imaginative process and absorbing ideas through a social network.

Stages 4 – 8 have not yet been discussed here in the other subchapters in Chapter 4, as they provide a special character belonging to emerging new venture firms. Stage 4 is related significantly with entering the market and has a strong relevance to relational capital. The stage is emphasised by gaining new customers.

Next, the 5th stage, early growth, is characterised by increasing the number of product and service variants, but putting the production capacity especially to full use. Potential new customer options become feasible through planning new products and services at the adjacent customer segments.

Stage 6, early growth, elapses when a shift from the initial market position becomes feasible, with less effort allocated to developing new products and/or services. In practise, this means that a firm possesses attractive offerings positing a variety of cost-efficiently maintained product portfolio. Moreover, this enables the gaining of the first positive net result from business operations excluding depreciation and financing costs, i.e. earnings before interest, depreciations, taxes and amortisations, EBITDA. From the diversification perspective, it is more profitable for a firm to expand by market diversification here rather than develop new products.

Stage 7 is dominated by a major expansion which becomes feasible from the strong financial, market and technology position. A firm is now near maturity and possesses the trust of the investors. Here a firm is able to execute costly operations which were not possible at the earlier, riskier stages. For example, generating new product businesses or buying technology firms, as well as international operations, belong to this level.

Finally, the discussed views of this subchapter, related to technology business growth, are present in Table 19.

Table 19: Summary of the perspectives on firm growth

Reference	Validity area/ Pivotal perspective
Growth-orientated stage concepts, both product and new technology business firms.	<ol style="list-style-type: none"> 1. New technology business firm stage conception, Operational stages and resource emphasis (Kazanjian 1989) 2. Venture-to-capital - emphasis on explaining: (1) the whole business growth continuum since innovation stage; (2) knowledge funding mechanism (Rasila 2002; 2004) 3. Stage gate model (Cooper 1990, Black 1998, Anthony & Ramesh 1992) – product management emphasis
VC-related stage models	Venture capital investor cycle mode: Tyebjee et al (1984) (discussed in Subchapter 4.5.1.)
Life cycle-orientated stage concept	Moore (1999) - emphasis on market expansion Greiner (1972) - emphasis on organisational evolution
Product and market diversification-orientated views	Resource dependency view: Penrose (1959); Kogut & Zandler (1992) Strategy management view: Ansoff (1965); Market differentiation strategy view: Porter (1980) Competence emphasis: Hamel & Prahalad (1990, 1994) Bidirectional business space (strategy management) view: Näsi (1987); Näsi & Neilimo (2006)
Business restructuring and internal pattern change-related views	Resource dependency view: Penrose (1959); Miller (1996); Miller & Friesen (1984), Jansen (2007).
Innovation management view	Open innovation management: Teece (2000); Chesborough (2003), Abraham et al. (2001).

The pivotal views of this study are present on the left and the related theorists are on the right in Table 19.

4.5 GROWTH ACTORS

As shown in Figure 2, the research area in the introduction pointed out that the opportunities for value adding actors may become feasible at several stages of growth or distressed episodes. Here in this subchapter the focus is on value adding actors. Two main options are discussed, namely learning and intervention.

4.5.1 Entrepreneurial cycle

Undertaking an entrepreneurial role may be preceded by working for an established company in the role of an ordinary employee. Learning from the technology, customers and industry in question, he or she may become a professional, who, in turn, increases his or her sense of self-efficacy and preparedness to become an entrepreneur (Niemelä 2002). Hence, the career path of entrepreneur is grounded on the role of knowledge worker.

Big companies are interested in entrepreneurially-orientated people. Certainly, companies are willing to take advantage of their energy, which is central to developing new services and technology products (Morris 1998). These employees are sometimes also called intrapreneurs. As stated by Pinchot (1985, p.xv): “[F]rom the standpoint of a company the benefits of having intrapreneur are obvious: Intrapreneurs introduce and

produce new products, processes, and services, which in turn enable the company as a whole to grow and profit”.

These firm-internal first-movers discover new opportunities and are alert to question present strategic choices. Sometimes they have to endure internal pressures on behalf of the quiet majority satisfied with the prevailing development of the firm (Christensen C.M. 1997). This conflicting situation against the traditionalist majority of the organisation or just an attractive business opportunity outside the firm may trigger a shift towards the entrepreneurial role. If not vested with strong ties to the firm, an intrapreneur would very likely become an entrepreneur (Morris 1998, p.15; von Hippel 1977; Burgelman 1984; Sharma & Chrisman 1999).

Once having taken the step to become an entrepreneur, there are different roles available, such as life-style and family entrepreneurial roles. One option is to become independent professionals like lawyers, authors, or business consultants, who judge themselves as knowledge entrepreneurs. Following Senge (2007, p.31): “[K]nowledge entrepreneurship describes the ability to recognize or create an opportunity and take action aimed at realizing the innovative knowledge practice or product”. In general, the transition from the intrapreneur role ahead embodies the next position, which is that of novice entrepreneur.

Actors involved both in business creation and development in the further stages of growth learn from their experiences, hence accumulating their personal intellectual capital (McGrath 1996; Ucbasaran & Westhead 2002; Ucbasaran et al. 2003; Ardichvili et al. 2003). Accordingly, they are termed habitual entrepreneurs, which is the next grade.

So far, none of these entrepreneur types capture the essence of growth-orientated entrepreneurship entailing entrepreneurial capital (defined in Subchapter 3.2.4). Following the exit-logic embedded in the venture capital process, firm owner-entrepreneurs of growth firms are also, like other owners, interested in the long-term outcomes of their hard work and will probably sell part of their shares when feasible. Vesper (1980) outlined the character of growth-orientated entrepreneurs by defining the methods they apply for building their venture. As he stated, there are ten types of entrepreneurs: (1) solo self-employed, (2) team builders, (3) independent innovators, (4) pattern multipliers, (5) economy of scale exploiters, (6) acquirers, (7) buy-sell artists, (8) conglomerators, (9) speculators, and (10) apparent value manipulators.

Later on in their career paths, successful and enriched growth-seeking entrepreneurs may shift towards a capital investor role. This step is preceded by working probably first in a business angel role and after that learning venture capital practises (Harrison et al. 2004). Preferring to stay in a corporation context instead of embarking into the firm owner role, a commendable business manager may, in turn, become promoted to a top management position, holding consistent responsibilities like his or her colleagues in their ownership firms.

What is implied by the profile definition of growth-orientated entrepreneurs does not necessarily work forever with one business project or firm. Goal-orientated entrepreneurs would very likely begin with a new business challenge once the venture at hand has geared up into a more stable state. Entrepreneurs' motivation for achievement (McClelland 1987) is not only reflected by a desire for reputation, but also channelling personal drive in gaining material goals (Morris 1998, p.77). The other motivators can be just a life-style preference for continuously running a new entrepreneurial challenge, as aptly stated by Dick Kouri, of the University of North Carolina's Business School, and himself a 12-time company founder: "starting a company is a very imaginative, innovative, energy-driven, fun process" (IMC Magazine 2008).

Once having launched their first business as novice entrepreneurs and accumulating experience by running the firm as habitual entrepreneurs, some of these people may continue, like Kouri, to launch a second and a third firm, and so on. Finally, entrepreneurs become actors who run businesses in a parallel and/or serial mode: "Serial entrepreneurs are entrepreneurs who have owner-managed more than one business, but only one at a time, and novice entrepreneurs are entrepreneurs with no prior experience from owner-management" (Rosa & Scott 1999; Westhead & Wright 1998; Westhead et al. 2003). Parallel mode, in turn, refers to a portfolio entrepreneur who possesses the simultaneous ownership of several businesses (Carter & Ram 2003).

Once achieving portfolio entrepreneur status, a particular person has reached the highest step on the entrepreneurial ladder. The next optional move is very likely to share his or her ownership with other investors, allocating their financial investments and restructuring the business portfolio into a more profitable form of a multidivisional firm. The underlying idea of restructuring entrepreneurially held portfolio is to gain a higher return-on-investment for the money invested in firms. Probably hiring a professional chief executive officer is needed instead of the portfolio entrepreneur continuing his duties in front-line business operations. The added value entailed by a new talent rests on his or her capability to search for and identify synergistic points among businesses in a certain portfolio (Kaplan & Norton 2004).

The guidelines for managing a business portfolio company imply managing financial risks and aligning organisational processes and behaviour. Kogut & Zandler (1992, pp.393) emphasise balancing short-term survival and long-term development of capabilities. Following a well-known four-field presentation by the Boston Consulting Group (1960), the portfolio is divided into high risk new businesses (star), mature businesses as cash-cow engines (cow), low profit businesses expected to be divested (dog) and rising stars (question mark).

For a new technology firm, the business portfolio is much emphasised by the risk business at hand necessitating a strong innovative organisational mode. Later on, the shift to a more bureaucratic organisation discipline entails the trap of entrepreneurial drive being paralysed and innovativeness expiring, once the early growth phase has passed and all four types of business portfolio are in place. This is also the point of collision of two different organisation climates, as is explained frequently as the reason

for merger & acquisition transaction failures among big companies buying new technology business firms. Also Greiner's lifecycle model discusses this matter in respect of firms shifting from an innovative to a more disciplinary mode. In fact, here is the evidence for the emergence of new intrapreneurs inside a less entrepreneurial organisation.

In a way a merger and acquisition transaction is arguably an end-point for a successful owner-founder entrepreneur, enabling a cash-out for the entrepreneurial work done. Moreover, here is start-point in a new venture elsewhere and a beginning of a new entrepreneurial cycle. Certainly, there is a difference in regard to the qualities of first round and next round movers in terms of being provided with financial and intellectual resources.

The journey of a skilled and expertised individual who is provided with entrepreneurial propensities goes through the roles of knowledge worker, intrapreneur, novice entrepreneur, and habitual entrepreneur. The next stages would take optional paths between the roles of serial entrepreneur or a business angel role, depending on financial status. The logic here follows a cycle where the entrepreneurial actor either continues in the entrepreneurial mode or becomes upgraded into a financial capital investor role such as the business angel role, capable also of investing money as well as intellectual capital (Harrison et al. 2004). In fact, this is the vertical dimension of going forward into the capital investor role. A business angel or just a rich businessman may move towards a formal venture capital firm and leave entrepreneurial front-line operations (Jungman et al. 2002).

The horizontal dimension of the cycle, i.e. serial entrepreneur launching successive entrepreneurial endeavours, has similarities with the venture capital investment cycle suggested first by Tyebjee and Bruno (1984). First, current firm owners and entrepreneurs attract investors to finance their company. This is followed by the entry of investors, their value adding and exit from the investee company.

Following Sahlman (1990), venture capital investments are highly illiquid, as they cannot be sold easily at any point in time. Also, venture capital investments are long-term investments where the time span for early stage projects may take approximately five years before investments are mature enough to be sold, and often several investment rounds are required before harvesting becomes feasible (Sahlman 1990).

4.5.2 Endogenous IC Accumulation versus Intervening Actors

Due to their personal life history and experience of running businesses, entrepreneurs are in a different position with regard to possessing intellectual capital. Novices may have only some human and entrepreneurial capital, whereas a habitual entrepreneur, besides entrepreneurial capital, has enriched human and social capital from his or her past experiences. McGrath (1996) suggested that experienced entrepreneurs may have access to opportunities others cannot detect because of the lack of required specific

knowledge the former possess but the latter do not. Moreover, serial and portfolio entrepreneurs have accumulated not only intangible assets but also tangible resources through their former businesses that might be drawn upon in the process of starting a new business (Scott & Rosa 1996).

Portfolio entrepreneurs, compared with serial and habitual ones, possess a better position for intangible and tangible resources because they may use them across their firms. Borrowing or transferring resources may involve a wide range of intangibles like organisational routines, employees, suppliers and customers, as well as physical resources such as buildings and equipment. In principle, any resource goes if it can be used to contribute to a new firm establishment, as the study by Carter (1998) of farming businesses and farmers holding multiple businesses, points out.

Alsos and Kolvereid (1998) also stated that portfolio entrepreneurs are more often successful in founding a new business than both novice and serial entrepreneurs. This can be interpreted as evidence for the superior value of owning essential resources for business formation rather than holding experience from prior ventures. In fact, the ability to use diverse intangible and tangible resources is like possessing a private business incubator.

Putting the previous text in terms of intellectual capital portfolio, entrepreneurs possess market-orientated relational capital, structural capital as well as human capital provided by employees of their firms, which are not possessed by serial and habitual entrepreneurs.

Table 20: Summary of entrepreneurial roles and their intellectual capital

Entrepreneurial roles and intellectual resources				
	Entrepreneur type	Definition	Dominant intellectual capital modalities	RBV
1	Intrapreneur	Prime movers of firms	Human C.: Knowledge	Knowledge, diverse job competences
2	Novice	Less experienced entrepreneur	Human C.: Knowledge, entrepreneurial capital	Knowledge, diverse job competences
3	Habitual	Experienced entrepreneur	Human C.: Knowledge, entrepreneurial capital Relational C: some social c.	Knowledge, diverse job competences, business firm experience
4	Serial	Highly experienced professional entrepreneur	Human C.: Knowledge, entrepreneurial capital Relational C: social capital, relationship capital (market orientation)	Previous + probably some financial resources
5	Portfolio	Highly experienced entrepreneur and influential businessman	Human C.: Knowledge, entrepreneurial capital Relational C: Ample social capital, ample relationship capital (market orientation) Structural Capital: Available from other firms	As the previous + Financial capital Tangible firm resources

Besides the endogenous accumulation of resources feasible for nurturing businesses, a second option is drawing resources from external sources. Especially, novice founder-entrepreneurs may lack diverse intellectual capital qualities like knowledge and contacts

to enable them to move ahead (Rice 2002, p.172), and, when desired, accelerate the growth process (Rasila 2004, p.106). Probably other entrepreneur types representing an individual or a team may contribute to exogenously served value as discussed here. Not sure about this last sentence

Growing ventures are faced with lack of information, trust, and competencies (Christensen J.L. 2004, p.3). These lacks are frequently discussed as gaps in the growth towards a mature firm (Näsi 1990; Harding 2002; Rasila et al. 2002, p.92; Rasila 2004). Specifically, entrepreneur teams may suffer from a competence gap, matching gap and financial gap. The former is related to job competences requiring an outside technology development regime, which is the founder team's strongest knowledge domain. A matching gap is the problem of finding a feasible venture capital investor that contributes not only financial capital but appropriate knowledge about the industry and customer in question. Moreover, a matching gap is defined by attracting any capital investor interested in an early stage risky endeavour. In turn, a funding gap captures deficiencies in the financial dosing system. Tyebjee and Bruno (1981) found that venture capitalists spend almost 50 % of their time screening and evaluating business proposals. Hence, the ratio of the effort allocated for scrutinising a particular venture case proportional to expected returns becomes less attractive the smaller the size of the investment is.

Crossing over these gaps, before receiving the first formal capital investment in the start-up stage, an entrepreneur is very likely to be guided by a venture-to-capital actor(s) (Rasila 2004; Okkonen & Rasila 2003; Harrison et al. 2004, p.689-691). In accordance with that term, a venture-to-capital actor stands between venture and capital, bridging the founding team with capital investors. They, he, or she are prepared to invest especially time and personal knowledge and experience, and when necessary, perhaps also money.

In fact, the concept of investment-like intellectual capital value adding introduces an intervention process where the external resources served by actor(s) are combined with the firm internal resources held by the entrepreneur(s). The titles of external contributors possessing especially intellectual capital are called co-entrepreneurs or knowledge angels (Harrison et al. 2004), who may be found from the members of the board of directors or as well as in managerial roles, or a mix of both. Their added value can be compared with the non-financial contributions made by business angels, divided into six categories: advice, contacts, hands-on assistance (legal, accountancy, provision of resources), serving on the boards of directors and advisory board, providing market and business intelligence, preparing firms to raise venture capital and providing credibility/validation (Madill et al. 2005).

From the firm point of view, a shortage of varied resources hinders the survival especially of new and small businesses. Secondly, raising financial capital and recruiting skilled employees may become obstacles to growth (Cooper & Dunkleberg 1986). Some scholars further raise the acquisition of resources to a central position in starting a new business (Landström & Johannisson 2001; Alsos et al. 2004, p.3).

The complementary roles of intervening parties joining the management team or taking a key person role within a venture may take diverse roles. The intervention depends on the case at hand, suggesting not only appropriate roles for intellectual capital investors, but also the time span of activity: “[I]n the short run co-production gives firms the capacity to deal with jolts, crises and problems. In the long run, it provides time for the firm by itself—or for the firm in a co-production partnership with the incubator — to develop the knowledge, competencies, and resources necessary to achieve autonomy from the co-production partner and sustainability as an economic entity” (Rice 2002).

With respect to the growth stage, Komisar (2001) suggested that a growing firm requires different leader types occupying the chief executive officer position. His notion considers more the mental profile, not actually the division into the needed know-how background, as discussed next.

To assist in linking the intellectual capital categories and patterns of entrepreneurs, Morris (1998, p.82) has interestingly characterised three entrepreneurial archetypes. They are namely the super sales-person, the real manager and the expert idea generator. Their more precise characterisation is presented in Table 21 next here. The first, super sales-person, is characterised by interpersonal intelligence (see lines 1 & 2), which refers to social capital witnessed also in lines 3 and 4 in the table. The sales-person is also an internal advocate for the salesforce and customer relationships (see lines 5 & 6) that refer to the market orientation of relational capital.

Table 21: Entrepreneurial profiles by Morris

Three entrepreneur archetypes			
	The Super Sales-person	The Real Manager	The Expert Idea Generator
1	Capacity to understand and feel with another	Desire to be a corporate leader	Desire to innovate
2	To empathize; desire to help others	Desire to compete	Love of ideas
3	Social interaction and relationships are important	Decisiveness	Curious, open-minded
4	Need to have strong positive relationships with others	Desire for power	Belief that new product development is a crucial component of company strategy
5	Belief that the salesforce is crucial to carrying out company strategy	Positive attitudes to authority	Good intelligence; thinking is at the centre of entrepreneurial approach
6	Background of fewer years of education and	Desire to stand out from the crowd	Intelligence is a source of competitive advantage
7	More years of business experience, especially in sales		Desire to avoid taking risks

Individuals holding real manager profile are obviously found in the CEO or the top general management positions or in the board of directors. His or her contribution to a growing firm could be characterised as holding leadership and power in decisions. Morris did not give a direct link to intellectual capital, but most obviously a real manager creates and practises management disciplines.

The third profile, expert idea generator, possesses a substantial amount of technology-related human capital (see lines 1, 2, 5) and tends to leverage it to the firm property (lines 3, 4, 6), which refers to structural capital (especially line 6), or even more, intangible assets like patents.

Although Morris states plausibly the three profiles, however, some scholars are likely to demonstrate patterns that fit into more than one of these categories (ibid, p.82).

4.5.3 Informal and Formal Venture Capital Actors as Intellectual Capital Investors

Informal and formal capital investors invest their intellectual asset, too, and are comparable with intellectual capital investors, though the role of financial capital investing is salient. The first of the two mentioned groups embodies actors like business angels who are prepared to allocate their time, intellectual resources and money without major contractual manoeuvre. The second one, in turn, is captive to the formal investment decision-making procedure. Moreover, venture capital firms differentiate themselves by specializing in the timing of when they fund entrepreneurial firms (Carter & Van Auken 1994) that claims the stage dependency of VCFs.

The relation between investee firm and investor is characterised by investors' preferences. In his study, Christensen J.L. (2004, pp.1, 10-11) suggested that a VC-firm favours working with portfolio firms which are "relatively large, innovative, financially fragile, and with large growth rates" (Christensen J.L. 2004, pp.1, 10-11). There is not only variation in how much venture capitalists are involved, but also the quality of contribution from them (ibid, p.1).

Table 22 below makes a comparison between incubators resourced by temporal advisory and some permanent staff working much in the informal capital investor role. Judging them solely as intellectual capital investors is not fair as they also provide seed money. The venture capital investor analysis in Table 23 is taken from the results of the study derived by Christensen J.L. (2004, pp.6-8) among Danish VCFs and their portfolio firms, accompanied as well as by a comparison with VCFs in the UK and Sweden. Both studies address the demand and supplier side perspective, i.e. VFC/Incubator and venture firm.

The content in Table 22, next here, is confirmed also by other studies. Schaefer & Schilder (2007, p.13) introduced "the most frequently derived advisory - smart capital - by VCFs, Business Angels and institutional financing agencies which were: accounting; controlling; marketing; technical problems; strategical problems; network advantages; financing; patent protection; juridical problems solving", those similar to the findings in Table 22.

Table 22: Non-financial resource allocation of VCFs and incubators

	A chart of resource's in new business creation				
Resource type	Detailed expression	Actor/ VFC (Christensen J.L, 2004) & Incubation (Rice, 2002)	Importance	IC interpretation	
Financing	Loans from banks, additional funding	(VCF, Incubation)	High (on both)	RC in getting VCF external funding	
Financial administration	Cashflow mgt, accounting, tax issues	(VCF, Incubation)	High (on both)	SC, HC	
Strategy work	Business planning New business opportunity judging	(VCF, Incubation)	High (on both)	SC, HC	
Product mgt; new business creation	Increase in RD-activities; ability to develop new products;	(VCF, Incubation)	High	SC, HC	
Customer and partner relations	Contacts and networks	(VCF)	High	RC (social capital)	
External stakeholders' relations and governance	Getting grants and loans, procurement issues	(Incubation)	Medium (Incubation)	RC, SC	
Competence mgt, HR	Competence development Recruitment advisory; Team building advisory	(VCF, Incubation)	Low (VCF); High (Incubation)	HC, SC	
Marketing & Sales	Knowledge of the market Sales/marketing/international trade	(VCF, Incubation)	Medium (Both)	HC (of market intelligence); RC	
Technical experience	Technical know-how	(VCF, Incubation)	Low (Both)	HC	
Specialised advisory	Insurance, legal, IPRs related issues	(Incubation)	Low (incubation)	HC	
Equipment resources	Laboratories, production machinery...	(Incubation)	Low (Incubation)	Tangibles	

Human capital is the pivotal intellectual capital of informal and formal venture capital actors, as stated by Harrison and Mason (1992): “In relation to value-adding activities, human capital variables were the most important, with previous consulting experience and entrepreneurial experience contributing to a higher involvement in value-adding activities.”

As stated in the table, most of the intellectual capital interpretations in the right hand column refer to human capital (HC) and accompany other intellectual capital subcapital. This refers to human know-how of knowing how a particular task is executed, which moreover manifests structural capital (SC).

The table is in line with findings suggested by Gorman and Sahlman (1989) and Elango et al. (1995), who found funding, strategy work and management recruitment pivotal tasks for VCFs. Reid (1999) suggested financing and financial expertise as the most important contributions, whereas knowledge of product or service and knowledge were

less important. The latter is also confirmed by other researchers (e.g. Fredriksen et al., 1997).

Reid (1999) and Elango et al. (1995) both stated that market intelligence and relationship introductions to customers, suppliers and service providers were less central to highly involved VCFs.

Subchapter 4.5 of the study has so far focused on three issues: entrepreneurial cycle, leveraging from entrepreneur to capital investor and resources involved in those actor roles. Moreover, the first two subjects together give a comprehensive view of entrepreneurial evolution and offer the conceptual foundation to mention by name actors appearing in the analysis part. Central to this study is also the resource pool provided by those actors.

Inspired by Carter's studies (e.g. 1998; 2003) on portfolio entrepreneurs' capabilities to raise new businesses, Vintergaard (2004) termed the resource pool needed for any new business endeavour as the seed-bed. It is the resource pool required for making a particular business opportunity become a true business. The resource providers may be the firm itself, owners, close partners tied with strong bonding, and ordinary trading partners. These resources are assets and capital involving tangibles owned by firm or other actors, intellectual capital and financial capital. Tangibles are such as production machinery, product development facilities, current knowledge embedded in the products and services, customer relationships and structures, and so on (Alsos & Carter 2004; Vintergaard 2004).

In this study the concept of seed-bed is used to define the resource pool necessary for initialising the business, entering the market and gaining an initial customer base. Based on the summary tables of Subchapter 4.2, a seed-bed in terms of intellectual capital theory is defined as:

- (1) Relational capital of financing: linking capabilities to other financial sources
- (2) Human capital of financing: financial instrument know-how
- (3) Structural capital: diverse management and administration structures, disciplines, processes and best practises
- (4) Relational capital: knowing who knows, partners, prospective customers, human capital – technology, market knowledge and intelligence
- (5) Human capital: normative advisory (legal, tax,etc), knowing how to develop the desired organisational structures
- (6) Human capital: business wisdom like strategy planning and industry forecast abilities
- (7) Structural capital of tangibles: diverse assets feasible for new business firm and the structural knowledge embedded in those assets.

As a summary of the whole of Chapter 4, the table next here, summarises the pivotal theoretical consideration both from the resource-based and intellectual capital views.

Table 23: Summary of Intellectual Capital Value Adding Dimensions in Ch. 4

TABLE – a Summary of the Chapter 4				
Ch.	Content	Mission	Resource Based View	Intellectual Capital Perspective
4.1.	New business creation continuum: recognition, combination, exploitation, deployment	Explaining the stages from scratch to established business entities by entrepreneurial terms		Characterising by human knowledge and entrepreneurial, social, structural and relationship capitals
4.2.	Intellectual capital value chain	Explaining interplay of subcapitals and their positioning in value adding continuum from the three theoretical perspectives	Terminology used here is dominantly intellectual capital orientated	Subcapitals and related factors
4.3.	Investability of intellectual capital	Identifying the most strategic resources and assessing their appropriateness for the definition of investment-like intellectual capital value adding	The subchapter is grounded mainly on RBV and strategy management literature except 4.3.1, which focuses on investment cycles	Linking IC terminology with business model and competitive advantage definitions
4.4.	Business growth – macro view concepts	Introducing theoretical concepts describing technology business growth	Diversification and venture stage model are grounded on RBV related terminology; Life-cycle concept is the umbrella concept for the previous two	The study makes an alternative cross reference table between venture stage model and intellectual capital definition of subcapitals
4.5.	Value adding actors: 1) entrepreneurial accumulation and 2) co-entrepreneurial intervention	Introducing value adding actors and their appropriateness/alignment for contributing to firm growth	Concept of seed including intangibles, financial and other tangible assets	Intangibles are defined in subcapitals and their factor terms

The concepts here create the conceptual foundation for the operationalisation of case studies. One of the points lacking in Chapter 4 is that intellectual capital terminology and conventional business operation management and strategy management terminology are dispersed. For example, intellectual capital terminology is dominantly used in Subchapter 4.2, but is absent in the other subchapters except for the author's alternative cross-reference in Table 18 in Subchapter 4.4.2. Hence, the analytical part of this study beginning from Chapter 5 aims to create a coherent theory apt for describing technology business growth both on the micro and macro level by combining resource-based and intellectual capital terminology.

5 INTRODUCTION OF EMPIRICAL PART

Chapter 5, the introduction of the empirical part, is divided into three subchapters. The first is dedicated to the introduction of the research process beginning from the finalised case studies in Subchapter 5.3, which is not the beginning of the entire research project but stands in the midst of that effort. The preceding part of the research project is explained in Subchapter 5.2 briefly. The essential part of the prior material are the long case study reports not included in this study, except for the long case report of the first case firm, the Machine Vision System Firm, which is attached in Appendix 1. Finally, the last subchapter introduces the lifecycles of the four case firms in the form of longitudinal narratives.

5.1 RESEARCH PROCESS

Subchapter 5.1, the framework for analysis is the introduction to the research process in Subchapters 5.2 – 8.2. Indeed, the early stage of the research process which is the research data collection and establishing the research database is discussed in Chapter 2, on methodology. Consequently, Subchapter 5.2 continues from that point onwards.

The content of Subchapter 5.1 is two-fold. First, the chosen analytical orientation is considered. The discussion is grounded on the research strategy present in the methodology part, where the crystallisation of the strategy is illustrated in Fig.6. Second, the content of each of the subchapters of the empirical part is discussed to highlight how the operationalising of theoretical concepts is exercised and how the interim results are achieved in terms of answering to the research questions.

Considering the first view, two levels of carrying the analytical work are central to understanding the flow of the research process. The first level is the overall analytical orientation, the research strategy, expressed in Fig. 6 by the three main stages: (1) exploration - description by induction, (2) exploration – generic conception (mostly) by induction, and (3) prediction – model building by deduction. This point of view is explained further on in Subchapter 5.1 as the starting point here is the second one.

The second analytical orientation is a subordinate to the previous as it considers the flow of the research process in a more detailed level. It encompasses 6 stages emerging in the research process. More precisely, the stages were not designed in advance in this research project but, especially, they manifested themselves along the iterations carried here until the finalised research process as available here now. The stages are: (1) deriving concepts from the research data; (2) validating the applied theoretical concepts with research data; (3) linking concepts with each other or just pairing them; (4)

extending their applicability by generalising the results; (5) creating a prediction model, and (6) testing the prediction model with the case material.

These six different stages of deriving analytical process have a great deal of similarities with the suggested five different theories of analysis found within information system studies. As labelled by Gregor (2006, p.611) they are: (1) theory for analyzing, (2) theory for explaining, (3) theory for predicting, (4) theory for explaining and predicting, and (5) theory for design and action. Instead of Gregor's point of view, however, this study uses the rationale of the mentioned six orientations.

Apparently, the first three orientations (1 – 3) are referable to the logic of induction. In turn, the last three analytical orientations (4 – 6) are aligned with the logic of deduction.

Most clearly the first orientation (deriving concepts) comes through in Chapter 6, as well as during the preceding work not presented in this study, but however explained in Subchapter 5.2.

The second and third approaches, validating the applied theoretical concepts with research data, and linking them together, concentrates on operationalising the theoretical concepts within the research area, which is exercised through subchapters 7.1.1 – 7.2.2. Too, they are found in Subchapters 7.5.1 – 7.5.3 and 8.1 within the theoretical concepts operationalisations. Consequently, the logic of induction is cultivated here.

Next, the fourth approach, generalising concepts, where the logic of deduction is dominant is shown in Subchapter 7.3 considering the research line 2, in Subchapter 7.5.4 of the research line 3 and Subch. 7.6.1 of the research line 4.

Next, Subchapters (7.3.2 and 7.4) are characterised by creating a prediction model, which is here the growth pattern. First, it is expressed in terms of operation management (7.3.2), and then in terms of intellectual capital (7.4). This fifth approach is found, too, in Subchapter 7.6.2 of the definition of the investment cycle framed by the single diversification.

The sixth and last approach is found in Subchapters 8.2 and 8.3 where the concept system of the investment-like intellectual capital value adding, the prediction model is finalised. The variety of investment levels is discussed also in Subch. 9.1 belonging to the regime of the sixth approach. Certainly, the dominant approach here is deduction.

The first view is now introduced, the three stages as mentioned earlier here. However, the key to understand the research process is present in the four research lines shown in Figure 25 next here, where the three stages are linked to. Accordingly, the content of each of the subchapters of the empirical part from the research line and its analytical perspective is introduced next.

The first tasks, not included here in this study, were writing the long case reports and tabulation of business processes following the logic of exploration-description by induction. All of the interim steps of the analysis work from the research database up to the case studies in subchapters 5.3.2 – 5.3.5 are not, unfortunately, documented and

included here, but described in general in Subchapter 5.2. The interim results from this period are the case firm specific business process tabulations and long case studies.

The next act after writing the long case reports was building the actual narratives of the case firms available in Subchapter 5.3. In turn, the case narratives are the foundation for carrying the analyses in Chapter 6 aiming at a definition of dynamism of technology business growth, and, furthermore, the definition of growth pattern, following the RQ1 – *Generation of the intellectual capital growth pattern*. In Fig. 25 this research path is denoted by the label, STREAM 1.

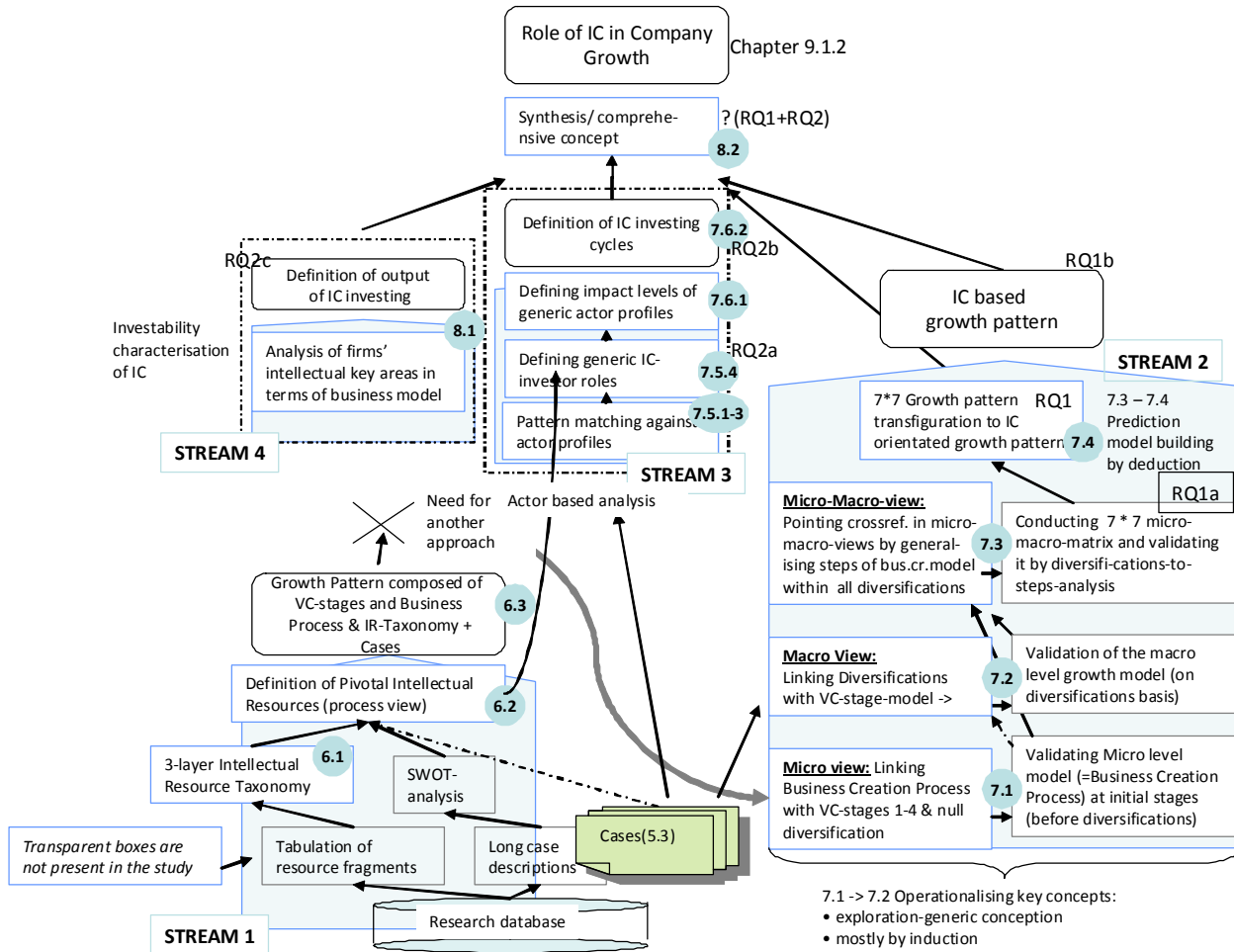


Figure 25: Research Process Overview

In fact, the entire research line 1 (STREAM 1) is captured by the exploration-description by induction. First, the analysis in Subchapter 6.1 focuses on creating the intellectual resource taxonomy, which is a sorting of intellectual resource fragments into the form of a three layer presentation format. The taxonomy was created in chronological order before writing the actual case narratives (5.3).

Subchapter 6.2 introduces the analysis of business process found from each of the cases (5.3) which is further applied for identifying pivotal and less pivotal business processes.

Business processes are considered here as the definition of intellectual resource areas aggregated from the fragmented level up to business process level presentations.

Finally, in Subchapter 6.3 these two analyses are used as the two starting points for building the first attempt to answer the RQ1, the growth pattern. Unfortunately, the result is unsatisfactory and further research is required.

The second research line, STREAM 2 in Fig. 25 is actualised in subchapters 7.1 – 7.4 following the exploration– generic conception by induction. Here, the theoretical concepts from chapters 3 and 4 are operationalised. A summary of these parameters is at the end of this chapter, in Table 24. Therefore, the study proceeds in chapter 7.1 by introducing the concept of business creation process connected with the early stages of venture capital stage model, stages 1 – 4. This synthesis of these two approaches is linked with the theoretical presentation of the intellectual capital value chain (see Fig. 23). It should be noted that from the intellectual capital point of view that the linking is preliminary and gives an idea of interpreting the business creation process in terms of intellectual capital. The actual interpretation comes later in Subchapter 7.4.

Next, the study makes an attempt to conceptualise the VC-stage model in terms of diversification concept, and a satisfactory macro level growth model is defined in terms of minor and major diversifications in Subchapter 7.2. There, the venture stage model, diversification and process concepts are discussed, reshaped and linked together. The first subchapter, 7.2.1, intertwines stages 4 – 5 of the venture stage model with minor product and market diversification (see diversification theory in Subchapter 4.4) and validates these concepts against case data. Next, in Subchapter 7.2.2, the same treatment is done for stages 6 – 7 in respect of the major product and market diversifications. Subchapter 7.2.2 also introduces a third diversification type, restructuring, which is embedded into the macro view-orientated growth continuum presentation as shown in Table 35, and the revised stage model.

In Subchapter 7.3.1 the validity of business creation process concept is extended beyond the early stages of business formation to cover minor and major diversification, which are also stages 4 – 7 of the venture growth model. The essential contribution here comes from the definition of the conformity of diversification types with regard to the business creation process. In other words, regardless of the type of diversification, the internal logic is defined by the 7 steps of the business creation process.

Accordingly, this concept derived in Subchapter 7.3.1, the macro view of business embryo growing towards a mature firm is validated against the case data in the next subchapter, 7.3.2. The validation proceeds to successfully manifest the micro-macro view of 7 * 7 grid, which is composed of 7 diversification levels (vertically) with 7 steps of the business creation process (horizontally). This is also the answer to the RQ1a, “*What is the strategic resource dependency of technology companies’ growth from embryos to mature firms expressed in terms of operations management growth pattern?*”.

Eventually, Fig. 29, in Subchapter 7.4 is the definition of linkages between the 7*7 grid and intellectual capital definitions which is, moreover, the growth pattern in terms of

intellectual capital. Yet, it comprises the answer to the latter part of RQ 1 of this study: “RQ1b: *What is like the growth pattern defined in terms of intellectual capital?*”

Next, the focus is shifted towards the RQ2a, b, c - *Describing the intellectual capital value adding cycles framed by investment in technology company growth*. The pattern matching, in Subchapter 7.5 opens the three fold research line 3 (STREAM 3, Fig. 25). First, it is the validation of growth pattern by the actor cases. Here, the actor profile analyses of potential intellectual capital providers taken from the case studies are verified against the 7*7 operation management related pattern and the 3*7 IC pattern derived in Subchapter 7.4. Consequently, this is the answer to the RQ2a – “*What are the generic profiles of diverse intellectual value adding actors matched against [that] IC-pattern*”.

Second, the research line 3 holds a generalisation of intellectual investor profiles as well as a definition of the most obvious dependencies of intellectual capital as the entry points of new investors. Third, an abstraction from the generalised actor profiles entailing the four field investment cycle concept framed by a single diversification is exercised. The third view paved by the second view, the third view here gives the answer to RQ2b – “*What are the feasible IC-value adding spot areas and their levels of importance according to the IC growth pattern*”.

The research line 4 involves two perspectives. The first is in Subch. 8.1, where the operationalisation of the business model is carried and three business model types are introduced based on the business processes captured in Subch. 6.2. Second, supported with the gap-analyses of the firms’ intellectual resources dependencies, in Subch. 8.1.2, the definition of the business model composed of the competitive advantage factors is disclosed. The result of Subch. 8.1 is stating the cross-reference between the competitive advantage factors and diversification as the definition of the output of the investment-like intellectual capital value adding. It is also the answer to RQ2c- “*What is the cause-effect of intellectual capital from the investment perspective in company growth*”.

The concept of investment-like intellectual capital value adding is the desired outcome of the study besides IC growth pattern as suggested in Subchapter 8.2. Thus, on the grounds of: (1) the IC interpretation of 7-step new business creation micro and 7 level diversification model forming the IC-growth pattern; (2) the congruence within the four fields of and subcapitals of intellectual capital as the manifestation of the single investment cycle framed by the single diversification and, (3) cause-effect system of IC impact on competitive advantage, the logic of intellectual capital investment is stated in Subch. 8.2 and, then, validated against case material. Also, this concept system is the overall answer to the RQ1 and 2.

As a summary and discussion part to the results stated in Chapters 7 and 8, Subchapter 9.1 considers a positioning for the investment-like intellectual capital value adding within the context of growth firm investing. This consideration entails the distinctive profile for the investment-like intellectual capital value adding apart from the other types of intellectual value adding and venture capital investing.

Next, a summary of the theoretical concepts taken from Chapters 3 and 4 and their use for operationalising purposes is illustrated here in Table 24 next here.

Table 24: Operationalisation parameters

Title of concept	Essence of concept for analysis	Position of operationalisation	Source/ Subchapter
Intellectual resource tabulation	Creating an intellectual resource taxonomy	Constitutes the intellectual resource taxonomy	Derived from research data
Intellectual resource taxonomy	Creating the foundation for a hierarchy view of intellectual dependency of firms. A basic concept and also the most fragmented view of intangible resources	Aggregated levels (1 st and 2 nd levels) constitute the IC-interpretation of competitive advantage creating resources (in 8.2.) and gaps for external IC-providers	Derived from the tabulations. Triangulated with other literature
Business model	Explaining the composition of pivotal business processes	8.1: (1) Generalising business firm types into main categories; (2) manifesting the fundamental entities of creating competitive advantage	
Seed-bed	Description of value adding by intellectual resources engaged with financial capital and tangibles	8.2: Key concept for profiling intellectual capital investor candidates	Theory in 4.5.3
Business creation process – abbreviated BCR	Describes the required steps of creating new business from the resource dependency point of view and its generalised concept is central in linking IC with growth and RBV-view.	Linking with Venture Stage Model (stages 1-4) in 7.1; Generalising in 7.3 by diversifications	Theory in 4.2
Venture Stage Model	Defines more detailed business processes at growth stages than other macro-level concepts (value chain, diversifications)	Validation in 7.1 and linking with BCR in 7.1 Linking with diversification model in 7.2	
Diversification types	Defines the three growth modalities of technology growth orientated firms	Definition of null diversification in 7.1. Validation in 7.2.1 - 7.2.2 Confirming micro-macro-model in 7.3.2	Theory 4.4.1
Micro-macro-model/ 7*7 grid	Derivable from integrating BCR with diversifications	Deriving intellectual capital growth pattern, a 3 * 7 matrix presentation	
Competitive advantage	Creating different weighing values for intellectual resources and describing tradability	8.2 CA is compared against business critical IC-factors interpreted from taxonomy	Theory in 4.3.4
Intellectual capital value chain	Key to comprehend the interrelatedness of intellectual subcapitals	grounded on 3 * 7 matrix IC growth pattern and 7* 7 operation management based growth pattern (7.3.2)	Theory in 4.2
Intellectual capital typology	Describing the intellectual capital and involved subcapitals and factors applied in search of the IC-investor profiles and IC-dependency.	No validation. Linking subcapitals within other subcapitals and the embedded factors are applied here in the analysis following the theoretical evidence. Applied: 7.4: Linking RBV-based Business Creation Process view by the terms of IC 8.2: Linking competitive advantage with IC while seeking the most obvious opportunities for IC-investors 7.5: Transfiguring investor profiles in the terms of IC	1) Theory in Ch. 3 2) The theoretical cross-reference-tables, 19 (4.4.2); 21 (4.5.2); 23 in 4.5.3 manifesting venture-stage model and investor-profiles by IC-terms
Value adding actor types	Describing the most potential actor profiles to meet the criterion of intellectual capital investor (among other investor profiles)	Nomenclature of actor types is applied in 7.5 Actor type specific (VCF, BA) resource offerings are taken for verifying the seed-bed offered by actors in case studies in 7.5	Theory in 4.6
Seed-bed	Concept of intellectual capital, tangible and financial resources applied to defined the resources of investing in firm growth	Validated in 8.2	Theory in 4.5
Cash flow	Concept for defining the cash flows from operations, investments and financing	Applied in 8.2	Theory in 4.3

*) The intellectual capital value chain is the principal concept to be derived here, hence there is no preceding validation.

5.2 PRECEDING WORK OF CASE ANALYSES

The preceding work before writing the compressed case narratives in Subchapter 5.3 included writing the long case reports and the case firm specific business process tabulations.

As stated in Figure 26, next here, in the upper-most block, the first step after collecting the research data (see Subchapter 2.4) was establishing an organised research database. This was followed by creating the longitudinal case reports, as pointed out in the next block down in Fig. 26. For example, the Machine Vision System Firm full case report has 47 pages, the Optical and Spectroscopy System Firm 27 pages and the pre-seed case 18 pages. The Contract Manufacturer Firm case was written directly into a compressed format. There were also other supplementary data, like tabulations and competence gap analyses not presented here.

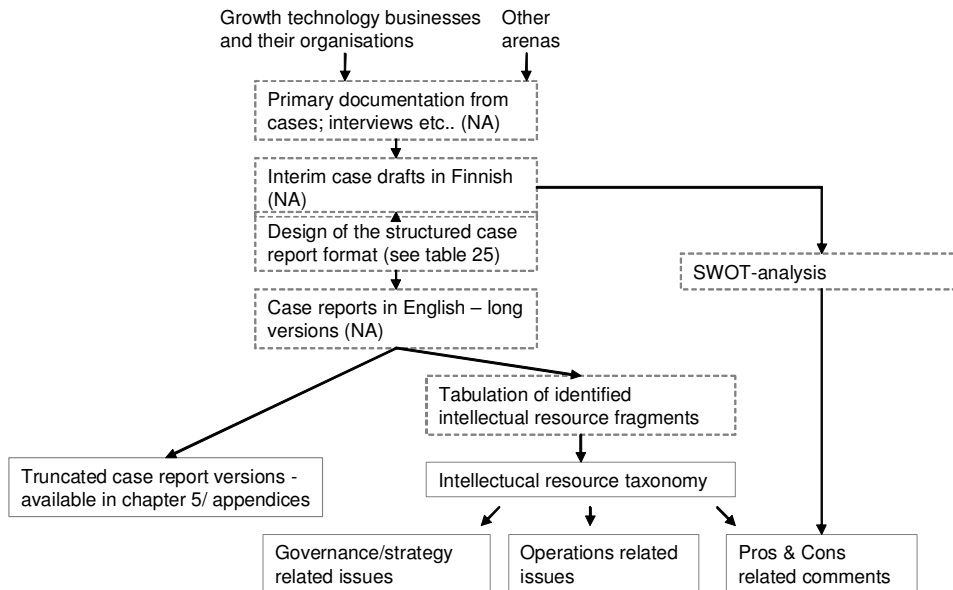


Figure 26: Proceeding from collected research data-base to case reports

To keep this dissertation sufficiently compact, only the truncated versions of the case reports are present here. This effort comprised the steps of analysing the case data and writing first case report drafts, creating the structure for the case reports, writing the first structured case reports, and finalising the truncated case report versions enclosed here. Besides the report writing, the identified intellectual resource fragments from the case data were tabulated. This workflow is also depicted in Fig. 26, where the dotted boxes stand for the preceding work not presented in this dissertation except for the Machine Vision System Firm case report, which is slightly modified in Appendix 1. There, the

text passages related to technology, sales and market, value chain, network and administration are not present.

The firm case presentations here are organised by the structure as pointed out in Table 25, which adheres to the recommendations of the firm case study report format suggested by the qualitative research literature (see e.g. Koskinen et al. 2005, p.159). Writing case reports is, in fact, writing narratives (Boje 2001), where the longitudinal presentation is the main body of the narrative. The entire telling is divided into timely periods, each of them constituting a distinctive life-cycle in a firm's evolution and organised into the dedicated subchapters in the long-report versions (not present here, except for the Machine Vision System Firm case in Appendix 1).

The main body of one cycle is composed following the three main categories:

- (1) Strategic and governance issues on lines 1 – 3;
- (2) Resource pool related topics on lines 4 – 5;
- (3) Operations management on lines 6 – 11.

The first one of the three categories is the main level description of each of the cycles. It considers reviewing strategic planning and implementation and unexpected occurrences, calling for re-thinking of the strategy which influenced the business model and organisation changes. The outcome from the strategic and governance-related part of the case report was an overview of the major investments and strategic choices.

The next category, resource pool, focuses on the evolution of financial and human capital funding. Here, the business model offered a key for the assessment of the centric operational activities, which, furthermore, gave an overview of the required intellectual resources and other resources. The financial details were observed from financial statements and balance sheet data. Accordingly, an overall summary table from this information was created to point out the financial progress and details for further reasoning at the analysis stage. The evaluation of human capital was mostly grounded on personal capabilities, career, responsibilities and intentions of key employees and members of the board of directors. The outcome in terms of resource pool consideration was an overview of the governance and ownership issues which gave understanding of the behaviour and intentions of actors in respect to wealth creation and investing during the writing process.

The third category is composed of five short subchapters concentrating on the main business activities indispensable for any company to survive. A simplistic Membership Categorisation Device-method, MCD (see e.g. Alasuutari 1999, p.99) was applied, as follows: (1) technology related with technology research, product development, product management; (2) customer-related activities such as sales, marketing, customer relationship care; (3) value chain-related subjects handling forward integration and pivotal suppliers; (4) network-related subjects dealing with value adding partners and other contributors, except those included in the previous point concerning the value chain; and (5) the last subchapter was dedicated to administrative services.

Table 25: Format of structured case report and its contributions to analytical work

Utilisation of narratives for divergent analysis purposes		
	Descriptions present in the structured case report (narrative) – Table of contents	Relevance in explaining the IC-taxonomy
1	Firm paradigm, major investments	Some information concerning the major (big) entities
2	Intended and realised strategy	Some information concerning the major (big) entities
3	Business model	Nails the main categories in IC-taxonomy
4	Ownership & governance	Defines the one IC-category, the ownership management
5	Financial progress & resources	No relevant information
6	Competences (HR-resources)	Defines human capital, which is the unstructured side of IC and one of the three main categories in the IC-models
7	Technology & products – not present in the dissertation	Defines the fragmented (lower levels) in IC-taxonomy
8	Sales & market – not present in the dissertation	Defines the fragmented (lower levels) in IC-taxonomy
9	Value chain – not present in the dissertation	Defines the fragmented (lower levels) in IC-taxonomy
10	Network – not present in the dissertation	Defines the fragmented (lower levels) in IC-taxonomy
11	Administration – not present in the dissertation	Defines the fragmented (lower levels) in IC-taxonomy

As pointed out in Figure 26 earlier, concurrently with writing the case narratives, intellectual resource evidence emerging from the texts was tabulated and a holistic view of the case firms' resources was created. This work was done case by case and the findings from each of the cases were added by accumulation into the four successive tabulation tables, the last one comprising all cases. Instead of trying to identify these fragments directly by intellectual capital basis and terminology, they were labelled by their native business function or business process names. Therefore, a summary of tabulation in Subchapter 6.5 is sorted by business process titles appearing at the two aggregation levels, plus the third fragments and forms the intellectual resource taxonomy, not the intellectual capital taxonomy.

The smallest entity noted during the tabulation was an intellectual resource fragment. The intellectual resource fragments stand for frequently repeated daily operations and management related occurrences, as well as less frequently occurring governance acts. During and also after the tabulation process, the fragments were next collected around the main business process labels. For example, occurrences related to technology research, product development, product management and technical procurement were anchored by the main title of technology management. In fact, each cell in the grand tabulation table is representative of a micro story, as suggested by Boje (2001, p.11).

The identified intellectual resource fragments were further used for defining the full intellectual resource taxonomy, which is in Appendix 2. The compressed version is shown in the end of Subchapter 6.1. Ultimately, the overall objective of this taxonomy was creating a terminology foundation and for the further analysis derived here. Moreover, the tabulation process was a sound indicator in respect of the saturation of

cases. Although, the number of fragments increased along with analysing cases, the number of main processes and subprocesses declined swiftly. Accordingly, there was good reason to restrict the number of case studies to these three sufficiently different types of firm cases complemented by the pre-seed case strengthened by supplementary observations, as discussed in the subchapter pertaining with triangulation in Subchapter 9.3 (internal validity).

The preceding work needed for the pivotal business process categorisations by cases, the outcomes in Tables 30 – 33 in Subchapter 6.2, was grounded on the prioritising of business processes and their fragments. Therefore, Subchapter 6.2 obtains an importance of presenting those main processes. In fact, this job necessitated searching for a pivotal resource element from the taxonomy data suggested by theory concepts related with competitive advantage and firm strategic resources in Chapter 4. Yet, the result, as seen in those four tables (30-33), reflects with the idea of the business model. Furthermore, the elaboration of business model configuration is continued in Subchapter 8.1, from the outcome of investment-like intellectual capital value adding standpoint.

Although, the focus of tabulation was in resource presences, also weaknesses and bottlenecks were observed. This approach available in the right-hand column in Appendix 2 in the column dedicated to comments of pros and cons was, in fact, an outcome of SWOT-analysis. Especially hidden and less visible occurrences manifesting strategic importance were searched for: those standing for resource dependencies, together with visible findings. As found during case analysis, certain firm operations or occurrences may stay hidden, especially when a particular task is less appropriately organised. Consequently, a simplistic SWOT-analysis (see e.g. Barney 1986) was applied here, focusing on weaknesses and threats. Compared with the original theory (*ibid.*), the following slightly modified definitions of Strengths, Weakness, Opportunities and Threats were applied during the writing process:

- (1) Strength: an empowering factor of growth which is well organised and indicates the presence of adequate intellectual resources;
- (2) Weakness: a deficiency in a certain organisational activity retarding the positive impact of enabling factors encouraging the business to grow;
- (3) Opportunity: an operational improvement or a new business opportunity – when activated and implemented throughout the organisation, they both would influence the gaining of higher profit.
- (4) Threat: external occurrence that would ruin or severely deface businesses and obviously needs a quick remedy.

5.3 CASE STUDIES

The second subchapter 5.3 is dedicated to the presentation of those four case studies in a truncated format in the subchapters 5.3.2 – 5.3.5. In fact, they are more or less analyses rather than narratives because of the revealing the strategic main lines of growth as well as the discussion of centric business process articulated later on in terms of business model. Moreover, the four case analyses are the starting point of the two analyses lines carried through out the empiric part as discussed in the introduction text in Chapter 5.

Consequently, three firm and one pre-seed case studies are presented here. The first two firm cases, the Machine Vision System Firm (5.3.2) and the Optical and Spectroscopy System Firm (5.3.4) are first successful but then troubled and, moreover, distressed. In turn, the third case is successful: the Contract Manufacturer Firm (5.3.5), which is taken as a positive reference here. Nevertheless, with all the cases, whether one, or a couple, or multiple cases, a sound analysis is required before proceeding to the generalising phase. This can be fulfilled, for example, in terms of analysing tabulated multiple cases or in-depth reasoning of just a few cases (Yin 2003, p.111; Alasuutari 1999, pp.192-195).

5.3.1 Introduction of Cases

Selecting cases is one of the fundamental factors for achieving a robust foundation for deriving analysis. Not only the number of cases, but also the choosing of polar-type cases, is the main selection criterion. This matter, in turn, was discussed in Subchapter 2.4.2 and the text here is a continuation of it.

All four cases here are named using aliases for reasons of confidentiality. Although the fourth case analysis, the Contract Manufacturer Firm case, is based mainly on openly distributed information, the factual firm name is replaced here. This is first due to reasons of consistency, and second, the alias name is a generic name and more informative as it represents the entire class of firms this particular firm belongs to, and in addition, some information is confidential.

Their life-cycles can be depicted as follows:

- Machine Vision System Firm: successful growth -> first distressed phase -> attempt at recovery and new growth -> starving and a major restructuring -> bankruptcy -> a new start-up
- Optical and Spectroscopy System Firm: successful growth -> stagnation -> distressed period -> management buy-out type of restructuring -> steady state
- Contract Manufacturer Firm: early growth -> prolonged unmanaged slow growth -> business portfolio restructuring -> growth in new market -> expansion by mergers and acquisitions -> maturity and slower growth
- Early stage business project, LDS: technology and business feasibility study -> pilot marketing -> attempt at establishing joint product development with

one industrial player -> refusal to establish a firm, rather favouring a technology transfer.

Besides the growth mode, the first and second firm cases reveal also a troublesome side. The third firm case, the Contract Manufacturer Firm, was chosen due its contrasting character to the other two firm cases. This particular firm represented another industry and it moved from being distressed to achieving big success since 1995. The data was collected by interviewing a minor shareholder - a financial expert of the firm, as well as printed material based on strategy plans, business plans and some 20 customer magazines offering rich data concerning the realised growth path of the firm. The data sources of the other cases are discussed in Table 26.

Table 26: Summary of the research data of this study

Presentation of research data					
	Industry and the observation period	Type of growth, financing and mgmt	Type of research data and episodes	Data collection sources	Contribution for deriving the results
5.3.2	The Machine Vision System Firm, a Finnish SME in the automation and control industry. 1996-2009	- High growth orientation - VCF & BA-funded -Managed by founder-CEO	Longitudinal, in-depth case Successful, distressed and failed	Induction: archival records, interviews, documents, artefacts, organisation research OD,	Creating of IC taxonomy Identifying the most obvious opportunities and dependencies of IC Identifying differences of significance between divergent IC qualities Reasonings of the present actors to provide IC and within an investor role
5.3.3	The Optical and Spectroscopy System Firm, a Finnish SME in the automation and control industry. 1996-2006	- High growth orientation - VCF-funded+ multiple founders -Managed by a recruited CEO	Longitudinal case used for complementing the in-depth case, Successful, distress and survived	Archival records, interviews, direct observation, documents and artefacts	Complementing the IC taxonomy Identifying the most obvious opportunities and dependencies of IC Identifying differences of significance between divergent IC qualities Reasonings of the present actors to provide IC and within an investor role
5.3.4	The Contract Manufacturer Firm, a Finnish big SME in several industries, foremost in the metal industry (1960)/-95-2007	-Growth orientation - Bank funded -Managed by founders	Longitudinal case 1995-2007 + background information since founding in 1960. Successful firm	Interview (one) strategy-related documents, second hand literal analysis 1960-1996.	Complementing the IC taxonomy Identifying the most obvious opportunities and dependencies of IC Identifying differences of significance between divergent IC qualities Reasonings of the present actors to provide IC and within an investor role
5.3.5	The main pre-seed, LDS, and other - cases 2005/6-2007	- High growth orientation - Managed by IPR owners		Participant observation, OD	See previous comments on the cases on lines 5.3.3 and 5.3.4 here

There are also brief characterisations of the case firms' pivotal parameters on the four left-hand columns after the reference column on the extreme left. The 2nd column points

out the observation period and industry. The next column introduces the characterisation of financial and key intellectual capital value adders of the firm. The third column describes the observation period. The fourth column discloses the applied data collection methods. The fifth column summarises the contribution of this study's analysis purposes.

The flow of presentation in the following subchapters is organised almost identically. First, the narrative describing the entire life-cycle of the case is shown. Next, there is a brief business model presentation, which is followed by a discussion of the intellectual resource tabulation and a summary of it.

An exception to this order of presentation is the first case, the Machine Vision System Firm case, which is a compressed version of the entire structured report available in Appendix 1. Consequently, the business model, or in fact, multiple models along the evolution is discussed in each of the five subchapters.

5.3.2 Machine Vision System Firm Case

The Machine Vision System firm was founded in October 1996. The first growth cycle took off within the years 1996 – 1998. The business was run on a part-time entrepreneurship basis by the founder-CEO until May 1998, when he finalised his master's thesis. The initial offering for customers was a mathematical model-based engineering service for the plastics manufacturing industry. This period is shown by the pre-seed and seed phases in Figure 27, which is the overall course of this company.

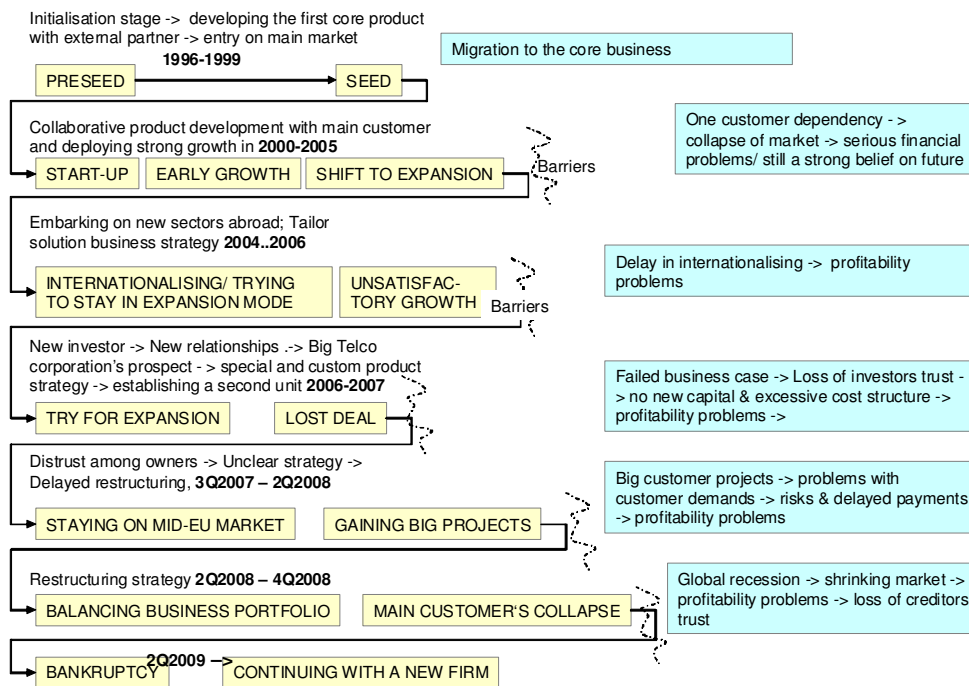


Figure 27: Strategic main course of Machine Vision System firm

In 1999 a new business opportunity was recognized, involving automatic quality control technology. During 1999 – 2000 the firm developed a new product focused on solving customers' quality inspection needs by a solution based on CCD camera, software and illumination technologies. This project was funded by a seed investment. The product development was contributed to significantly by contracting an external technology development institute. This new product entered the market in late 2000. Although the entry was aimed at a new segment, the telecom industry, the common denominator for both the initial engineering services and this new product offering was plastics. More precisely, the initial idea and the object of inspection was the plastic frame of cellular phones, soon followed, however, by other points of inspection within the cellular phone manufacturing industry. This period is represented by the seed and start-up blocks in Figure 27 on the following page.

In 2002 the engineering service offering was abandoned due to the more profitable control system business area. The developed new product was, in fact, reshaped during 2001 – 2003 in collaboration with the main customer from 2001. The period 2002 – 2005 was a time of expanding the business up to 1 million € and achieving the first profitable years in 2004 and 2005. During this period the company moved from the start-up stage through the early growth stage. Three investors were also engaged in 2001 – 02 to fund the business expansion.

Unfortunately, the growth was grounded too much on this one global customer, a contract manufacturing company. At the end of 2005 the one customer risk was realised in an unwanted way and the business volume collapsed in 2006 down to half of that of 2005. This occurrence is labelled by the note “Barriers” in Figure 27 on the right side of the second line.

The next line, the third in the figure, denotes the measures for expanding the customer base with new clients in the EU area that were started in 2004. Although the re-growth was not satisfactory in terms of expected expansion, the gaining of new foreign customers was achieved finally at the end of 2006 with new customers in German-speaking countries. Growth barriers here arose mostly due to slow penetration within the chosen international market areas.

2006 was a time of planning and introducing a two-fold business strategy comprising tailored and standard product businesses. A major Finnish factory automation company, which is a global service provider for a big Finnish telecom corporation, laid off personnel in 2006 and some of them were recruited by the Machine Vision System firm. Moreover, these new people formed a subsidiary in another location in Finland near the big Finnish telecom corporation. This proximity offered a gateway to the gaining of a provider status with this big corporation, which was interested in automising certain inspection operations by machine vision technology. The business opportunity here was estimated to be 20-25 million EUR within the next 5-7 years.

These plans in 2006 were realised when a new investor took a seat on the board of directors and a share of the Machine Vision System firm. The new investor also

provided high-grade social bonding with the big corporation's top directors, who were anticipated to speed up the partnership creation. In spite of the preparations to seize the opportunity, the Machine Vision System firm lost this opportunity in spring 2007, which is seen in Figure 27 at the end of the fourth line.

During 2006 – 2008 the revenue stayed round 0.5 million EUR. The growth pace was progressive, at 5 – 10 % per year. The main problem was unprofitability due to an excessive headcount owing to the lost case and lack of replacement business (in 2007). The Machine Vision System firm prolonged the holding of the two units, living in the hope of making a breakthrough in the German market within other sectors. Because the firm did not achieve a major improvement in revenue figures, the debt load began to distress its economic performance. A desired fusion with a major European automation company, a partner too, ended unsuccessfully in March 2008. This would have been a lifeline for the company to escape from the troublesome situation. This track is pointed out in the fifth line (staying in the mid-EU market...).

The company underwent a heavy restructuring process from May 2008 until the beginning of 2009 (see the 6th line, second from bottom in Fig.25). A financial balance was achieved at the end of 2009, but the collapse of the main customer in Germany caused an unavoidable cash crisis in February 2009. In spring 2009 the firm went through a bankruptcy proceeding, but the business infrastructure, technology, core team and established customer relationships were continued with a new name and restructured ownership.

5.3.3 LDS Pre-seed Case

The case description here concerns a new business opportunity heading towards a business project where the author of this study was acting in the roles of management consultant and commercialising expert. The developed product of the case is rooted in the diode laser technology developed in a Finnish university of technology (the identity of which is filtered here). The product is a multifunctional testing and characterization system for mounted laser diode testing, abbreviated to LDS 2010. It was not a breakthrough innovation but more of an incremental one, where the innovativeness rested on knowing how to integrate the commercial components in a single frame and automatise the testing process.

A Finnish university of technology fully owned the IPRs but had no interest in becoming a partner, favouring the technology rights to be transferred to a research team, especially when tending towards creating a new business firm. Up to this point the business consisted of a team of four young persons comprising two senior researchers and two master's degree workers holding versatile engineering skills that enabled the developing of a first version for the first customer, which was the laboratory itself. Basically, the owners of the technology had two options: either tending towards a new technology firm or trading the technology rights with the researchers to form an established company interested in this particular technology. Regarding both choices,

the entry market potential rested on the researchers' network, as well as on some industrial contacts.

The development work started with a prototype build-up project in the beginning of 2007. The factual product (or service) development was in progress during the consultancy and observation period from Oct 2007 to Feb 2008. Following the venture stage definitions, this particular embryo passed the 1st stage, technology conception and leaped directly to the 3rd stage. The tasks belonging to the 2nd stage, deriving a technology and market feasibility study, were not properly derived.

During the spring of 2007 the team executed a kind of a novelty study, to ensure a competition situation. It also served as a preliminary freedom-to-operate clarification, which, moreover, investigated the occupied technology space in terms of IPRs having relevance with this particular technology developed by the team. Both clarifications were systematically analysed and supplementary data researched by the management consultant.

Other initial consultancy tasks were related to industry analysis, competitor analysis and acquiring funding for further development of the technology and commercialisation of it. However, the main effort during the observation period was allocated to carrying out a buyer-decision analysis by means of marketing letters and phone calls within the domestic market and UK universities. The results were extrapolated on the global market level, suggesting not more than a potential of some 90-100 buyers within 3 years among the total market opportunity of 1000 customers from both universities and industrial firms. In cash, this denoted a 100 million € market volume for LDS compatible solution.

Finally, the consultancy effort was documented into a business plan involving frequently encountered topics such as market analysis, product analysis, pricing and cost structure, technology roadmap, growth strategy, financial and risk analysis. The practical tasks considered were partnering attempts with a German company and planning an industrial trial with a local firm.

The market study revealed the entry-market as appearing somewhat tiny and not feasible for big business. Thus the stake and the growth potential would have been rather low, and this case would not have been attractive for investors, neither to external intellectual resource value adders without a fair salary. It was also estimated that the business after the early growth years accompanied by a product family would have employed some 3-4 people. The entrepreneurial intentions were finally buried as the senior researchers' willingness to sacrifice time for this case was limited due to their doctoral studies.

5.3.4 Optical and Spectroscopy System Firm Case

The roots of the Optical and Spectroscopy System firm spanned backwards to the time when the founders were carrying out their research projects and part of the founders were working with their doctoral studies. The firm was founded in June 1999 by 10

professionals of optical measurement and material science on the back of a solid patent portfolio. The founders transferred their shared ownership of four patents and one copyright, accompanied by prototypes, to the firm and were compensated by shares. Five of the founders held 88 % of the share total. In fact, the founders underwent the opportunity recognition and product conceptualisation steps before the formal establishment of the firm. Also some work related to the exploitation and generation of products was activated before the IPR transaction to the firm.

The business idea was selling self-developed optical and spectroscopy systems and supporting services for measurement and diagnostics purposes for chosen technology research and development-orientated customers such as commercial laboratories or companies' internal research units. During 1999 – 2001 the firm's resources were devoted to developing the first product and attracting the first customers. The first sales deal took place in February 2000. The growth was backed by minor seed-money, and the company directed by a researcher-backed CEO and a board of directors comprising by researchers. 2001 was a breakthrough moment in many ways. The first product was finalised, the firm attracted a venture capital investment and an international sales expert took the leader position, while the present CEO shifted to the chief technology officer's, CTO, position.

At the start-up stage the business was grounded on two main offerings. The first was a solution for the quality assurance and diagnostics needs of thermal spray processes, and the second, an imaging solution for capturing images of high-speed targets. The venture capital investors and founder shareholders shared a mutual vision of the firm becoming a product firm. This was, however, difficult because the firm's customers preferred problem-solving and solutions accompanied by consultancy rather than off-the-shelf-products. This led towards developing new product variants and more costs were incurred in product development. Furthermore, getting new customers necessitated tailoring, which entailed more new product variants and an enlarged product portfolio. Finally, at the end of 2006 the company possessed roughly 35 sales items around the 5-6 main products.

Besides the two product series, the firm was keenly monitoring new optional business opportunities. Two of them were based on technology product conceptions by two of the key founders. Hence, the firm gave room for technology specialists to operate with new ideas and tasks. Related to the new innovations, one episode took place in 2004 – 2005. One of the main owners of the Optical and Spectroscopy System firm advocated a particular diode-related technology necessitating a new business operation. In 2005, after an unsuccessful partnering process and some other turbulent episodes, this person left and established a spin-off company. The patent rights owned for the time being by the firm were restored to these two persons, who, in fact, were the original IPR-holders.

In 2006, the Optical and Spectroscopy System firm had global customers divided into industrial firms and research institutes developing commercial thermal spraying systems or willing to apply high-speed imaging. Customers were accessed through their own sales representatives in German speaking countries, but mostly through three sales

companies. The company also developed a global distributor network in Asia and North America during the years 2001- 2004. Hence, the distributor mix comprised direct sales (EU), partner sales (Asia, USA), integrators (two corporations) and OEM-sales. So far, the firm had evolved into an engineering company possessing a wide set of offerings rather than a true product business firm, which was confirmed by the opinion of the board's chairman in 2005.

Although the revenue growth was steady from the level of 2001, the incurred costs were high and the company made successive negative net results, as seen in the table below. The cumulative loss until the end of 2005 was roughly 1.5 million EUR, as stated in retained earnings account in liabilities. The company's financing gap was filled from diverse financial sources not present in detail here. Unluckily, the growth was retarded during 2004 - 2005 when the company had reached a revenue level of 700 – 800 000 however, it had an unacceptable cost-structure that caused a management buy-out process accomplished with cutting the personnel headcount from 7 – 8 to 4 in 2006. After the restructuring the firm continued its business operations satisfactorily but was not anymore a growth, but rather a slow growing, company.

The business model was quite the same during the observation period, although the intended shift towards a product company was not realised. The revenue model consisted of the diagnostics and measurement service, and product and consultancy service businesses. The customers were research institutes and industrial companies' research functions, coming from diverse industries like the automobile and machining industry, among others.

Table 27: Financial statements of the Optical and Spectroscopy System firm

	1999	2000	2001	2002	2003	2004	2005	2006
Products&Services	19,8	131,5	25,1	248,2	699,8	689,1	759,1	19,8
Other income	0,0	19,1	29,6	106,8	13,4	13,4	9,6	
Variable costs	-4,4	-73,0	-34,3	-191,3	-259,6	-292,0	-193,2	19,8
Gross margin	15,5	77,6	20,4	163,7	453,6	410,5	575,5	39,6
Gross margin%	78 %	52 %	37 %	46 %	64 %	58 %	75 %	200 %
Personell costs	-8,8	-87,5	-132,7	-324,6	-392,4	-399,3	-282,0	0,0
Travell.,office,marketing fixe	-14,8	-49,3	-192,6	-276,3	-313,9	-350,6	-267,6	0,0
Activations to assets (for info)					93	68,3		
Margin II (EBITDA)	-8,1	-59,2	-304,9	-437,2	-252,7	-339,4	25,9	39,6
Margin II%	-41 %	-39 %	-557 %	-123 %	-35 %	-48 %	3 %	200 %
Amortisation&Depreciation	0,0	-2,7	-14,2	-20,0	-21,3	-22,5	-52,1	
Profit(EBIT)	-8,1	-61,9	-319,1	-457,2	-274,0	-361,9	-26,2	39,6
Finance expenses	-4,7	-6,1	-116,9	2,1	5,3	-11,1	-19,8	19,8
Tax	0,0	-2,2	2,1	0,0	0,0	0,0	-19,8	19,8
Profit/Loss	-12,9	-70,2	-433,9	-455,1	-268,7	-373,0	-65,8	79,3

The common denominator for them was need for the research and development of surface material coating processes. Accordingly the firm's value proposition was to offer measurement and diagnostics products and consultancy services, enabling customers to accelerate new materials development cycles and cut the their capital expenses. The value chain embodied sales channel partners and manufacturing subcontractors as the firm focused on the technology and product development.

Competitive strategy was founded on patents, first-mover advantage and superior knowledge of the customers' thermal coating technology, not only the company's own offerings.

5.3.5 Contract Manufacturer Firm Case

The company, a general metal and electronics industry contract service company, was founded by in 1962 in Helsinki, Finland. The case description and analysis here considers the years 1989-2009. Until 2001 the company was a SME and in 2002 the revenue broke the level of 40 million EUR and the headcount exceeded 250 employees, which were at that time the boundary values for defining SMEs.

The company manufactured at the beginning thin metal sheet and wire products. In 1979 it established a new site in Eastern Finland. Since the beginning, the company adopted a customer-centred service model consisting not only of producing ordered items but instructing customers on how to get more out of the products and giving advice in respect to productivity matters. In 2003 the company was the winner of the best subcontractor award in Finland, 2003.

The firm can be characterised as a component manufacturer and small size subcontractor in its early years of 1962 – 1989. Then the company recruited the current CEO in 1986 to manage production in its main factory in Eastern Finland. Then the production manager (currently CEO), together with three key persons, left the company and founded a direct competitor firm in 1989. A year later, they bought the whole share capital of the Contract Manufacturer firm they had left in 1986. Ownership was divided into the new CEO (the 1986 recruited production manager) holding 57 % of the shares, and the two other, long-serving metal product manufacturing experts, each, 21.5 %.

At the beginning of the 90s the company ran operations at three sites. Its machining operations were separated from other operations and a new subsidiary was founded in 1991. In 1992 an affiliate firm was founded in Southern Finland, which was taken over later on by a share sale to become a subsidiary of the Contract Manufacturer firm.

During 1991- 1994 Finland endured a severe recession period that also damaged the subcontractor service firm's businesses. The management team was not adapted to survive through the recession time and needed external advice.

Takeoff for growth occurred in 1994- 1995. At the beginning of the rapid growth cycle the company possessed a sound customer basis for enlarging its businesses, a motivated personnel, flexible production capacity, preparedness for system deliveries besides product making, a customer-centred service concept and good relations with financiers. The weaknesses as stated in the strategy plan in 1995 were insufficient internal communication, dispersed operations in multiple locations, thin industrial economics knowledge, low capability for additional funding, low profitability, excessive debts and personnel resistant to streamlining business operations. However, within the reference group of similar companies, the contract manufacturing firm analysed here belonged to the upper quartile.

In 1994-1995, after a couple of financially tough years, the company underwent a restructuring process. The company received financing from Finnvera plc, a specialised financing company owned by the State of Finland. The process involved, in fact, a thorough strategy planning, which was derived by a Finnvera expert who stepped into the contract manufacturer's payroll. He became a minor shareholder and worked actively until 2003, managing the internal subsidiary dedicated to business operation and strategy planning. The company also adopted for the first time a working board of directors, which was in the beginning an informal reference group, but later on a formal board.

The fast growth period took off in 1995 and continued quite strongly during the whole observation period until 2007. As stated in the firm's first factual strategy plan, in 1995 the revenue growth pace was set at 50 % on an annual level. However, the realised growth during 1995 – 2005 on average was 18 %⁵ from the level of 5 million EUR to 33 million EUR in 2005. The revenue growth until 1998 was smoother, 16 %, as the second line of the table states. After that, the company made successive M & A-operations, as discussed below.

The growth steps were both due to organic growth, but also based on the merger and acquisition transactions, M & A-transactions. In 1997 a new subsidiary dedicated to small customers was established in Eastern Finland. In 1999 two transactions were carried out when the contract manufacturer firm bought the majority of shares from a plastic machining firm. The second, a metal coating firm, was connected in terms of a share sale with the contract manufacturer. In turn, in 1999 the first foreign company was bought in the Czech Republic due to proximity synergy with the contract manufacturer's main Finnish client running operations in this country. In 2001 the company increased its thin sheet metal production by buying the business operations of a small steel product firm.

In the late 90s the Contract Manufacturer firm participated in the nationally derived programme for 20 SMEs within the metal industry run by a public organisation, the Federation of Finnish Technology Industries. The programme employed seasoned consultants running operations of the participant firms as well as the firms' own prime movers dedicated to quality assurance matters and the implementation of the quality management system of ISO 9001 (in 2000-2001).

⁴ Considering the economic performance figures among Finnish metal industry firms, this firm was positioned in the highest decile.

⁵ The value of 33 m € in 2005 is obtained by adding 18 % of the figure from the previous year incrementally, beginning from 5.4 m € since 1995.

In 2002 the contract manufacturer penetrated the subcontracting market of the electronics industry by buying a majority of the shares of Elektronet Ltd (in Finland). Elektronet produces manufacturing services mainly for one customer, JOT Automation Ltd.

A subsidiary of the Contract Manufacturer firm, Elektronet Ltd, bought a production unit of JOT Automation Ltd in terms of an asset sale - no shares were exchanged, and the company is located now in two cities in Finland. The transaction increased the headcount of Elektronet from 24 to 80 and the revenue was estimated to reach 12 million EUR during 2002. Consequently, Elektronet strengthened the subcontractor relationship with JOT Automation as well as its presence in the electronic and telecom industry value chain comprising end-customers such as Nokia, LM Ericsson and Siemens.

At the end of 2002 the contract manufacturer company possessed three business areas, thin sheet metal, machining service and electronics industry subcontracting. They were organised in the form of own subsidiaries responsible both for profit and costs figures. The core processes were production, design and product development and logistics, all supported by the Contract Manufacturer's excellent customer service concept and high quality management guidelines as the foundation of success.

Table 28: Financial statements of the Contract Manufacturer firm

All values in 1000 €	15 mths 12 mths				
	1994	2002	2003	2005	2005
Group turnover	5400	18835	23623	41333	33066
Other income	0	1140	-323	217	174
Variable costs	-2700	-10081	-11739	-23437	-18750
Gross margin	3700	9894	11561	18113	14490
Gross margin%	69 %	50 %	50 %	44 %	44 %
Other costs from operations	-2220	-6968	-9047	-13530	-10824
Margin II (EBIDTA)	1480	2926	2514	4583	3666
Margin II%	0	15 %	11 %	11 %	11 %
Amortisation&Depreciation	?	-598	-1302	-1988	-1590
Profit(EBIT)		2328	1212	2595	2076
Finance expenses		-272	-398	-523	-418
Tax + arrangement	?	-752	-337	-534	
Proffit/loss of the year	170	1304	477	1538	1230

In 2003 the Contract Manufacturer firm launched a comprehensive business development programme targeted to revamp the strategic main course, restructure administration activities, improve operation, leverage production technology, begin true internationalisation after a trialling stage, restructure sourcing management, leverage personnel skills and motivation and improve the internal cohesion between production and design functions. Accordingly, the company made much strategic recruitment in the areas of sourcing and technology development as well as hiring a new member in the board of directors who possessed a strong background in developing the subcontractor

business in the value chains of the electronics industry. A second site abroad was established in Estonia targeting employing 50-60 workers.

Internationalising and building strategic alliances was predominantly seen during the years 2003 – 2008. The first move, as said, was to the Czech Republic. Soon after that a subsidiary was established in Estonia. Although the company captured some economies of scale advantages by internationalisation, like multisite organisation enabling resource pooling and customer proximity, it encountered global competition. Especially low cost manufacturing in the Far East forced the company to concentrate on high grade products, letting go of the mass manufacturing products. Furthermore, the constantly tightening labour costs required remedies and cost-cutting was undertaken in Finland in terms of flexible production. Other competitive strategy elements were establishing a dedicated product research and design group capable of producing services from product planning up to prototype development.

In summary, the evolution of the Contract Manufacturer firm can be characterised by the following stages as:

- Component manufacturer and a small size subcontractor – 1962 – 89
- Hijacked by an eager management team 1989 – 1994
- Takeoff for growth 1994-1995
- Fast growth 1994 – 2003

6 FIRST ATTEMPT TOWARDS BUILDING GROWTH MODEL

Answering to the first research question is, in fact, building a dynamic intellectual capital model. This task proceeds here, in Chapter 6 through three intermediating stages because the business growth descriptions of the cases do not directly manifest the intellectual capital quality in business operations but, more over, resource dependencies.

Consequently, the building work in Subchapter 6.1 is initiated by defining comprehensive intellectual resource taxonomy, which is a cross case analyses of intellectual resource findings from the three case firms and the one early stage business endeavour (LDS-case). Yet, it is a terminology foundation for identifying main business processes, subprocesses and their more fragmented appearances along the firm growth path, too. The short form of taxonomy is in Table 29 and the long version in Appendix 1 embodying all three levels.

The taxonomy table enables, indeed, looking all the four cases from the business process perspective which is carried in Subchapter 6.2. Identifying the fundamental business processes contributing firms' growth is the second analysis stage towards intellectual capital based growth model. All essential business processes (2nd level taxa in the taxonomy) are discussed and sorted into the case specific tables. The presentation begins from the Machine Vision System firm and continues in the same order as accomplished earlier, in Subchapter 5.3.

Next, the firm specific business process sortings together with the taxonomy are used in Subchapter 6.3.2, where the study is centered on the dynamic view on growth. In the case presentations, growth towards maturity is seen as a continuous completion of business management practises. For researcher this evolvment appears in emerging new business processes transforming as an integral part of firm's daily routines. Therefore the analytical unit here is a business process, the second level taxa, which are identified and tagged in respect to the stage of growth following the venture stage model codes. Eventually, the outcome here is a growth-orientated technology business firm resource allocation, a roadmap for intellectual resource value adding. It is, too, interpreted in intellectual capital terms yielding the desired end-result.

The analytical work is characterised by the etic-principle which means deriving research results at the low abstraction level and dominated by the ideas arising from the research data, not from analytical concepts brought by a researcher. However, one exception is applying the venture stage model stage definitions in Table 18 which denotes here the main leveraging stages along the growth path from an embryo to a mature firm. Despite of this exception, the research approach is explorative and derived by induction. It is too

aligned with the idea of exploration-description as stated in Figure 6 by Stebbins & Shaffir.

6.1 INTELLECTUAL RESOURCE TAXONOMY

The purpose of this subchapter is to bring forth the intellectual resource findings from the cases and explain how the comprehensive intellectual resource presentation was generated along successive tabulations. The result here is the intellectual resource taxonomy, which is shown as a general level presentation in Table 29 and in detailed, in Appendix 2. So far, the study does not discuss intellectual capital as it is not directly identifiable from the cases. Due to reasons of triangulation, a brief reflection passage with other available resource taxonomies arising from the fragmented analyses is discussed at the end of Subchapter 6.1.

Tabulation for the intellectual resource fragments was first done to the Machine Vision System firm case, followed by the LDS case, next the Optical and Spectroscopy System firm, and finally, the Contract Manufacturer firm case. Therefore, the first interim tabulation consists of findings from the Machine Vision System firm case. The second interim tabulation houses the previous one, together with the Optical Spectroscopy System firm resource fragments. The next one is composed of the previous two, plus the LDS case, whereas the final version embodies all four cases.

Since the first tabulation (the Machine Vision System Firm) until the final version, the tabulation table expanded from some 150 lines to 350 lines. To ensure traceability, three versions of tabulation, each of them representing the interim results of the tabulation process, were documented. Unfortunately, the interim tabulations are not attended to separately in this study, but the summary from the all tabulations is in Appendix 2 and a compressed version in Table 29, next here.

During the tabulation processes of every case, each meaningful observation implicating intellectual acts was recorded in the tabulation matrix cells. The 3rd level taxa stand for frequently or occasionally occurring value adding acts executed by firm's internal or external members. To bring out the actual taxonomy the following steps involved in processing one case study at time were carried out:

- (1) Primary sorting of intellectual resources fragments (3rd level taxa) into a group of similar fragments in the tabulation table for the 1st case (Machine Vision System Firm);
- (2) Processing the next case following the procedure in step 1 by adding new fragments into the common tabulation table and adding new 2nd level groups into the table when necessary;
- (3) After processing all cases, the structure of the common tabulation table was re-organised and finalised into the form of taxonomy.

The first step, primary sorting was assisted significantly by a structured case report, where the content is organised by organisational functions (see Table 25, *Format of*

structured case report and its contributions to analytical work, Subch. 5.2). The outcome from the 1st step was rearrangement of fragments under the group titles appearing at the 1st and 2nd level. Step 2 involved adding new fragments from the new case into the same table, as used within the previous case tabulation. Step 2 ended with rearranging the whole content under the group titles, and when necessary adding new titles. Finally, in Step 3 after the last case tabulation (the Contract Manufacturer firm case) the tabulation was finalised into its current form as present in Appendix 2 and Table 29.

Taxa are sorted not only by their membership in a particular business function, but also by their character in respect to the organisational status. As shown in Appendix 2 (and only the titles, not columns, in Table 29) there are two main categories: (1) the board of directors, and (2) management team and organisation responsibility areas, both of which are divided into two columns, indicating the planning and analysis responsibilities of the organisation. Therefore, these two columns were used for differentiating the operational level or the strategic and ownership level occurrences, which are, in fact, the acts of thinking and performing acts of a particular firm. Each line in the tabulation table is provided with case reference (the left-hand column) and comments (on the right).

The very first column on the left in the summary table was reserved for tagging with a case study (firm) reference code or multiple codes in order to ensure the traceability of the case-specific material.

In total there are in Appendix 1

- 309 lines appearing at the 3rd level, totalling c. 400 taxa (one line could embody 1 to 4 findings), called tasks
- 52 group titles appearing at the 2nd level (=1st aggregation level) denoting the main business processes
- 11 main group titles appearing in the main level (2nd aggregation level) denoting the main functions.

In Table 29, as stated, the 3rd level presentation is filtered, except at the top of the table there is one occurrence left as an example under the title of product development.

Field studies outside of intellectual capital studies, and even within the field, do not offer a frequently fragmented view on firms' resource pools, as discussed regarding the latter in the theory part (3.1.3). In turn, business model presentations (see 3.4.3) within the strategy management field prefer to stay at a high aggregation level. An exception to the latter is the study by Seppänen, as discussed at the end of Subchapter 4.3.4, which aggregated some 36 resource areas into seven main categories: physical, organisational, relational, human, informational, financial and legal issues.

Field studies outside of intellectual capital studies, and even within the field, do not offer a frequently fragmented view on firms' resource pools, as discussed regarding the latter in the theory part (3.1.3). In turn, business model presentations (see 3.4.3) within the strategy management field prefer to stay at a high aggregation level.

Table 29: Overall summary of intellectual resource tabulation

221 SUBJECTS OF STRATEGIC IMPORTANCE		SUBJECTS OF OPERATION MANAGEMENT	
Analysis & Planning	Implementation	Analysis & Planning	Implementation
PRODUCT AND TECHNOLOGY ORIENTATED ACTIVITIES			
RESEARCH ACTIVITIES			
PRODUCT DEVELOPMENT			
	Product portfolio analysis		Generating new lead products
F02	Product roadmap		
PRODUCT MANAGEMENT			
SOURCING			
SUPPLY WEB MANAGEMENT			
IPR MANAGEMENT			
PRODUCTION			
PRODUCTION PROCESSES STREAMLINING			
PRODUCTIVITY MANAGEMENT			
PRODUCTION CAPACITY MANAGEMENT			
SALES AND MARKETING ORIENTATED ACTIVITIES			
MARKET RESEARCH - DOMESTIC			
MARKET RESEARCH - FOREIGN			
MARKET COMMUNICATION AND BRAND MANAGEMENT			
CUSTOMER ACQUIRING - selection and attracting			
SALES MANAGEMENT			
SALES - Tendering			
SALES - Contract management			
CUSTOMER RELATIONSHIP MANAGEMENT ORIENTATED ACTIVITIES			
DELIVERY MANAGEMENT			
CLAIM HANDLING			
AFTER SALES & TECHNICAL SERVICE OF (PROJECT BUSINESS)			
CONTRACT MANUFACTURING/ CONTINUOUS PRODUCT AND SERVICE SALES			
CUSTOMER RELATIONSHIP MANAGEMENT (in project/solution business)			
VALUE CHAIN RELATED ACTIVITIES			
SUPPLY CHAIN MANAGEMENT			
DISTRIBUTION CHANNEL MANAGEMENT			
INTERNAL LOGISTICS (see the 2nd location -> combine these)			
NETWORK MANAGEMENT RELATED ACTIVITIES			
KEY RESOURCE HOLDERS/ STAKEHOLDERS			
INTERNAL LOGISTICS (inbound)			
COMPETITIVE STRATEGY RELATED ACTIVITIES			
LONG TERM STRATEGY			
STRATEGIC INVESTMENT MANAGEMENT			
STRATEGIC ALLIANCES			
INTERNATIONALISATION AND LOCATION MANAGEMENT			
KEY CUSTOMER PARTNERSHIP MANAGEMENT			
ECONOMIES OF SCALE ADVANTAGE			
(TOTAL) QUALITY MANAGEMENT - including performance management			
ENVIRONMENTAL MANAGEMENT (Influences on firm's reputation and, further, competitive)			
COMPETITOR ANALYSIS AND POSITIONING IN VALUE CHAIN			
MANAGEMENT TEAM RELATED SUBJECTS			
FINANCIALS RESOURCES RELATED ACTIVITIES			
FINANCIAL ADMINISTRATION AND MAIN OPERATIONS			
INCOME FINANCING & PROFITABILITY MANAGEMENT (restructuring related operations)			
FUNDING AND CASH MANAGEMENT			
CASH MANAGEMENT			
LEADERSHIP & HUMAN RESOURCE RELATED ACTIVITIES			
LEADERSHIP			
ENTREPRENEURIAL DRIVE			
HUMAN CAPITAL CARE			
LEARNING AND TRAINING (F03)			
HUMAN RESOURCE MANAGEMENT			
WORK SAFETY			
GOVERNANCE AND LEGAL SUBJECTS			
OWNERSHIP MANAGEMENT			
CORPORATE FINANCING			
COMPANY GOVERNANCE			
RISK AND CRISIS MANAGEMENT			
INFRASTRUCTURE RELATED RESOURCES			
IT-SOLUTIONS			
MANAGEMENT SYSTEMS WITH LOW IT-SUPPORT			

An exception to the latter is the study by Seppänen, as discussed at the end of Subchapter 4.3.4, which aggregated some 36 resource areas into seven main categories: physical, organisational, relational, human, informational, financial and legal issues.

Field studies outside of intellectual capital studies, and even within the field, do not offer a frequently fragmented view on firms' resource pools, as discussed regarding the latter in the theory part of the explanatory power of IC-models (3.1.3). In turn, business model presentations within the strategy management field, like the one present in Subchapter 4.3.4 by Chesborough, prefer to stay at a high aggregation level. However, the more recent studies breaking this rule are the welcome exceptions, like the study by Seppänen (4.3.4), which aggregates some 36 resource areas into seven main categories: physical, organisational, relational, human, informational, financial and legal issues.

Among non-academic business books, Sherman (2003), a strategy practitioner of growth, among other issues, divided the core resources of a growth firm into brand equity (recognition/loyalty/image), new products and services (R&D/strategic relationships), distribution channels (technology/relationships), new markets (new domestic or international markets), staff (recruitment/HR) and stock price and market value management, and financing (market perception/analyst reports).

In turn, Järnstedt (2007, p.50) a non-academic, too, presented the firm from a business process categorisation point of view. He also applied a three-layer approach, where the first aggregation level comprised 5 main level taxa: those of supply chain management, diverse administration areas, customer relationship management, research and development, and infrastructure. These were, moreover, divided into 26 taxa, manifesting the main subprocesses, which are then divided at the third level into 250 taxa, called business processes.

Comparisons with these studies bring up only a few minor deficiencies, which are:

- Visual design and usability development
- Communication is not only market communication, but also the company's communication
- Service function would comprise also fleet service

The last two in the list indicate the increased specialisation in big companies, that were not that apparent in the Machine Vision System firm and Optical and Spectroscopy System firm, due their relatively small size. The Contract Manufacturing firm was big, but due to its business type the service function was embedded into the entire business, as it was, de facto, a service function.

The conclusions here are that the taxonomy presentation in Table 29, corrected with the deficiencies noted above, is a valid starting point for further analysis, and it serves as well as a basis for the technology firm's intellectual resource framework.

6.2 FUNDAMENTAL BUSINESS PROCESSES IN CASES

The subchapter 6.2 introduces now the pivotal business processes within the case firms and the one embryo. In order to save time the identical business processes appearing within the second, third and fourth case are not shown again in the tables (Tables 31 – 33). For this reason tables are in a certain degree shared presentations and, therefore, not exactly firm specific presentations. In fact, there is no problem in mixing processes in this way, yet the four set of business process presentations from the four cases are treated next, in Subchapter 6.3, as one pool. Finally, this collection of central business processes is organised in the form of holistic growth continuum.

Considering Machine Vision System firm, summarised in Table 30, leadership and human resource care was less visible due to the relatively small organisation size.

Table 30: Summary of intellectual resource areas of Machine Vision System Firm

1 st level category	2 nd level categories:
Product and technology-orientated activities	Research activities Product development Product management Sourcing Supply web management
Market and Customer relationship-orientated activities	Market research – Domestic; Market research – Foreign Marketing communication Brand Management Customer acquiring Sales – Tendering Sales – Contract management Technical service
Value chain related activities	Delivery management involving project management Distribution channel management Internal logistics
Financial related activities	Financial administration operations Funding and cash management
Strategy and business planning related activities	Long-term strategy planning Profitability management Investment management
Leadership and motivation related activities	Entrepreneurial motivation and spirit Human capital care
Governance related activities	Company governance Ownership management Risk management Crisis management
Infrastructure and facilitating IT-systems	IT-solution of supporting major business process

Governance issues were cared for in terms of board of directors meetings, shareholder meetings and less formal senior manager meetings. IT-solutions were not in a significant role except for the project management and accounting systems. Production-related activities were mostly included in project deliveries, thus not comprising an own main group here.

The summary of intellectual resource-related business activities found during the writing process of the Machine Vision System firm case report is in Table 30 below. The most fragmented appearance, which is the 3rd level presentation, is not included here - rather only the main (first) and the second level presentation.

The intellectual resource analysis of the LDS case disclosed some 40 new intellectual resource findings at the 3rd level. Aggregation of these new ones revealed eleven 2nd level groups, those belonging to 9 main level intellectual resource groups present on the left side column in Table 31 below. The analysis disclosed two new 2nd level findings: competition analysis and immaterial rights property management highlighted with bold text on the table in the right hand column. These were present also in the Machine Vision System firm case, but very weakly.

Product and technology-related topics were predominantly present in the LDS case. Unlike the Machine Vision System firm case, this case emphasised the need for a true research orientation besides engineering skills. This was due to the complexity of the measurement technology and, especially, the scientific knowledge of the object of measuring - diode laser technology.

Also the case raised the essence of IPR protection and accompanied patent process once developing new technology products grounded on scientific research, though not as much as revealed by the next case, the Optical and Spectroscopy System firm case.

The development of new product technology also caused subtle measures aiming at a product launch. Consequently, some new items of evidence of IC fragments were recorded in the market and customer related domain into the table of IC-categorisation.

In sum, the LDS-case, centered on the generation of new technology product, called for divergent resources. The four person team possessed mainly firm-internal resources, or, here, team-internal seed-bed composed of a comparable older technology system entailing high-grade technology knowledge for making an improved system; laboratory and workshop facilities for construction purposes; and scientific knowledge regarding the application area. The needed complementaries here were market and customer segmentation advice, financial advice and advice on raising financial capital, strategic advice and attracting the first pilot customers and initialising sales and marketing.

Ownership questions were exposed to some extent within this case. The growth process, from the product development stage to the business project, and further to an entrepreneurial action, involved discontinuities - those of calling for ownership management. The shift from one stage towards the next involved the present owners

tending to preserve their power and economic wealth creation status that would become threatened in the next stage situation alongside new key persons or owners. This occurrence was seen in the researchers' attitude in terms of preserving their economic status as researchers rather than being directed towards some uncertain entrepreneurial role and uncertain income.

Table 31: Summary of additional intellectual resources occurrences of LDS case

1 st level category	2 nd level categories: The occurrences of IC-evidence in the 3 rd level are indicated in brackets like (x).
Product and technology-orientated activities	Product (8) Immaterial property rights management (3)
Market and Customer relationship-orientated activities	Market and customer relationship related subjects (7) were dispersed into several subgroups not present here separately
Revenue-cost model related activities	Business concept and outlining the revenue-cost-model (3)
Value chain related activities	Distribution channel management (2)
Leadership and motivation related activities	Entrepreneurial and teaming drive (3) Management and leadership (3)
Supply network management	Networking (2)
Strategy management	Competitor analysis (3)
Financing	Financial and funding (2)
Governance related activities	Governance of ownership and incentive management (3)

The Optical and Spectroscopy System firm allocated much of its resources to cultivating business opportunities from the research project stage towards true business, which is seen on the IPR- and product management lines in the table next on lines 1 and 2 in Table 32 next here. In that same table, lines 3 and 4 stand for market and sales expertise, as well as business intelligence. The market-entry was founded on principal customer strategy, complemented by sales partners. The main task of the new sales-orientated CEO in 2001 was, in fact, establishing a sales and distribution channel network.

A second major issue is related to firm governance expertise and evoked by extending the business portfolio as seen on lines 6 and 8. This was due to new technology product businesses that were created by a joint venture together with an international corporation holding a subsidiary in Tampere. In fact, the company was burdened by a wide patent portfolio and could not properly commercialise two of its patents. Besides the current technology position, the main owner of the Optical and Spectroscopy System firm advocated another laser diode application area, which formed, in fact, a rival idea to the original business strategy. Moreover, this was a threat to sustaining the firm's unity, and manifested the need for a new business endeavour. Finally, a new spin-off firm was actualised in 2004, held by the main owner, who left the Optical and Spectroscopy System firm.

Winning a substantially broad customer basis within three years necessitates managing growth constituted on external funds. This ended in a financial crisis in 2004 – 2005,

which is referred to in the lines 7, 8, 9. The end-point and the survival of the crisis followed basically the same restructuring logic as discussed within the Machine Vision System firm case, though the legal measures were not equal as the plight of the Machine Vision System firm case was deeper.

Table 32: Summary of additional intellectual resources occurrences of the Optical and Spectroscopy System firm case

	The group following the 2 nd level title	A brief characterisation regarding the new issues
1	IPR management	Patent portfolio and immaterial property rights governance were new together with LDS case. Here, especially the IPR global strategy was a new subject
2	Product management	Partly the same as with the Machine Vision System firm, the new themes was concentrated around product portfolio and product version management
3	Sales & distribution channel management	New subjects were such as channel control and conflict management, territorial channel building (US, Russia)
4	Competitor analysis	Competitor analyses emerged distinctly. Especially the main competitor's lower pricing caused trouble and forced the Optical and Spectroscopy System Firm for example to engage in price snooping
5	Customer management	Customer management got some new hits mainly due to the larger customer basis of the firm compared with the Machine Vision System firm
6	Business portfolio management	One person, due to his own technology background, advocated a new product business that he attempted to organise with a global corporation – finally without success. This later caused a spin-off (from a new start-up)
7	Innovating new income sources	FO2 has a wider repertoire of running divergent service beside the product sales in order to diverge income cash-flows
8	Firm governance	New joint venture operation and establishing a spin-off firm and financial instrumentation.
9	Cash management problems and profitability care	not discussed here in detailed
10	Organisation well being related subjects	not discussed here in detailed
11	Management problems with dominant customer	not discussed here in detailed

A total of 28 new intellectual resource fragments at the 3rd level of the intellectual resource taxonomy were found during the writing process of the (long) case report. They were duly added into the cross reference table available in Appendix 2. The summary of new findings is in Table 32 next here.

The business model evolved significantly through the observation period. In the beginning in the sixties and seventies the value proposition for the customers was grounded on making component production. Towards the 80s the service concept was enlarged by manufacturing bigger entities such as sub-assemblies requested by customers. Consequently, the assembly technique and production management improved and the network relations were strengthened and diversified. The time in the nineties was dedicated to streamlining production processes and increasing the quality,

reliability and precision of customer service following the guidelines of just-in-time management thinking. After the turn of the millennium the research and product design services were organised by a separate service function in order to strengthen customer relationships. In fact, the Contract Manufacturer firm was a competence service centre capable of solving customers' solution needs.

The main attention in 1995 was focused on decreasing the number of customers from roughly 100 to 30 and improving the delivery and customer service concept. The market was formed of 20 key customers who had outsourced their production for external partners and 10 smaller companies. The Contract Manufacturer firm strived to close partnership relations with customers, ensuring high transparency and satisfaction. In this millennium the company extended its business operations to the electronics and telecom supply chains by offering electro-mechanical manufacturing services. Also it covered some plastic material machining and manufacturing.

The value chain comprised the end-customer, their main supplier and after that came the contract manufacturer. Deliveries were transported either directly to end-customers' premises or to the Contract Manufacturer's customers. In fact, the firm underwent a forward integration from the position of a component manufacturer to a system integrator during the nineties. This is just like the theory of the three available positions of the industry wide value chain in Subchapter 4.4.1 (Fig. 24), where the first is a component manufacturer position, next, a system integrator and then comes a true system supplier.

The revenue generating mechanism was based on profitable customer relationships and a mutual understanding of fair pricing that took the form of open book accounting at the more mature relationship level with the main customers. The value network was built up from internal services, such as machining services, as well as with an increasing number of small special firms.

Considering competitive strategy, the landmarks were flexible and agile production technology, high-grade customer service model and a customer-centred approach, and scalable production capacity from components to assemblies. Shifting entirely towards flexible production, cost advantage was generated both by improving machinery and also having flexible employees. Internalisation and multi-site structure offered some of the scale of economy advantages previously mentioned.

The firm successfully passed through roughly the same stages as the venture money-backed firms (the Machine Vision System firm and Optical and Spectroscopy System firm). Applying here the venture growth stage model, the current status (in 2007) of the Contract Manufacturer firm matches with the characteristics of stage 8, which is to say an established company in the main market and ready for the financial market.

The next issue discussed here is the pivotal additions for intellectual capital categorisation. Along the writing process of the Contract Manufacturer firm narrative, in total there are 158 new 3rd level findings and 14 new functions (2nd level). A

summary of the new findings is shown in Table 33, next here. Also they are presented in Appendix 2.

The 1st line in Table 33 emphasises the features involved in building customer relationship, which was beyond the level met in other cases. The key features at this point were the capability to assist key customers within product development, to offer high quality production services with and when necessary to stretch from the component manufacturing role to sub-assembly manufacturer. The 2nd line expresses the added value arising from the manufacturing involving producing new innovations, product design and co-producing services for customers, as well as stretching to produce larger entities when desired.

Simplifying management operations and work processes, as well as keeping the organisation structure simple were the leading guidelines to ensure profitability, which is expressed on line 3 in the table below. In practise, this meant that some of the work processes became less efficient, or even obsolete, due to the continuous changes dictated by business growth and organisation expanding.

The 4th line refers to brand management that was not explicitly discussed in the research data, but was strongly embedded in the quality and customer relationship management issues. Especially, the perception of a high degree service level and quality of products on behalf of the Contract Manufacturer firm's customers reinforced this point of view. The brand value was increased significantly by winning the national award in the election of the best metal industry subcontractor. These notions are in line, for example, with the brand management definition by Kaplan & Norton (2004).

The total quality management on line 5 is partially overlapping with the brand management and the subjects related with customer relations in general. However, the firm internal disciplines of product quality management led eventually to filing for ISO 9001 certification. The firm deliberately cultivated production management practises such as lean manufacturing to avoid waste work, flexible manufacturing and the Kaizen ideology of continuous improvement of operations.

The firm also put much emphasis on the customer-centric operation model (line 6), where the establishment of a partnership programme, as said earlier, was outstanding evidence of this point.

A high productivity metal industry manufacturer must possess a great deal of competences, know-how and ability in managing producing services and products. Accordingly, human resource management was clearly seen in research documentary, too, and for example personnel training (line 7) was mentioned frequently. Moreover, the skills and experience required in re-organising and improving the manufacturing process in contract manufacturing were engaged with leadership, operation management, cost accounting, customer relationship and networking. The next lines 8 – 14 are not separately discussed here.

Table 33: Summary of additional intellectual resources occurrences of the Contract Manufacturer case

	The group following the 2 nd level title	A brief characterisation regarding the new issues
1	Key customer relationship management	Top class production services Developing new products for customers Flexible and scalable deliveries
2	Production management	Managing production process and flow from raw material sourcing up to product delivery
3	Productivity	Running operations cost efficiently (compared with customer) Contract manufacturing; Offering high grade manufacturing
4	Brand management	Customer satisfaction; Image
5	Total Quality Management	Service quality level of customer-centric processes Internal process quality; continuous improvement of operations Team/ production cell orientated production
6	Partnership development and managing framework	Loyalty increase Investing in customer specific production capacity Adaptive customer's customer service model, i.e. serving not only direct customers but also end-customers
7	Human Resource management	Training & competence management Flexible production Work safety
8	Claim handling	
9	Supply chain management	Serving end-customers beyond the primary customer
10	Strategic alliances	
11	Internationalisation and location management	
12	Economies of scale advantage exploitation	
13	Environmental management	Influences on firm's reputation and, further, competitive position
14	Corporate financing	

Although the business process findings across the case firms are much the same, there are, however, huge differences in the maturity of running those functions. With respect to the essential business processes of the Contract Manufacturer firm, total quality management was pervasively present in all essential business operations. Also, the key customer relationship management was organised perfectly, and, indeed, the firm had integrated operations seamlessly with the key customers. Internationalisation was more salient than that found in the two other and younger firms. The Contract Manufacturer firm's value chain management, both backwards and onwards, was plausible. Some products were delivered directly to end-customers and the contract manufacturer had control over its own principal firm within certain functions related to deliveries and customer's technical support, which was a sign of a high level of trust between the Contract Manufacturer firm and its key customers.

The most visible thing differentiating the Optical and Spectroscopy System firm from the other case firms was the patent portfolio that required a more careful technology management principle and also accrued costs. Also, owning patents caused problems, as some of the IPRs were not aligned within the rest of the patent portfolio, and this led to one of the main shareholders establishing an own spin-off firm.

Therefore, the next subject is trying to build a growth model based on dynamism of business processes.

6.3 DYNAMIC VIEW OF BUSINESS PROCESSES

The discussion here in Subchapter 6.3 is related to the applicability of business processes for defining the entire growth continuum, from a single business opportunity through the growth stages and successive diversifications up to the stage of a mature firm.

The analysis work carried here, first, tries to position each second level appearance, i.e. a subprocess of the entire taxonomy along the venture stage references from zero to eight. Then, the belongingness of each of the objects (subprocess) is assessed according to the intellectual capital quality.

The starting point for positioning business processes comes from two sources. The first considers appropriate units of analysis from the taxonomy table (in Appendix 2 and the truncated version in Table 29), which suggests 11 main level business functions and 52 business processes, as well as 309 tasks. As said, the 1st and 2nd level taxa were chosen as the unit of analysis because the 3rd level taxa turned out to be too detailed an entity. Second, the selection of business processes in the tables in Subchapter 6.2 not only states a list of more valuable processes among the whole variety of 52 processes, but also entails the perspective of time. In fact, each of the processes encompasses a point of creation, and therefore they can be positioned along the firm growth path.

Thus, the second level taxa, i.e. the main processes, were connected to their first appearance along the growth and assessed from their most dominant intellectual subcapital point of view. Practically, those 52 main processes of the entire intellectual resource taxonomy table were tagged by two codes: (1) stage reference of first time emerging, and (2) the dominant subcapital quality. Considering the latter, four alternatives were used: human (HC), relational (RC), organisational knowledge and process capital of structural capital (StC), plus their combinations when two or more alternatives were equal.

The sorting of business process by subcapitals and stages is in Appendix 3. Labelling of the business processes present in the taxonomy table by subcapitals and growth stage of the first appearance does not give very much additional contribution for the study as the majority of the business processes are encountered for the first time in stages 1 – 5 following the venture stage coding.

However, this view was complemented by a second interpretation. Besides the initial appearance of a particular business process, the appropriate stage where this process reaches substantial maturity was estimated. The related code is in the column entitled 'enhanced'. Reaching the enhanced level was judged by the establishment of this certain process throughout the organisation provided by a formal system like an IT-system or any documented firm internal discipline. In other words, a mandatory requirement for the enhanced status here is the business process providing a clear status among the company management disciplines and practises. Therefore, it is advocated not only by the first adapters, as is the case with the initial level business processes. It would have been useful to apply a more normative ranking for the maturity assessment like the literature on capability maturity models. However, this is avoided here due to reasons of simplicity and also due to the research setting, as the focus is mostly on the first research problem rather than the second and third ones, to which this extension would have contributed.

Some major emphases between service (The Contract Manufacturer firm) and solution business-orientated firms (The Machine Vision System firm, The Optical and Spectroscopy System firm) are distinctive. A service-orientated business model emphasises the role of quality management, even at the early stages, as well as making services and products less visible. Considering the latter business model type, quality management, the situation was opposite to the former.

The first stages 1 – 3/4 are concentrated on developing the first product and/or service development, market entry, production tests and tasks which are explained with the LDS case earlier. The predominance is on engineering and product-related business processes. The minor product and market diversifications providing respectively the venture stage codes 4 and 5 in Appendix 3, reveal mostly sales and customer relationship-related activities, and improving product manufacturing processes. Moreover, they manifest the importance of relational capital. Later stages are accordingly dominated by human capital/ structural capital (the former), and relational capital (the latter).

The contribution of the analysis, as summarised in Appendix 3, separates initial and enhanced business processes occurrences. Moreover, it indicates the more sophisticated processes as belonging to the later stages (ref.code 6-7), apart from the basic processes appearing during stages 4 - 5. The restructuring operation is not indicated with its own code because the venture stage model does not provide clear status for it along the subsequent stages. For example, line 48 is embedded with profitability management referring to restructuring, but is here referred to by a more general code indicating the stages 4-5.

Transfigured in terms of intellectual capital, Table 34 shows the frequency statistics of subprocess appearances. It seems that different subcapitals are slightly biased due to fact that the data collection was based on documents and interviews with multiple people and across organisation boundaries. Consequently, human capital due to its individual nature stayed in the background. This matter is seen in Table 34, where

relational and structural capitals are notably present. The high number of structural capital subprocesses, 23 occurrences, comes also from the dominant roles of both the organisational knowledge and business process factors. Relational capital appeared in the relationship with customers and business partners, with 10 occurrences.

The visible forms of human capital came forth in the manifestations of highly structured information and knowledge of individuals, 4 occurrences. However, it should be emphasised that human capital is pervasive through most of the occurrences of relational and structural capital and the less visible appearances were caught by the methods of participant observation and organisational development. Some of the subprocesses were difficult to be classified to only one subcapital and consequently a dual interpretation was given, as seen in the table below.

Table 34: Summary of subcapital occurrences on 2nd level appearances

StC	23
HC	4
RC	10
RC/HC	2
RC/StC	8
HC/StC	1
ALL	1

As a conclusion of this discussion, a particular business process appearing at least on two maturity levels, initial and enhanced, makes the positioning within the growth stages complex. Thus, using an additional unit of analysis such as the organisation maturity model concepts becomes necessary.

A second conclusion is that due to deviating business models, the growth of a particular firm favours certain processes to be prioritised. In Subchapter 8.2.2 three different business models, two of them found from the case studies, are introduced. Each of them discloses a similar composition of main business processes, albeit provided by unequal strategic importance, which explains the business model specific preferences about the order of appliance of business processes along the growth path. For example, the service business model (Contract Manufacturer Firm) favours the business process engaged with customer service quality management to become developed in the earlier stages, whereas the product business model stresses less the role of customer service issues (since they are mostly taken care of by the distribution partner, and the integration with customers is relatively low).

Third, the business process is too limited an entity for the manifesting of a driver for investment. In practical business situations developing a particular business process (i.e. 2nd level taxa) is considered a daily operation management act, whereas bigger process entities such as sales and distribution network establishment (Optical and Spectroscopy System Firm) would trigger intellectual capital investment. Hence, establishing a main process is a mandatory but not necessarily adequate condition for intellectual capital investment.

In this sense, applying the intellectual capital concept becomes favourable instead of trying to build a growth model based on the business process approach. However, intellectual capital and business process are not substitute concepts, but more like cause and effect. That is to say, intellectual capital is the main ingredient for developing business processes.

In next chapter, dynamism of growth is approached by applying defined concepts in the theory part. Certainly, this increases the level of abstraction and shifts the research mode from etic to emic, where interpretations of the research material are observed through the concepts and not vice versa, as has been the case until this point.

7 DYNAMISM OF BUSINESS GROWTH

The dynamism of business growth is grounded on the three key concepts stated in Chapter 4 in the theory part. Two of them, the business creation process and the diversification concepts, are views on micro and macro level occurrences of firm growth. The third concept, venture stage model, lies between these two, holding as well characters for explaining micro level occurrences at the early stages. Thus, it has a supportive and supplementary role for the other two as it discloses both a micro view on growth when speaking about the early stages and a macro view at the advanced stages of growth. Consequently, the venture stage model is a key for binding the micro and macro view.

Therefore, Subchapter 7.1 takes a view on deriving the business creation process. Subchapter 7.2 is dedicated to the validation of diversification as a macro level concept. Both these concepts are bind together in Subchapter 7.3 and a 7*7 matrix is defined. Finally, Subchapter 7.4 is a transfiguration of that micro-macro pattern into intellectual capital terminology which is the answer to the first research question dealing with the generation of the intellectual capital growth pattern.

Subchapters 7.5 and 7.6 stand for the research line 3. There, the focus is directed towards the answer of the first subquestion of the research question 2 pertaining the describing the intellectual capital value adding cycles framed by investment in technology company growth

most obvious positions of providing opportunities for intellectual capital investments.

The operationalisation strategy and its more precise introduction from analytical process perspective is not repeated here as they were already discussed in Subchapter 5.1, Research Process.

7.1 VALIDATING CONCEPT OF BUSINESS CREATION PROCESS

Subchapter 7.1 introduces the concept of business creation process connected with the early stages of venture capital stage model (Subch. 4.4.2). In fact, those initial stages of growth do not manifest diversifying but more like entering to the initial market by the first product/service offering. Consequently, the perspective here is a micro view on growth.

The objective here is to operationalise the theoretical concept of business creation taken from Subchapter 4.1 against the case studies. This is fulfilled within a limited area of business growth continuum, which is at the early stages of business growth from opportunity recognition to the market entry. Validation is complemented by a

comparison with the venture capital stage model, which endows robustness to the concept definition here. The validation of the business creation process concept takes a stance on the concept of diversification, too, as the first journey from a business idea to the entry into the initial market involves no diversification. However, this first evolution is called a null diversification for the reasoning later presented here. The output of Subchapter 7.1 is revealed in Figure 28, where also the intellectual capital terminology is provisionally stated.

The discussion is organised in scrutinising sequential episodes identified in the case narratives which are accordingly reflected with the definitions of the steps in the business creation process concept. The first episode involves finding an appropriate and feasible business idea (The Machine Vision System firm; the Optical and Spectroscopy System firm; The LDS). The two sources of recognising a business idea, as discussed in Subchapter 4.1.1, are clearly present in the cases. There are both business opportunities inspired by research findings (The Optical and Spectroscopy System firm) and by customers' ideas (The Machine Vision System firm)⁶. The first episode is not only invisible brainstorming, but also concrete acts are seen, such as making initial constructions on a lab-scale for proving a method/pattern at the core of the product idea (The LDS).

Hence, the first episode is defined by business idea recognition and idea conceptualisation, where the presence of business network providing social aspect and human capital for creating innovations is mandatory. In conclusion the stages 0 and 1 of the venture stage model as shown in Table 18 and business creation continuum fit precisely with the description of the first episode. From the intellectual capital definition point of view, there are both social and human capital components

Next, the second episode comprises ensuring the business opportunity, both from the technology and market opportunity perspectives. Together, these two compose a business plan as well as being called a business feasibility study, which is the document for proving the existence of a profitable business (or businesses) and convincing investors to fund the case in question.

In some of the cases making a market study as part of the business opportunity study was not fully seen, but there were acts related to confirming the patent coverage within the technology area in searching for and identifying comparable solutions in the market which are typical of freedom-to-operate and competitor analyses. This is seen in the way how the LDS team preferred to move in their emphasis with proceeding to finalise the first construction feasible for the prototype level. Therefore, only some market study

⁶ Regarding the initial stage of innovating the first era for the Machine Vision System Firm in 1998-99, which came after the actual founding of the firm in 1996.

related tasks were carried out. Accordingly, technology start-up firms have a proclivity towards focusing too much on technology to the detriment of other perspectives like market segmentation and customer demand (Groundsten 2004). However, this notion does not deny the fundamental position of a business feasibility study including the technology and market perspective before finalising the first workable technology construction, or even more, a prototype. The emphasis and order of tasks both on the business feasibility study and technology development domains seem to be dependent on their costs. Proto-building was preferred over analysis work in the business cases, where the costs and business risks were less significant, and vice versa.

In sum, the second episode here is characterised by means of conceptualising and concretising the customer offerings - a product or a service. Also, confirming the recognised business opportunity, both in the technology and market feasibility perspectives, and creating the first business plan are typical tasks here. Hence, this characterisation is aligned with the definition of stage 2 of the venture stage model and the exploitation step of the business creation process (4.1.2). Although exploitation was defined merely by absorbing technology related intangible complementaries, the concept of exploitation step of business creation process is considered here also utilising analysis capabilities. That is to say, absorbing and acquiring intangible complementaries not only for technology development, but also for deriving a market study and a business strategy. From intellectual capital point of view, these operations claim structural and human capital, and, moreover, reflect the definition of the second zone in the theoretical intellectual capital value chain concept as put in Fig. 23 in Subchapter 4.2.4.

Next, the third episode involves forming a business team and developing the first tradable product or service that is trialled by the pilot customer found during the market study, (The Optical and Spectroscopy System firm; LDS; the Machine Vision System firm). Sometimes it would be necessary to outsource R&D work like The Machine Vision System firm did when it expended much effort on developing the first version of its second main product, the machine vision system, with the external research and technology development institute in 2000-2001.

In sum, the third episode is parallel with the definition of stage 3 of the venture stage model, where the emphasis is on product development and finding prospective customers. Also, this episode is congruent with the definition of the generation step in the business creation process. Strategy management, market verification and financial funding activities centered on the chosen business model were present, too. In respect to the theoretical intellectual capital value chain presentation in Figure 23 (4.2.4), the salient subcapitals are organisational knowledge and diverse management disciplines, both belonging to structural capital and certainly human capital located in the area across the dotted line between zones 2 and 3 in Figure 23.

The fourth episode is divided into selecting, ramping up the chosen business model and exercising an appropriate organisational form for technology commercialisation and deriving the entry-to-market effort. For the LDS case this would have been making a

choice between a technology transfer option or launching an entrepreneurial endeavour. Established firms (the Machine Vision System firm; the Optical and Spectroscopy System firm) were able to use the present business structure or let the business case be organised outside the firm boundaries in terms of a spin-out firm: Optical and Spectroscopy System firm).

In sum, the fourth episode embodies much of the actions which belong to a business ramp-up and entering the initial market. Hence, this episode is in line with the stage 4 definition (venture stage model) and matches perfectly with the concept of deployment (business creation process). However, the deployment acts inside customer premises, which belong to the delivery and implementation of sold goods and services, are not visible here. The intellectual capital value chain interpretation here posits two subcapitals, structural and relational, the former due to organisation model related acts and the latter to the required sales acts. Following Figure 23 (4.2.4), the fourth stage (venture stages) and deployment (business creation process) belong to zones 3 and 4.

Finally, the figure, next here, summarises the episodes in four stages, where the right-hand stage is divided into two acts following the definition of deployment step in the business creation process. The two theoretical perspectives – venture stage model and intellectual capital – are introduced together with the concept of business creation process.

The last point of discussion here is the interpretation of the diversification concept applied to the evolution of business growth from opportunity recognition until entry into the market. Within the four steps illustrated in Figure 28, there is now product or market diversification present. Within the initial steps of growth a firm pushes into the initial market position by the first product/service, hoping for a successful start-up. However, stretching the view beyond the initial starting-point, the opportunity recognition step, it is relatively easy to notice that none of the new ideas are brought forth from a vacuum. As all of the case firms here prove, the new business opportunity ideas relied on past technology innovations embedded in the products and services. Therefore, the preceding leap before the opportunity recognition of a particular firm is constituted either in a product or market diversification from the existing spectrum of technology.

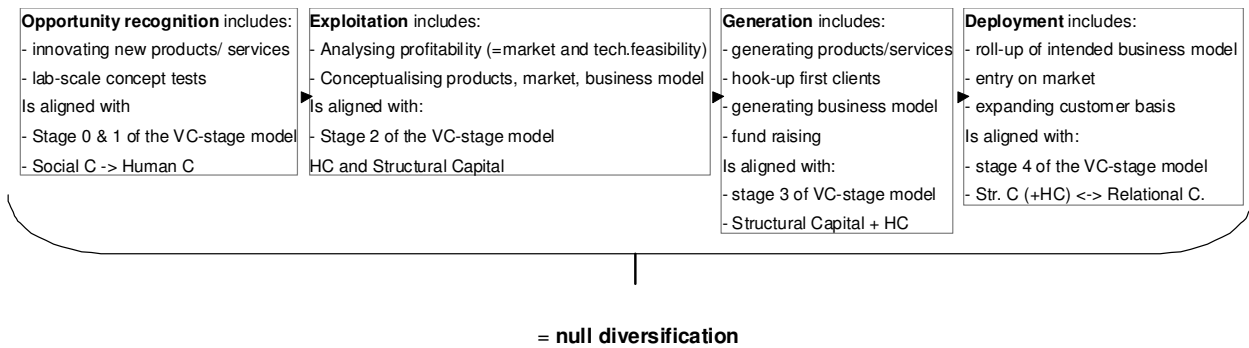


Figure 28: Re-defined Business Creation Process linked with VC-stage model, IC and diversification

Conclusions:

- As such, the theoretical model of the business creation process presented in Subchapter 4.1 is a valid concept in defining the early stages of business growth from business opportunity recognition to entry into the market.
- Strengthened by the additions presented in Figure 28, the concept of business creation process is valid for defining the first four stages of the VC-stage model.
- The partial growth continuum from opportunity recognition to entry into market makes sense with the definition of null diversification.

7.2 LINKING DIVERSIFICATIONS, STAGE MODEL AND GENERALISING OF BUSINESS CREATION PROCESS - MACRO VIEW

The analysis here is on the macro level of investigating growth. The theoretical concept of the venture capital stage model is taken here as the basis of macro level growth. Because it is described by the terms of operation management, the study here makes an attempt to conceptualise the VC-stage model in terms of diversification concept. This is because a generic explanation model grounded on the operation management or business process terminology caused problems, as stated in Subchapter 6.3.3.

Hence, in this subchapter the diversification occurrences of the case firms are examined and the parallel with the venture stage model is assessed in the two subchapters. The end result is present in Table 35 at the end of Subchapter 7.2.2. The next subchapter, 7.3.1, is devoted to linking the diversification view with the concept of business creation process. Consequently, this subchapter, 7.2, as a whole preserves linkage with concepts validated earlier here – seed-bed, intellectual resource taxonomy, intellectual capital – through the venture stage model, and secondly, the business creation process concepts.

7.2.1 Minor product and market diversifications stages 4-5

Acts related to the fourth stage, the start-up stage, are not only a starting point for expanding business volume but also for the continuous product improvements requested by customers (The Optical and Spectroscopy System firm). Also the Machine Vision System firm spent a substantially long period during 2002-2003 in making its existing main product feasible for a global major customer, which was, de facto, the market entry point for the Machine Vision System firm. As such, both these case firms put emphasis on holding on to their first customers and catching new ones. Moreover, these firms were obliged to develop, and especially, diversify their products due to expansion of their businesses within the entry market.

In conclusion, the operations belonging to the fourth stage fit perfectly with the idea of minor product diversification that took place after launching onto the market. Minor product diversification is centered on ensuring the true market demand and developing the main offerings to meet the recognised factual demand. The supplier firm also derived continuous market learning in order to decide on the next moves of both product development and market expansion.

The next diversification act, minor market diversification, is seen in the way both the Machine Vision System and the Optical and Spectroscopy System firms envisioned new adjacent customer segments close to their technology basis and easy to access from their initial market positions. Especially the Machine Vision System firm was eager to enlarge the market scope as it was profitable in 2004 due to an expanded business volume granted by the principal customer.

Minor market diversification did not mean the absence of diversifying product and service offerings. However, the main emphases, as well as arising new expenses, were predominantly from market operations, not from product development. Regarding the latter, typical of this step is implementing add-on technology components from close partners (the Machine Vision System firm), or available from the market (both firms), or involving some configuration changes of the existing product to meet the desired (new) customer segment's demand preferences. The Machine Vision System firm succeeded finally at the end of 2006 in capturing new customer segments in other industries within the existing technology base which was an evidence for a minor market diversification, unfortunately accompanied with continuous profitability problems origin of losing the major customer earlier in 2005.

Following the venture stage model, the fifth stage, the early growth stage which is expressed in Table 19 (Subch. 4.4.2), is defined as: "a firm has successfully passed the product development stage and possesses feasible offering(s), products and services", and "(firm) demonstrates signs of profitable business". Essential for this stage is capturing the business potential concealed in the firm's technology offerings and options for expanding the next market segments.

In conclusion, the fifth stage can be characterised in terms of minor market diversification to the adjacent market segments suitable for the present technology portfolio held by the firm. Although the technology basis is extended by add-ons and by some other product enhancements, they are, however, new (software and hardware) configurations built on top of the existing technology knowledge held by the organisation. Hence, there was no actual minor product diversification occurring in accordance with market expansion, or the level of product diversification is considered low compared with the market diversification.

The shift from a minor product diversification to a minor market diversification was seen in the research-to-business endeavours' growth path (The Optical and Spectroscopy System firm; LDS). These new born technology firms captured the first customers from among their peers, from universities, and from research laboratories

(The Optical and Spectroscopy System firm), which is consistent with Moore's characterisation of the two first customer segments before chasm: technology enthusiasts and early adopters as defined in Subchapter 4.4.1 in the G.Moore's (1999) market segmentation concept. Moreover, both firms entered a homogenous market, which turned out gradually to be more heterogeneous due to the product variants and various needs of the customers. By definition, the firms passed first minor product and then minor market diversification which is sometimes a relatively long learning period is needed for spotting a profitable business space (Gasera Ltd interview 2007).

The minor product and market diversification path is followed not only by less successful companies, but also by top-class born-global companies. An exceedingly successful Finnish technology company, Polar-Electro Ltd, in the 80s took up a cutting edge market position in the 80s with its heart-rate monitor products within the athletes' market segment. As evidenced by the CEO Martti Karppinen, success was given a boost by Edwin Moses, the Olympic Games winner in the 400 m hurdles, who was spotted in global TV broadcasting with a Polar Electro's product on his chest. Soon this product was adopted by ordinary people. Hence, the product conquered adjacent markets after initial entry market entry (athletes) by extending the product range (Karppinen's interview memo 2007).

In the case narratives a business restructuring was seen to follow stage 5, minor market diversification. In respect to the case firms, the magnitude of business restructuring after stage 5 varied, depending on the customer base and the size of product/service portfolio. Considering the Optical and Spectroscopy System firm case, the restructuring act appeared to reshape and increase the homogeneity of the customer base. The reason for the need to restructure the business portfolio (products/service and customers) was rooted in the product improvement requests from customers due to the expanding customer base and also to the challenges set by investors to stay on the path of strong growth, which was threatened. In terms of customer loyalty, the firm launched new product variants and drifted towards a distressed situation due to profitability problems in 2005. As said in the case description of the Optical and Spectroscopy firm in Subchapter 5.3.3, in 2005 – 2006 there were in total some 30 sales items generating ca 700 000 € revenue with negative profit, which was also an indication of less profitable products and customers. Eventually, the troublesome situation was relaxed by a management buy-out in 2006 which allowed rejecting the strong growth imperatives as well as restructuring the business portfolio. Also the Machine Vision System firm restructured its business for the first time in 2005 by focusing on new markets and reinventing the customer (the Machine Vision System firm after 2005), while shifting towards new industry sectors with new product modifications.

In conclusion:

- A comparison with the venture stage model points out no corresponding stage restructuring. However, venture capital theory interestingly suggests four restructuring types, as shown in Table 17 at the end of Subchapter 4.4.1.

- The other restructuring related theory in that subchapter strengthens the analytical findings found here.
- Restructuring the businesses portfolio, including both customer and technology offerings, becomes feasible, or even mandatory, especially after minor market diversification preceded by product diversification.
- Common denominator for minor restructuring is improving profitability.

Next, validating the concept of three successive minor diversifications – product, market, restructuring – becomes more robust once introducing the third firm case, the Contract Manufacturer firm, grounded on the service provider business model. Since its foundation in 1960, the firm stayed in the role of a small and less growth-orientated firm. At the beginning of the 90s the new management team switched into a new gear. During the troublesome years of 1993 – 1995 the firm possessed a plethora of customers - over 100, yielding some 3 million € revenue. The majority of them were small and some of them even unprofitable, as stated in the business plan documentation. On the other hand, the Contract Manufacturer firm was highly dependent on only one key customer, yielding 50 % of the revenue.

The time in 1994 – 95 was, in fact, the beginning of a new life cycle, as there were present feasible building blocks for growth, like strong support by local governmental authorities, a new entrepreneurial management team, eagerness to grow, a strong entrepreneurial leader and financing banks' trust in the firm. Instead of attempting a move towards the next diversification, major product/service diversification step, the firm went through a restructuring process and accomplished downsizing the number of customers to 30 and reorganising its technology portfolio, too. It was also dependent on one main customer, which generated over 50 % of the revenue in 1995. To improve this unworkable situation, the Contract Manufacturer firm acquired three new key customers. The interpretation here is that the Contract Manufacturer firm had achieved both minor product and market diversification and after that derived a business restructuring process first, before carrying expansive measures.

Restructuring may be less visible when both minor product diversification and minor market diversification are completed successfully. No evidence for salient restructuring carried out after minor product diversification and before minor market diversification was recognised (Contract Manufacturer firm; Machine Vision System firm).

With regard to restructuring as a minor diversification, the conclusion here is that the restructuring stage comprises reorganising the customer base and technology portfolio. It involves, moreover, considering a reverse-acting diversification dictated by balancing profitability and focusing on business strategy. Accordingly, restructuring is called here reverse diversification.

7.2.2 Major product and market diversification - stages 6-7

The Machine Vision System firm demonstrated profitability in 2005 but declined during 2006, yet was still capable of expansion. In mid 2006 the owners and management were enthusiastic about a new major business opportunity. Despite the profitability problems, a new investor, together with the owners, funded the firm to develop a new technology service concept. In fact, it was not only a new concept; the firm launched a contract service provider business unit aimed at winning a big contract from a big Finnish telecom manufacturer company. In other words, this attempt was preceded by a shift towards a system supplier from the product supplier position, hence claiming a major product diversification. So far, this occurrence can be regarded as evidence of major product diversification. Ultimately, the success of both the Optical and Spectroscopy System and Machine Vision System firms ended at the gates of the major product diversification stage.

In conclusion: disregarding the profitability problems, this developmental progress is best characterised in the venture growth stage model by the 6th stage, fast expansion. Following the definition, this stage is defined as “fast growth prevails” and “demonstrating a profitable business and capturing the potential involved in expansion” as stated in the VC-stage model, summarised in Table 18 (Subch. 4.4.2).

A major product, or here, a major service diversification, was seen also in the way the Contract Manufacturer firm developed its service concepts from 1995 after achieving profitable business and a feasible business foundation for new growth. Yet the firm still served its regular customer on the standard delivery concept basis and it had to develop a new way for serving the current and new key customers. Gearing its businesses to a new level required a new customer service model, and more generally, new service-orientated thinking. Three developmental activities were visible. First, the firm invested first in the reliability and accuracy of delivery management, applying the principles adapted from the philosophy of total quality management, which pervaded the whole organisation. Second, there was a change in value chain position as the Contract Manufacturer Firm delivered contracted production directly to end-customers (i.e. customers' customer). Third, the firm began to offer product design services in order to raise the customer loyalty.

This three-faceted progress was an evidence of an investment in caring and preserving for key customers and gaining new ones and deriving a major service diversification. Moreover, it claims that the major service (product) diversification was carried before the major market diversification which was derived later in the late 90s when the customer service model was geared into a new level.

In conclusion: a major product diversification becomes feasible after minor product and minor market diversifications, and achieving a sound financial position.

After strengthening the service offering foundation, the Contract Manufacturer firm underwent a market diversification when entering into new industry sectors. It first expanded into the plastics industry in 1999, which may, however, be considered a minor

market diversification because the market here was an adjacent market to the metal industry due to a common service - machining.

The firm took over new market sectors as it attained market position in the sheet metal product business, where it had had a tiny market position in thin sheet metal production since the 80s. This move in the beginning of the 2000s necessitated changes in the sheet product capacity, involving new type of production machinery. Furthermore, this suggests a combination of major market and minor product/service diversification while the market diversification was dominant to the product diversification.

A major move onto the market and evidence of a pure market diversification after major product diversification was the entry into the electronics contract manufacturing business in 2002 by means of acquisitions as explained in the case narrative. Eventually, by the end of 2002, the firm held three major contract manufacturing service concepts: thin metal sheet manufacturing, machining services (both for metal and plastics), and electronics industry subcontracting. In sum, gaining the electronics industry contract manufacturer position was established due to experience in production technology within the sheet metal contract manufacturing business. Therefore, the role of product/service diversification was low compared with market diversification that can be considered a major one.

The firm internationalised in 1999 and established a subsidiary in the Czech Republic. This move was more like obeying the main customer's request to follow it abroad and strengthening cooperation at the local level. Accordingly, the market diversification was in this case rather low.

The third type major diversification is major restructuring which is carried after a major market diversification which is, in turn, preceded by a major product diversification as defined here. This notion is based only on one case (the Contract Manufacturer Firm), where the restructuring involved reshaping the entire group. After expanding customer basis in the latter half of 90s and carrying merger and acquisition operations Contract Manufacturer Firm had multiple sites and bought firms. Hence, there was a need for arranging its business into strategic business areas following a corporation model. Restructuring activities considered not only rearranging the product/service and customer portfolio as after the minor diversifications, but especially here the form of business firm portfolio. Accordingly, a major restructuring diversification was carried called here also major reverse diversification.

Conclusions:

- Major market diversification occurs after major product/service diversification.
- Major market diversification can be accompanied by minor product diversification.
- Major restructuring diversification is carried after major market diversification

The difference between major and minor diversifications until now has not yet been discussed definitely, which is the next task. This matter is also taken up here for reasons of triangulation, as there is only one case, the Contract Manufacturer firm, reaching a

the major market diversification level. Therefore, the discussion here is derived by taking additional firm cases.

The idea of market diversification is seen in the way that technology firms have organised their businesses. Since the 80s Polar Electro expanded by major product diversification and market diversification. Witness to this are the solution and service provider businesses built on top of the current product offerings. Clearly, they call for a different type of business model and are targeted at new customers like the public and business organisation well-being market. The same company model is seen in Vaisala Plc, another case firm outside the actual case studies, grounded its success in weather measurement gauges since in 1936. Today, it holds a three faceted business group structure divided into the component, solution and services business units. Consequently, these firms are evidence of major product and market diversifications.

After leveraging the minor product, market and restructuring diversifications, firms tend to try for bigger moves like merger and acquisition transaction, just as the Contract Manufacturer firm did. That is to say, firms at the major product and market diversification stages favour non-organic growth. However, the firms capable for M & A-operations are provided with a corporate financing activities as well as financial resources which are typically found from either listed or non-listed mature companies.

The examples here among the listed companies stress the pivotal role of balancing between M & A-operations and managing own research and development activities. As stated by the R & D-representatives of Vaisala PLC (Vaisala interview 2007), the rationale for buying a new technology firm is rooted in acquiring strategic new customers and/or technology, which is to say market or product diversification. Second, Outotec PLC made a strategic move in 2007 to acquire technology rights from Liquim Ltd to apply them in Outotec's product offerings to mining companies (Outotech interviews 2006; 2007), which was apart from Liquim's paper industry solutions. This case was apparently a major market diversification.

Metso Automation, a division of Metso PLC, changed the balance between own R&D and M & A-operations following global economic situation. This attitude reveals, in fact, favouring either organic or non-organic growth. During 2002 – 2004, a recession period, Metso Automation obeyed a strong cost discipline and decreased its R & D-investments. Conversely, this phenomenon was seen in 2006 – 2007 during the good times in the global economy, when the company focused keenly on searching for new innovations and investing on collaboration with universities.

Eventually, Table 35, next here summarises the conclusions of growth continuum expressed in terms of diversifications referred with the venture capital stage model.

How to separate major and minor diversifications? The market diversification is discussed first where the rationale for separating minor and major market diversifications is involved in the magnitude and high-risk of extending customer basis. The minor one is mostly tied with achieving a stable customer basis and satisfied customers. Together with mature technology, it forms a solid business foundation,

yielding a sound revenue and profitability model. In other words, a minor market diversification is focused on operating within the current customer basis and the potential new customers nearby the firm's business boundaries. In turn, a major market diversification involves venturing into new unknown territory. Regarding the relationship between minor and major product diversification, there is analogue with the two market diversification main types: either a small or a big leap.

Table 35: Revised stage model

STAGE	Brief characterisation of diversification
Stage 8	Maturity Major business restructuring
Stage 7	Major market diversification embedded in a minor product diversification when necessary – Major expansion following VC-stage model
Stage 6	Major product diversification embedded in a minor market diversification when necessary (minor product diversification?). Fast growth, expansion stage following VC-stage model Restructuring of product and customer portfolio
Stage 5	Minor market diversification Beginning of expansion/ late early growth stage following VC-stage model
Stage 4	Minor product (service) diversification Entry to market and early growth stage following VC-stage model
Stage 3	Finalising/carrying product or/and service development and contacting the first potential customers; forming a business team and preparing for founding of a business firm
Stage 2	Market and technology feasibility study involving the proof of existence of a profitable business and preparing a business plan for funding negotiations; construction of first workable and movable product; trialling with trusted industrial partners
Stage 1	Recognition and conceptualisation of business idea, initial lab-scale construction

A more compelling identifier for making sense between minor and major diversification is the impact of diversification into the firm's business model. A change in the product or customer basis does not necessarily require rearranging management operation, or more even, business firm's model which is referable to minor diversifications. In turn, major market operation, like a change from operating in domestic market to international company requires new distribution model and probably rethinking of market and sales operations. Certainly this occurrence fits perfectly with the concept of major market diversification. Accordingly, a shift from the product business to service provider role necessitates that the products become bundled with services, which is leveraging product portfolio and a major product/service diversification assuming that the company stays in the same customer sector.

7.3 LINKING NEW BUSINESS CREATION PROCESS AND DIVERSIFICATIONS

The target in this subchapter is first to create a hypothesis for the entire growth model based on the concepts of diversification and business creation process, as introduced in the two previous subchapters. First, the validity area of the concept of business creation process is extended to cover all diversification, not only the null diversification as stated in the Subchapter 7.2. Therefore, the first subchapter here focuses on applying the concept of business creation process to describing and defining the course of micro level business growth actions of any of the diversification types. The point of view in how the linking is carried here is from diversification to steps in the business creation process. Accordingly, the text is organised by diversifications. The result from this investigation is a generalised pattern composed from 6 diversifications + null diversification and 6 steps of business creation process.

In fact, the 6*7 pattern is a hypothesis for the scrutinising carried out in the second subchapter here. The point of view is now from the steps of business creation process to diversifications and the text is accordingly organised in steps. Some new findings are identified and the pattern is extended to cover 7 steps and 7 diversifications. Finally, this subchapter validates the hypothesis by deduction and gives insight into the intrinsic appearance of diversifications. Moreover, the composition of diversifications and the business creation process lays the foundation for the entire technology business firm growth model.

7.3.1 Generalising Business Creation Process and Creating Micro-Macro-Model

In this subchapter the validity area of the concept of the business creation process is extended to be considered within any type of diversification. The point of view is diversifications reflected with the steps of business creation process aiming to establish a hypothesis for the growth model. The order of introducing diversifications is chosen to begin from major diversifications, both product and market ones, and continued by introducing minor diversifications, then, finally, restructuring, the third type of diversification, which is named reverse diversification.

The claim here is that the concept of business creation process is applicable to define the internal passage of creating business in respect of major and minor product, market and reverse diversifications. First, major product diversification is discussed grounded on a sample taken from the Machine Vision System firm evolution path, which is described in more detail in Appendix 1 on pages 9-10. The firm tried to sign up a new big customer in 2007, which would have involved major product diversification. The episode began by recognising a business opportunity which was, de facto, a subcontractor position for this international Finnish telecom company. Next, the firm negotiated funding with a new partner candidate, which had, besides money, also valuable contacts with the targeted company. This stage could be characterised as the

exploitation stage, i.e. exploiting the required key resources for further steps. Next, the firm made provisions for carrying out the desired business, which is parallel with the generation stage, as it comprises not only making but also acquiring the needed resources. The most visible generation tasks were the creation of a service business model and preparing and executing a pilot for the customer's own evaluation purposes. Next, the firm internal deployment involved especially establishing a seven employee new site near the targeted new big customer (for more details, see the case narrative in 5.3.2 or p.10, Appendix 1), as well as extending the shareholding with the new partner, an investor. So far, the description here fulfils perfectly the business creation process, excluding the customer deployment that would have been realised when winning the deal.

The business creation process embedded in a major market diversification is seen in the occurrence where the Contract Manufacturer firm embarked into the electronics contract manufacturing industry sector. This manoeuvre was based on an opportunity to acquire customers in terms of merger and acquisition operation from JOT-Automation Plc. The Contract Manufacturer firm's resource pool for this operation comprised financial resources, high grade service concepts and reputation, other management practises and skilled personnel. These resources were exploited for generating new service forms, and, especially, the high level service concept present in the company's current business units. The source material does not tell in detail the acts related to generation. Obviously, training the personnel as well as implementing the service model throughout the purchased business unit were the practical acts resembling the generation stage. The organisational changes within the purchased firm reflected the features of deployment.

The conclusion is that the concept of business creation process is a valid concept to demonstrate the sequential acts embedded within major product and market diversification occurrences. Hence, the chain from the first business idea to the deployment step of adding value to customers is built-in in these two major diversification types.

Next, the study validates the business creation process for minor diversifications based on the case studies not indicated separately in the following text until to the summary table. With regard to minor market diversification, the first step, opportunity recognition, is the outlining of a business opportunity for the present technology offering outside the current market regime, horizontally or vertically. The object of outlining is a customer, unlike in the product diversification case, where it is the offering. Hence, in respect to the minor market diversification it can be said that the first step is innovating a new (customer) use case for the existing offerings and, then, defining appropriate market segment(s) for this particular use case. Considering minor product/service diversification the opportunity recognition holds inventing new products/services to the current market area. Moreover, an opportunity recognition step calls for making both technology and market feasibility studies, which are needed for carrying a profitability analysis.

The exploitation stage is concerned with collecting the required tangible and intangible resources from the firm's internal sources and external ones, which is organising a seed-bed for the business operation (a *seed-bed is the resource pool comprising tangible assets, intellectual and financial capital owned by the firm itself or by other actors, as explained in Subchapter 4.5.3*). Considering minor market diversification, the intangible side is more substantial than in the case of minor product/service diversification, which necessitates more tangible assets as well as financial resources.

Generation within the case of minor diversification is focused on creating or enlarging the current management structures suitable for reaching and managing the chosen market. As such, the making of concrete issues is less visible, unlike the case of product/service diversification, where the role of creating visible products/services is dominant.

Deployment involves both firm internal and external topics. First, the internal deployment is seen in the change of ownership as the intended new market or product diversification may call for additional funding which is to say new investors. Also firms may require the implementing of new operation management practises due to new key persons on the firm's payroll, or a new subsidiary may be established, or, a new spin-off firm may take off, which are all forms of deployment. Firm external deployment resides on the customer's premises. Thus it is related with value propositions present in the product and service offerings. Unlike in the case of minor product diversification, a firm external deployment is less visible in respect to minor market diversification.

Based on both the evidence emerging from the validation of the business creation process among major and minor diversifications, both product and market ones, the study concludes here that the business creation process is an appropriate pattern for demonstrating any type of diversification. The steps are: (1) recognition of room for new product/service or for new application for existing products and services; (2) analysing and conceptualising product/service and market demand; (3) exploiting needed resources; (4) generation of new products/services or of product/service adaptations and required new management structures; (5) deployment of required new organisational forms; (6) deployment products and services to customers. As stated, an additional step, involving analyses and conceptualising, is added here.

Next, the business creation pattern is adapted to restructuring, which is to say a reverse diversification. As found in the case narratives, it would take diverse intensity levels in respect to shrinking business operations. The mildest version among restructuring types is obviously a business process or operational streamlining, as noted, for example, in the improvements of cooperation between the Contract Manufacturer firm and its key customers (Appendix 2 lines 176, 179). The next level restructuring type is reorganising the customer and technology portfolio, abandoning less profitable ones and concentrating on more profitable ones in order to gain more profits from the latter. The most powerful appearance of restructuring businesses is undoubtedly a production-making asset sale, an entire business unit sale, or a shutdown, as happened to the Machine Vision System firm in 2008. The streamlining option can be neglected as it is

every-day care of sustaining firm's productivity. The other two options, product and customer portfolio restructuring and asset sales are termed minor and major restructuring.

Regarding restructuring options, opportunity recognition is relevant for the minor restructuring case, unlike major restructuring, which is characterised by an urgent demand to change the firm's business model. Consequently, a major restructuring is taken as given without a search for new cost saving opportunities. Second, profitability analyses and plans for productivity increase or recovery from the distressed situation are analysed and conceptualised. Third, the appearance of exploitation is not salient, as the case here is not investing but divesting. However, exploitation is seen in the measures of arranging resources for carrying out the planned restructuring acts. Fourth, generation here takes the form of restructuring business portfolio (minor) and business model (major case). Fifth, shaping new organisational form is implemented after organisational changes aimed at increasing profitability. Sixth, deployment on the customer's premises is not present.

Conclusions:

- Major and minor restructuring, termed also major and minor diverse diversification, is appropriate for demonstrating in terms of the six steps in business creation.
- The six steps are present also in product and market diversification where both the business opportunity recognition and the deployment step are divided into two steps.

The overall contribution of Subchapter 7.3.1 is highlighting the uniformity of the three diversification types, which is articulated in Table 36 next here.

Table 36: Conformity of diversification types vs. business creation process

Business pr.step -> Stage (vertical)	Opportunity discovery	Opportunity selection	Analysis and conceptualising	Exploitation	Generation	Firm intern. deployment	Customer deployment
Diversification type							
Product/ service	present	present	present	present	present	present	present
Market	present	present	present	to some extent	present	present	imaginary/ not present
Restructuring	obvious (present)	present	present	to some extent	present	present	present (divestitures)

One of the additions to the interim result in Subchapter 7.1 is dividing business opportunity recognition into two acts, discovery and selection, which are precisely as defined in the theory (Subchapter 4.1). Moreover, business opportunity recognition captures the three main factors of social capital mentioned in the theory part (4.2) and arose also from the case analyses: (1) the capability of processing new ideas and knowledge related to particular business opportunities, which is the cognitive skills of individuals; (2) the behavioural dimension related to sharing common norms, trust and sanctions, which are enablers of a recognition act; (3) the quality of communication

engaged with sharing common terminology and jargon, which is a prerequisite for comprehending a particular expertise area in business.

The other additions to the theoretical notions observed in the Subchapter 7.1 where the opportunity discovery and the selection are characterised as one step, is the deployment step divided into firm internal and customer deployment, the step 6 and 7.

7.3.2 Validating Grid of Business Creation Process and Diversifications

Next here, the 7 step business creation process * 7 diversification model is finalised grounded on the previous analytical work in Chapter 7. Especially, the generalising of 7 steps of business creation process apt for defining the micro-level view of any of the three minor or major diversification types in previous Subchapter 7.3.1 casts the foundation to define the spoken 7*7 model. The used terminology here arises from the operation management theories found in the resource dependency literature. The interpretation into intellectual capital vocabulary comes in next Subchapter 7.4.

Whereas the perspective in the previous subchapter is from diversifications to business creation process, the point of view is here from business process creation steps to diversification. In practise, this means that the text is organised by steps where all diversification modalities are then discussed briefly.

Business process opportunity recognition is divided into discovery, which is the first step, and selection, the second step. Within the four cases studies, the first step, discovery, appeared as searching for new business ideas with business partners and members of the business network.

From the diversification perspective the discovery act was found from the product, market and restructuring modalities. All these three options disclosed the essence of discovery of new business opportunities in terms of extending the current product offerings (product diversification), expanding customer basis (market diversification) or improving profitability (restructuring diversification). Regarding the major diversifications the attention of the firm executives (the Contract Manufacturer firm) was directed to the firm acquisitions (market and product diversification) and improving synergy within the current business portfolio (ibid).

The second step, selection act, is characterised by selecting the most appropriate business opportunities among those discovered. The selection process captured by an individual is hidden in nature. However, in the in-depth case (the Machine Vision System firm) this act was identifiable in the talks with the researcher and CEO during a period 2008 – 2009 (the research method can be characterised as participation observation and organisational development orientation (French & Bell 1990).

Besides new technology product and service-focused business opportunity recognition, the case material revealed some evidence related to brainstorming new market opportunities in all the cases. In fact, there was a multitude of initiatives related to

innovating new customer segments for current technology, which is evidence of market diversification-orientated business opportunity recognition and selection. Opportunity recognition and selection was found also within the restructuring acts, where a typical initiative considered streamlining interorganizational key customer processes (The Machine Vision System firm, The Contract Manufacturer firm, The Optical and Spectroscopy System firm), and distributors (*ibid.*).

The third and next position in the business creation process involves the acts of conceptualising and analysing. Here, less formal analysis and conceptualisation during the discovery and selection steps by first mover-innovators are carried out on a more normative basis in terms of structured methods. In the cases, typical analysis methods were technology feasibility studies and market studies applied for testing the eligibility of the innovated new product and/or service concept.

Also the role of the board of directors was central here at the third step as it constitutes the initialisation point for establishing a new investment project, and, consequently, an entry point for additional funding and investors. For this reason, the analysis and conceptualising is introduced separately in the business creation process concept.

The third step considers not only product related analysis and conceptualisation, but market and restructuring perspectives, too. The formal analysis-conceptualisation acts were also found among foreign market studies, or in the case of redirecting businesses toward developing a restructuring plan carried out by external consultants. In this respect Table 37 below introduces step 3 divided into the three diversification modalities.

The fourth step, exploitation, is a direct cause of positive technology and market feasibility studies carried during the analysis-conceptualisation step. Not only intangibles, but also tangible resources such as financial and material resources were clearly present in this step, as the exploitation is aimed at establishing an investment (all cases). Typical appearances of intangible resources were absorbing and/or exchanging external knowledge resources and providing internal resources necessitating knowing people, thus manifesting some social capital.

Depending on the business concept and the type of innovation behind it, the required investment was dominated either by a rich set of tangibles and intangibles or just merely intangibles. Minor business projects were grounded typically on less radical innovations (e.g. the product improvements of the Machine Vision System firm). Accordingly, the needed resources were taken from network and internal sources by exchange or other low cost compensation methods in addition to personnel and the board of directors' time, accruing personnel costs and delayed revenues from other businesses. The other edge here in the exploitation step is allocating resources for more risky business endeavours dependent on outstanding financial funding and other resources, which postulates formal investors like venture capital firms (Optical and Spectroscopy Syst. firm).

A fundamental difference between these two investment types is involved in the decision-making process and applying governance procedures for defining changed ownership relations due to the invested additional resources. The first alternative, as depicted in the previous passage, does not necessarily call for the board of directors' or, new investors' participation manifesting ownership management procedures. Consequently, in the case of less formal investment cases, there would be little or no need for ownership capital. In turn, a major investment calls for a formal investment decision-making process and is significantly dependent on ownership capital.

The market and restructuring diversifications were not as clearly identifiable at the exploitation step as the product diversification type. Mostly this was due to preference for intangible, knowledge-based resources over financial and material based tangibles. Consequently, the exploitation was derived by knowledge absorption and other less formal knowledge-based exchange methods, though there was also purchasing of e.g. business intelligence and contracting external advisors in all three firm cases.

The fifth step, the generation step, ultimately leverages the less visible outcomes from the preceding steps into visible acts tied with product and/or service development tasks in the case of product diversification. Making a new product or service and improving production-making capabilities are the obvious features of step 5, which is also proven by theory of the generation step of business creation process (4.1.4) and the cases.

A major act in establishing new sales and distribution channels to a new market area is witness to the market diversification type at the generation step. However, the major or less powerful changes and maintaining of distribution channels should be distinguished as belonging to the firm external deployment step, not to the generation step.

The rationale for this is seen in the acts of steps 3 – 5 in presence of market diversification, and also apt for reverse diversification. First, the feasibility study is created during the 3rd step, which is a brief look on the planned new business endeavour. Next, increasing the accuracy of the created feasibility study takes place in exploitation step giving, in fact, a raise for the first actual project plan. Furthermore, once there is produced no concrete artifacts, like products during the generation step, the major act here is finalising the detailed project and roll-out plan for the market endeavour.

The restructuring of businesses belongs also to the domain of the generation step as it involves change management focused on making the customer and product portfolio more profitable. Here, the 5th act is dedicated for analysing the profitability improvements by means of restructuring the business portfolio which is opposite to the two other expansive diversification types. In turn, a major restructuring to avoid a distressed situation is considered here to belong to both generation and firm-internal deployment because of the ownership management issues.

The sixth step comprises the firm internal deployment, as called organisational deployment, which is theoretically grounded in Subchapter 4.1.4. Central to a firm internal deployment of business operations is positioning within the value network.

Especially, the case firms sought synergy with partners forward in the value chain, but also tried to outsource non-core business functions.

An firm-internal deployment not only undertakes a business operation by choosing position within the value networks, but it also selects an appropriate business model and organisation around the product and service business stretching beyond the firm borderline to the customer's premises, which is, in turn, customer deployment, the seventh step, explained further here. Moreover, both of the two deployment steps can be characterised by one word – commitment. Thus, an organisation is committed at all levels to execute business through the generated new product or service.

As evidenced by the Optical and Spectroscopy System firm, eager advocates of a new technology type may find themselves establishing a new spin-off firm (more detailed, see 5.3.4 and Appendix 2 lines 262, 264). In these circumstances, the commitment is not dispersed through all levels of the parental firm, especially among the owners and board of the directors. Regarding firm internal deployment, three modalities of establishing a new business organisation were found in the case firms, as proved by the theory, too: organisational, alliances and spin-outs (4.1.4). The first one is obvious and was the most frequently encountered type (all cases), while spin-outs (Optical and Spectroscopy System firm) and alliances were identified with distributors and key customers. Moreover, the alliance option was seen to take divergent forms from intimate joint business ventures up to less intensive partnership relations (Contract Manufacturer firm).

The sixth step of launching a new business operation stands as a point of no-return for investors. The roles of owners and board of directors are focused on controlling the success of the new investment. The capital expenses at this stage are manifold compared with generating a new product, which is due to investing not only in technology but also diverse business functions. Accordingly, here the entire organisation and operations management are vested in this new endeavour and all central business functions are trained and prepared to run the new business in question.

Firm internal deployment appeared through all of the three diversification types: product, market expansions and business restructuring operations. Product business launch absorbed relatively big money and necessitated organisation-wide actions. Consequently, this diversification type was brought forth distinctly in all three cases.

However, market diversification does not necessarily manifest itself clearly, like in the case of rolling current technology onto a new market area. Here, no major changes in the current firm internal operation model are needed nor the establishing of a joint operation is required. Especially when there is market pull from the customer side, it would be necessary only to strengthen some of the sales functions. Yet, the firm-external operation model changes are typically outstanding. Embarking onto a new market necessitates building new sales channels and partnering with new distributors, which are considered here to belong to firm internal deployment-related acts. An excellent example here is the global sales and distribution network built by the new

CEO of the Optical and Spectroscopy System firm in 2002 – 2004, which fits with the definition of market diversification-orientated deployment.

Restructuring appeared clearly within the case firms, too. Typically, a restructuring process involved changes in the ownership relations and business model. Restructuring-related deployment acts were carried out within the key customer relationship of the Contract Manufacturer firm (more detailed discussion, see Appendix 2 lines 176, 179). Small size restructuring acts occurred within key customer relationships (All cases), where a typical initiative considered streamlining the interorganizational processes.

The seventh step is also characterised by customer-related deployment, comprising two areas. As discussed earlier, major sales and distribution channel building belongs to the generation step of market diversification. In turn, minor modifications and maintaining of distribution channels are considered here to belong to the firm external deployment step engaged with the product diversification type. The rationale behind this is increasing customer commitment. Furthermore, this act is subject to winning a new sales deal. For example, the Machine Vision System firm recruited a new employee adjacent to the key customer for support purposes in the foreign market area in 2008. Hence, this first area of customer deployment can be characterised best by the word commitment and increasing relatedness between customers and supplier.

The second area of customer deployment goes beyond the supplier firm's boundaries, ending at the point of adding value for the customer. A sales action and implementation of delivery are the most salient subjects of the business process creation continuum here, as well as the cash flow from the trade to the supplier.

Following a market diversification-orientated customer deployment, the practical situation here is launching into a new country or territory or to a new application area within the current geographical position with existing technology. Grounded on the firm cases, this setting is called especially pull-marketing, as proven by the Machine Vision System firm's entry into German speaking countries since 2004. However, separating the customer deployment step between product and market diversifications is more an academic than a practical issue, as the sales and marketing and distributing managements are always intertwined, and distinguishing them from each other in small technology firms is blurred.

The restructuring option also considers trading assets or larger business entities following the logic of divestments occurring within firm restructuring cases or minor business portfolio reorganising.

As a summary of the validation of the business growth model, in brief, it is a continuum presentation grounded on seven steps of business creation process repeating on each of the seven diversifications is present in Table 37 next here.

The individual cells in that Table 37 are the essence of describing a particular action involved in the growth continuum by means of operation management vocabulary. Putting it in terms of the narrative analysis, each of the cells stand for a micro storia of a narrative analysis (Böje 2001) where the grand narrative is the whole table.

In fact, the seven diversifications form a stack where a firm is leveraged from the initial position of growth, the embryo stage, up to a mature firm. The table 37 claims for the business operations to be carried along the growth path towards a mature firm.

Table 37: The entire growth pattern of 7 business creation steps and 7 diversifications

Business creation process)+outcome ->> ----- Diversification types (down)	Recognition-Discovery (1) Explication of new bus. opportunities	Recognition-Selection (2) Priorised new business opportunities	(3) Analysis - Conceptualisation Divestment and/or investment decision	Exploitation (4): Contractual ownership arrangement	Generation (5) New revenue enabling outcome/ artefact	Organisational deployment (6): Organisational structures for the generated entity(-ies)	(7) Customer deployment Selling/ sales contract
Major reverse (restructuring) diversification	Intuitive evaluation of synergy/ remedies for distressed situation	Scoping cost-saving opportunities/ remedies	Restructuring plan, profitability improvement analysis	Searching for buyers for divestments	Detailed restructuring programme & portfolio analysis	Carrying the restructuring.	Asset sales & Integrating bought assets on behalf of the buyer organisation
Major market diversification	Discovering new market opportunities and acquisition targets	Scoping business potential	Business plan /analysis	Acquiring external resource & allocation plan for internal resources;	Detailed plan for joint operations	Integrating sales and distribution channels	Delivery and Implementation Taking advantage of offerings
Major product (service) d.	Innovating new product/ services opportunities and acquisition targets	Scoping business potential	Business plan /analysis	Acquiring external resource & allocation plan for internal resources	Integrating product mgmt and other needed functions		
Minor reverse/ restructuring diversification	Intuitive evaluation new cost savings / remedies for distressed situation	Analysing current business portfolio, e.g. non-profitable customers/ products	Profitability increase plan incl. major changes in business portfolio/ reshaping business model	Allocation plan for external and internal resources	Revamping business processes; Detailed restructuring programme & portfolio analysis	Restructuring organisation and business partnerships.	Trading firm's assets & Integrating traded assets on behalf of the buyer organisation
Minor market diversification	Brainstorming of new customers and customer groups	Intuitive evaluation of new application opportunity (for current technology)	Market feasibility analysis; Use case concept	Acquiring external resource & allocation plan for internal resources	Project work of sales and distribution channels	Integrating sales and distribution channels; Extending management structures	Delivery and Implementation Taking advantage of offerings
Minor product (service) d.	Searching for new product/ services opportunities	Evaluation of the product/service opportunity	Market and technology feasibility analysis Initial construct	Sourcing and allocation plan for external and internal resources	Product/ service development	Restructuring firm's ownership and governance structures; Establishing new business entities	Delivery and Implementation Taking advantage of offerings.
Null Diversification	Searching for new product/ services opportunities	Evaluation of the product/service opportunity	Market and technology feasibility analysis Initial construct	Sourcing and allocation plan for external and internal resources	Product/service development	Ramp-up of business firm	Delivery and Implementation

Characterisation of business operations is founded on the business operations which can be described in detailed by business processes and, furthermore, competences as is the case within intellectual resource taxonomy, in the Table 29, as well as in more detailed in Appendix 2.

Some considerations arising from the analysis shall be taken into account carefully. First, as shown in Table 37, the 7 steps definition here emphasises the essence of the organisational hierarchy levels because the investment decision-making tasks are taken into account apart from operational level acts. More generally, activities falling into the regime of firm governance calling for the board of directors' and owners' participation are considered here with care. This has implications especially for steps 3 and 6, which do not fit precisely into the theoretical foundation, as shown below in the discussion passages of each of the steps.

Second consideration is that, the 7 business creation steps within 7 diversifications must be considered as an ideal model not existing fully in the real business world. As said earlier, some extraordinary lucky growth firms may pass minor restructuring, which is reverse diversification, without salient restructuring. In other words the required restructuring is built-in continuous efficiency control and profitability improvements. Firms' evolvement is not necessary a continuous advancement along the diversification stack from bottom up but possibly trying twice or more some of the product and market diversifications within the financial resources. For example, a firm may try to follow the steps of minor market diversification until faced by a dead-end and forced to restructure or just abandon the interim results from this diversification (expecting that this example firm had not reached the 7th step, deployment enough successfully).

7.4 IC DEPENDENCY IN TECHNOLOGY BUSINESS GROWTH

Finally, the analysis here is centered on answering to the RQ 1: *Generation of the intellectual capital growth pattern and the related subquestions*. The text here is organised in to the three subchapters. The first deals with interpreting the previous table articulated by the business operations terminology into the intellectual capital terms. The example of applying the IC-pattern to the case firm increases the understanding of practicality of the IC-growth pattern. Finally, the third subchapter here, is for describing a more general overview of binding the successive diversification to an entire growth spiral.

7.4.1 IC-Growth pattern

Since the beginning of Chapter 7 the analytical process through linking micro and macro level growth concepts has progressed until the 7*7 grid in Subchapter 7.3.2 which is an expression of the micro-macro-model. Thus, this model is here transfigured into the form of intellectual capital growth model, which is exactly the answer to RQ 1.

The discussion here is grounded on two starting points. The first is the previous 7*7 pattern (Table 37), which is the technology business firm growth model articulated in

terms of business operations. Second, business operations are also manifestations of intellectual capital, and, as stated, they reveal micro stories of business creation, which is, in turn, an expression of either one or more of the subcapitals and their factors of intellectual capital which are summarised in Table 13. Therefore, the first task is to identify all invisible and visible actions engaged on each of the cells shown in Table 37.

Because the expressions in these 49 cells (7*7) are approximations of real business world occurrences, the researcher of this study has worked in parallel by analysing the micro stories available in the case studies. This approach is, in fact, a duplication of the primary analytical work derived in the previous subchapters (7.1 – 7.3.2), which ensures a high grade and precise interpretation of the content of those cells. Accordingly, this approach enables relatively easily the creation of a cross-reference table between business operation names and intellectual capital concepts.

The interpretation of intellectual capital is organised on eight lines in Fig. 29. The seven lines from the top are each dedicated to the seven diversification types following the same order as in Table 37 in the previous subchapter. The 8th line on the bottom defines the mandatory intellectual capital qualities, which are common for any of the steps of new business creation (horizontally) at any of the diversifications (vertical). That's why:

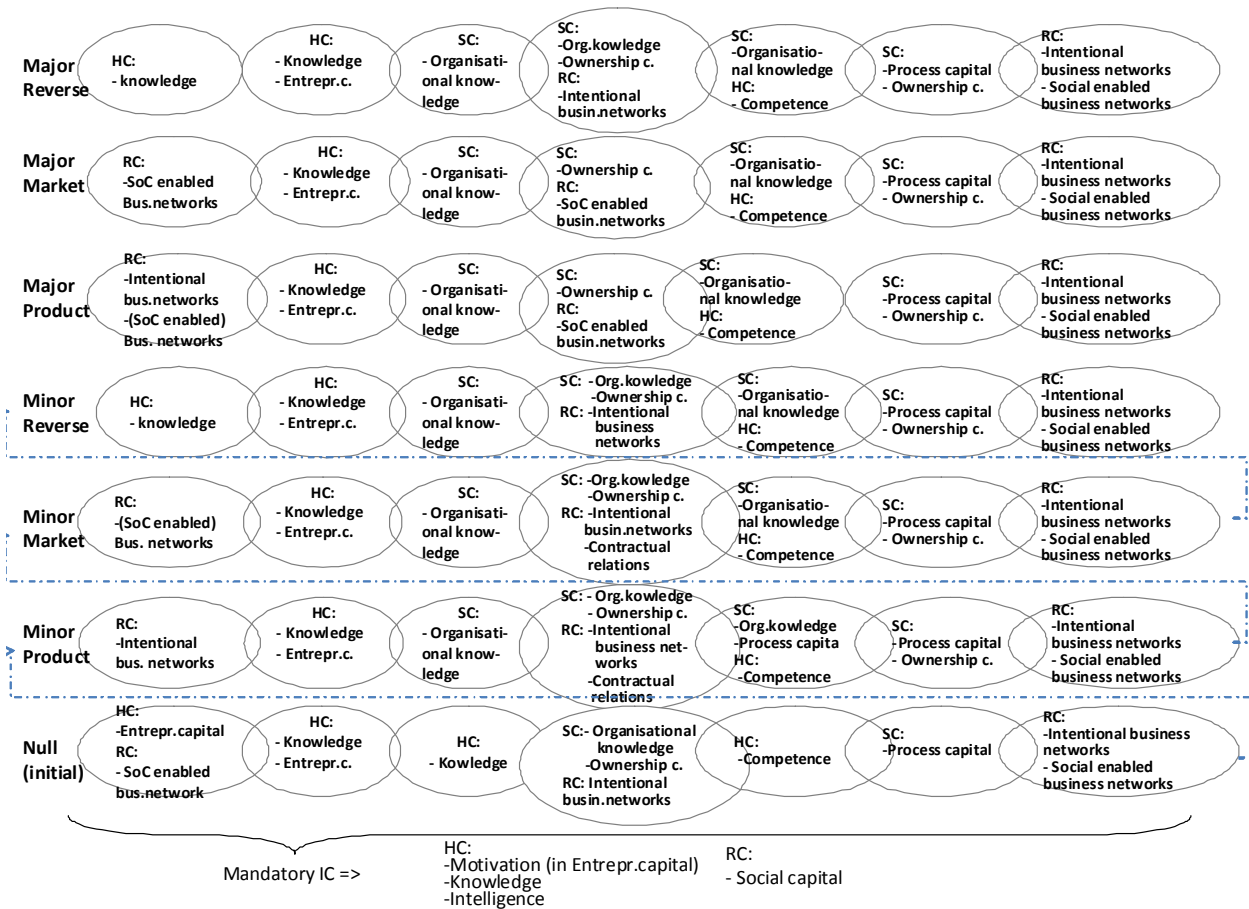
- social capital encompassing the norms and behavioural aspect,
- intelligence of human capital,
- motivation and risk taking in entrepreneurial capital of human capital and
- knowledge of human capital

are not separately mentioned in each of the 7*7 cells as they belong to the each of them. However, an exception is made when there are no other IC-qualities present rather than the mandatory ones.

Therefore, the cells highlight the most characteristic subcapital present at a certain business creation process step. Consequently, the interpretation is not exclusive for other subcapitals occurring simultaneously with a certain subcapital, although they are not especially mentioned there. The rationale for this comes from the theory where the intellectual capital value chain encapsulates a cumulation of intellectual capital beginning from human capital which is mandatory for any business firms (Subch. 4.2.4 Fig 23). Then comes structural capital which is needed for increasing the business firm's efficiency and, finally, adding value by relational capital intensifies co-operation with customers and stakeholders.

The 1st step, discovery, appeared as searching for new business ideas within present customers, business partners and any members of the business network. Needless to say, this act is highly grounded on social capital enabled business network and intentional business networks. Exceptions: 1) At the null diversification level, where the business network of the initiator of the new business idea is negligible, the right interpretation is the first quality (social capital enabled business network), and, especially, entrepreneurial capital; 2) concerning minor and major restructuring diversification, the

ideas of increasing profitability and relaxing the troublesome debt situation are mostly internal and pondered by the board of directors at the beginning before external wisdom; 3) concerning the market diversifications, the role of intentional business networks grounded on the strong social bonds is secondary to the social capital enabled business networks.



Abbreviations used in the table: SC = Structural Capital, HC = Human Capital, RC = Relational Capital, SoC = Social Capital

Figure 29: Intellectual capital value adding pattern

This is because the intentional business network is basically formed of customer and close partners who are not as good sources of new market ideas as the more loose

contacts found in the business networks of weak ties. Also, this finding is in line with the theory of the intellectual capital value chain discussed at the end of Subch. 4.2.4.

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The 2nd step, selection process, matches precisely with the definition of human capital, as it calls for thinking between alternative business opportunities tied with entrepreneurial intention. In respect to the cases, individual knowledge attributes like processing declarative and procedural knowledge were present in the CEOs' what-if-then-ponderings of new business cases. Also, the cases plausibly state that social capital enabled business network is an enabler for the human capital needed in steps 1 and 2.

Exceptions: In respect to the step of discovery-selection, within the seven diversifications there are, in fact, no variations of intellectual capital qualities. This is because of the very human centric operation at this stage.

The 3rd step, following the business creation process definition deals with analysis and conceptualisation. Here the desired outcome is the positive investment decision for the plans, so far, defined as the main level presentations. The intellectual capital interpretation for it is organisational knowledge of structural capital. Here, the selected ideas from the previous step, suitable for further analysis, are subject to the formal feasibility study. Now the organisation's prior and externally sourced business data plays a pivotal role during the analysis process. The outcome is the investment decision.

The efficient utilisation of organisational knowledge is dependent of declarative knowledge of human beings as well as competences but not that much entrepreneurial capital at this stage. Consequently, human capital is present here as the mandatory requirement.

Exceptions: At the null diversification, formal business analysis methods, such as feasibility studies, and further, rich organisational knowledge are not used or they are rare. Yet, in the following diversification levels they are met with frequently. To be

precise, the analysis carried out at the reverse diversification cycle encompasses preparing a financial analysis of the current troublesome situation, which is not called a feasibility study. This is needed for convincing new investors and creditors, and it is done before the actual restructuring master plan (in the generation step).

The 4th position, which is the exploitation step, is centered on making a detailed project plan including a resourcing plan. Secondly, acquiring tangible, financial and intellectual resources for new business creation is carried out. The needed intellectual capital here is dominantly structural one. This judgement is founded on two perspectives. First, organisational knowledge of structural capital is drawn from internal as well as external knowledge repositories to be utilised in the next step, generation. This means that any structured knowledge apt for generation new business is considered here as organisational knowledge unless it is fully structured and considered as asset like patents. Second, the acquired resources necessarily claim for negotiating between the present owner of those resources, a firm internal or external body, and receiving party. Consequently, this act is characterised by ownership capital of structural capital.

Other qualities of intellectual capital here, in the 4th step, comprises the purposeful business contacts, not just social bonds as well as established business network for streamlining the acquiring of resources. By definition these qualities belong to relational capital. The judgement for relational capital is due that stretching beyond the firm boundaries are considered as network structures and, therefore, as relational capital.

To a certain degree entrepreneurial capital is seen here important. The other factors of human capital are not separately mentioned here. Also, process capital of SC can be identified here. Especially engaged with the investment decision-making process beginning from an investment initiative up to the investment decision, before the actual ownership-related contract issues, process capital was easy to find within the case firms.

Exceptions to step 4: 1) Because reverse diversifications/restructuring do not necessarily involve acquiring tangible but financial and knowledge based resources, the need for process capital is low. However, the ownership capital and organisational knowledge are salient here. 2) Minor market diversification, entry into a new market by current products and services with additional features, may necessitate some strategic partnerships with external technology partners providing add-ons. Similarly, minor product diversification may be dependent on the external technology developers. Furthermore, this is subject to both intentional business networks and the contractual relationship of relational capital. 3) Major market and product services are frequently characterised by an acquisition operation where the target company provides either a new market or new technology, depending on the case. Accordingly, the ownership capital is outstanding, whereas organisational knowledge of SC is in a secondary role. 4) Due to the shortage of advanced procurement processes, there is no process capital at null diversification.

Generation is the 5th step of business creation process which is parallel concept for organisational knowledge and process capital of structural capital and competence,

present in human capital. In real business operations generation is very much a synonym for the verb making.

Concerning the minor product diversification the generation step is obvious, because of the object of generating is visible, a new product or a service. In turn, the other diversification types do not openly manifest the generation phase. More over the generating belongs to the sixth step where the forming of the needed new organisational structure takes place. Next, the diversification types are considered here one by one.

New products and services as such are tangible assets, but making them absorbs a great deal of organisational knowledge (of SC). In turn, the role of process capital is salient in minor product diversification as the product making is founded on streamlined processes, such as product making in sophisticated product management processes.

The act of generation present at major and minor reverse diversifications is less visible as most attention is given to the organisational and ownership restructuring belonging to step 6. However, there are acts such as generation of the detailed project plan of cost cutting and the portfolio analysis of the needed reductions in customer and product portfolio.

In a rather similar way, the major product and market diversifications keep sharpening the merger and acquisition plans as well as carrying the negotiation to the end with the representatives of the sellers. Minor market diversification is characterised by market entry related operations before actually enrolling the organisational structures. In sum, the common subcapital for these diversifications excluding the minor product and null diversification is organisational knowledge of SC, whereas minor product diversification holds not only organisational knowledge but process capital, too.

Exceptions: 1) At null diversification the process capital stays in the background.

Another evidence of defining structural capital as the dominant subcapital in the generation step comes from the theory. In fact, the generation step has strong relevance to the second phase in the intellectual capital value chain presentation, which, moreover, reflects the features present in the internal perspective in Kaplan & Norton's value chain concept (Fig. 21, 4.2.3). Hence, structural capital is dominant in the 5th step.

The 6th step is first and foremost characterised by the implementation of generated new organisational entities to support in the most efficient way the use of deliverables from the previous step. For example, new products and services, which represent product diversification, demand rebuilding a new or enlarging the current operational entity. In turn, the plans generated during the 5th step of the market and sales management entity (i.e. distribution channel) requires implementation and integration with the present business operation model. Shrinking businesses, which are the most salient occurrence at reverse diversification, necessitate implementing major changes to the firms' operational model. At major market and product diversifications consideration of the organisational aspects of merging the acquired company calls for a diligent operation in intertwining two different organisations.

Consequently, the interpretation of the most outstanding intellectual capital here is, regardless of the diversification type, the process capital of structural capital. However, the implementation of new business operation model and entities is subject to ensuring key employees high motivation in the changed situation. Accordingly, the second interpretation here is ownership capital engaged with bonding the core competences by means of financial compensation devices.

In turn, strengthening of the bonds with external actors, like partners at market diversification, brings forth relationship management with partners. Although it would be tempting to interpret this as relational capital, it is process capital because the focus is developing management for relationships, e.g. distribution channel management. In the case of an ownership based relationship between the distribution channel partner and the principal, ownership capital belongs to the exploitation step, which is the right place to establish tight ties with the new partners.

The 7th step, customer deployment, is characterised by the act of selling. First, regarding reverse diversification, the sales of divestitures is dominant at this step. Second, minor market diversification is, in fact, taking full advantage of established customer relationship management. Here, the newly established sales force enables the gaining of new customers, which represents bonding between supplier and customer, and also evidence of the intentional business relation of relational capital aiming at strong bonding between the supplier and the customer.

Regarding minor product diversification the generated new product is now here pushed on to market through the less structured sales channels rather than in case of minor market diversification. However, intentional business network of relational capital is dominant also here. Both major diversification types are also dominated by intentional business network of RC as the main task here is the enforcement of sales operations.

Step 7 also deals with social capital. Especially, once strong bonding is established, then next, the strengthening of vertical bonds aiming at increasing new relations between the parties becomes necessary. Social capital was especially salient the institutionalised business relations in the case firms. Consequently, trust, loyalty and obedience to norms were imperative for sustaining cooperation between the business parties. Because any business should be provided with fair human and social capital, as stated at the bottom of Fig. 29, these qualities do not deserve to be mentioned separately from here onwards in the examples following. These mandatory intellectual capital requirements, social capital and basic human capital, are therefore common to all of the stages of the IC value chain. In part, also entrepreneurial capital is considered here as a mandatory requirement because it is rooted in the motivation perspective of human beings.

7.4.2 Example of IC growth pattern matching

Applying the IC-growth pattern in practise is fulfilled here by the in-depth-case of this study, the Machine Vision System firm case in Subchapter 5.3. To avoid duplicating the case description, text here refers briefly to the case description.

The discussion of pattern matching is carried here on the two accuracy levels. First, the early growth during the years 1996 -2003 of the case firm is shown in terms of business operations as shown in Fig. 30 and, then, transfigured into the terms of intellectual capital. Second, the continued evolvement 2004 onwards is matched directly with the IC-pattern. The point of using this approach is to convince for the reader, not only the applying of intellectual capital growth pattern, but also, the growth pattern explained by means of business operations.

During 1996 – 2002/3 the Machine Vision System firm encountered three investment cycles which are appropriate to define in terms of 7-step diversification concept. First, the firm tried to run the business with an engineering service offering, which was the first factual business but abandoned later in 2001. Next, the founder-entrepreneur recognised the machine vision camera system technology to be sufficiently mature and powerful for commercial use within industrial quality inspection applications. This idea was grounded on the information available both from technology experts as well as the plastics industry firms that the Machine Vision System firm has been operating with in its initial offering. Moreover, the firm’s own resources offered a sound foundation for generating the new product, and assisted by VTT, the Technical Research Centre of Finland, a new camera-based inspection system was developed.

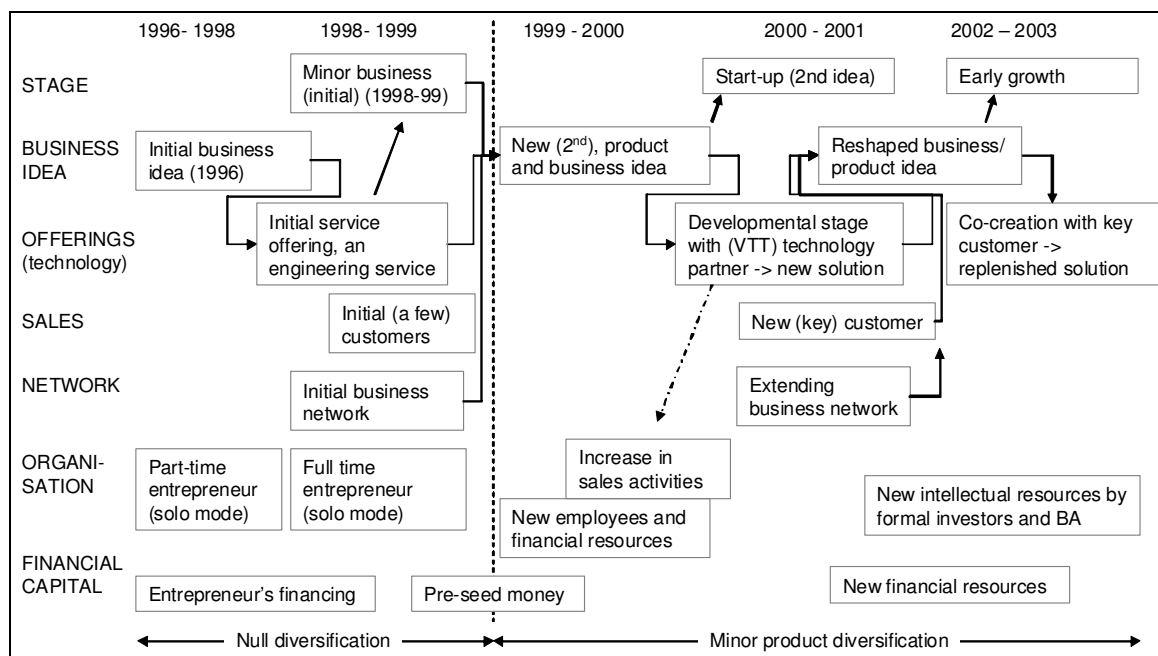


Figure 30: Logic of seed-bed in creation of new business idea and products

Unfortunately, this second offering, the machine vision camera solution, did not capture new markets in 2000-2001 and more precisely, any customers. However, a new key customer candidate accepted a cooperation project with the Machine Vision System firm and the solution was significantly replenished with new features. In fact, the replenished solution constituted a new product offering, the third one. Beginning from

the opportunity recognition that was now served by the key customer until the finalising of the replenished new camera based inspection system during 2002-2003, the Machine Vision System firm received a substantial boost to its business growth. This step is indicated in the right-hand block Fig. 30 in the line of successive three business ideas.

More precisely, the product and service offering line (next down from the business idea line) of the picture shows: (1) that the initial engineering service provided a foundation for the development of (2) the machine vision based camera system, a new product that was eventually (3) remodified significantly as requested by the key customer. Finally, since 2001 the Machine Vision System firm has run two businesses related to the first and third notions.

In fact, this 6 – 7 year long development holds two or three investment cycles, which are, by definition, diversifications. First, a null diversification took place in 1997 – 1999, when the firm was paving the way to the entry market with its initial offering. The second is, depending on the interpretation, either a prolonged minor product diversification or a two stage minor product diversification.

The first cycle was succeeded by a minor product diversification during 1999 – 2000 once the camera system business opportunity was identified. Here, the first offering served as a stepping stone to the second one. While the customer segment stayed the same, it is justifiable to talk about a minor diversification and not a new null diversification.

Due to the lack of customers the firm was urged to begin a new investment cycle which embodied co-operation with an industrial company and occurred in 2001-2003. The judgement for a new investment cycle comes with the rationale of allocation of financial and intellectual resources for developing a new machine vision camera system according to the requirements of the new customer.

Beginning with the concepts at the end of investment value chain, the first besides the financial is competitive advantage. It is easy to find the most important competitive advantage factor, which is the customer value proportion embedded in the superior offering. The firm also gained strategic advantage by capturing an international plastic manufacturer specialised in cellular phones. The Machine Vision System firm was granted an almost free distribution channel to the manufacturer's other sites, though this was detrimental to the restricted market occupied by one corporation.

Deciding the type of diversification regarding the period 2001-2003 is not a straightforward task. The development of a 2nd generation camera solution for the new customer can be seen as a minor diversification. The rationale for this choice comes with the arguments that the existing solution (1st generation product) only needed to be reshaped and the firm shifted from the intended (empty) market towards a new market, which is here (in 2003) only one customer. However, a more reliable interpretation considers a prolonged minor product diversification as the camera system, evidenced by CEO, was not only reshaped but reinvented. Especially the software encountered fundamental changes during the collaboration with the customer.

In respect to the concept of diversification and also investment cycles, the conclusion is that the development of the Machine Vision System firm during 1996-2003 comprises two diversifications: null and minor product diversification. The latter can be divided into two adjacent investment cycles bearing features of minor product and minor market diversifications. However, interpretation as two minor diversifications is preferred here, where the latter completes the first one.

The IC-value chain of the Machine Vision System ranges from the null diversification through the incomplete minor product diversification to the next round of the minor product diversification as illustrated in the Fig. 31 next here.

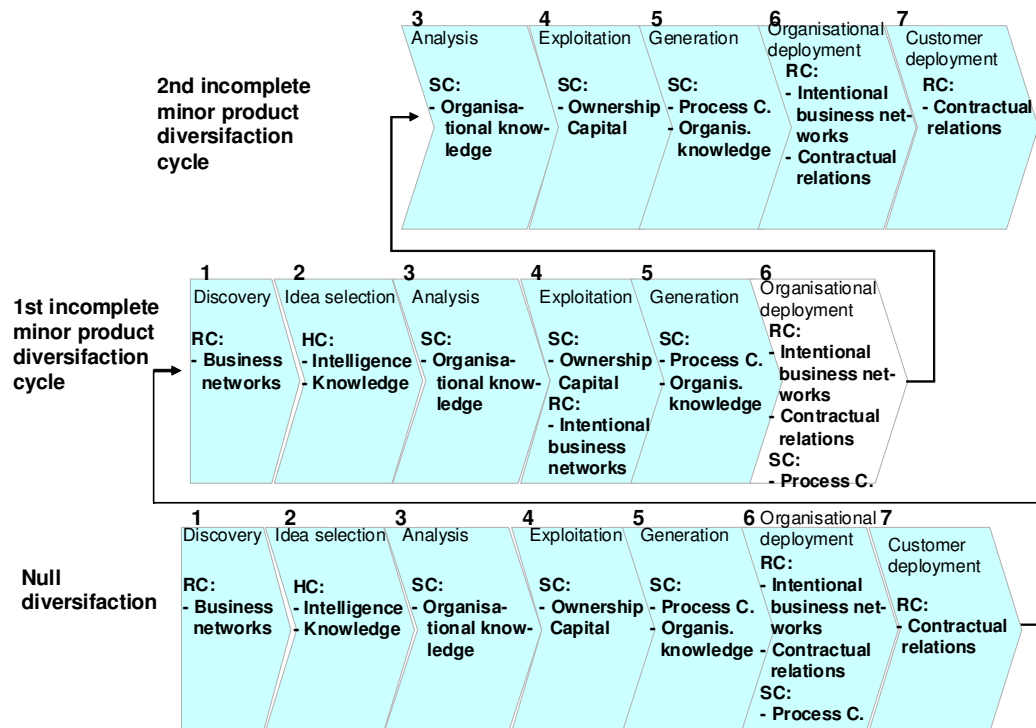


Figure 31: IC pattern of Machine Vision System firm in 1996 – 2002/03

The assessment of intellectual capital interpretation is begun here from the 1st incomplete minor product diversification, in the middle in Fig. 31. This is because the interpretation is basically the same for both the null diversification and the next diversification cycle, as they both are centered on product development. However, there is one outstanding difference between these two lines, which is the magnitude of the intellectual capital qualities embedded in the steps. For example, there is less organisational knowledge available in the step of analysis in the null diversification cycle than in the next cycle. This is due to the external development partner used in the cycle of 1st minor diversification. Also fund raising and tangible acquiring is modest in the 4th step of the null diversification.

Once looking at the 1st minor diversification, at the first step, the initiators of new business are discovering new business ideas and stretching the cognitive processing

capabilities beyond the current boundaries enabled by the established business network of knowledge exchange, which are the current customers and solutions. The 2nd step is just thinking and informal analysis of new business opportunity (product, market or restructuring) in solo mode or within a team of initiators. The dominant IC is HC here.

The 3rd step is devoted to formal analysis, where the typical outcome is a feasibility study, including both technology and market feasibility studies. Accordingly, the new ideas are reflected against the organisational knowledge, which is the prior knowledge held by the organisation.

The 4th step involves the activities centered on exploiting the needed financial, intellectual and tangible resources after a positive investment decision. The contacts with investors as well as technology development designers necessitate relational capital, which is characterised here by intentional business network. Also, by definition the previous subchapter called for ownership capital.

The 5th step is focused on generating the new machine camera system with the experts from the external research institute. Accordingly, organisational knowledge of SC is required here.

Because of relatively low interest in the market the launch of the new offering more or less flopped. Consequently, establishing new operational entities at the 6th step was less visible and the first minor product diversification is stopped here.

The next diversification, at the top of in Fig. 31 illustrates the 2nd minor product diversification, which is a direct continuance of the previous one. The trigger here was the interest shown by a big Finnish company, which suggested a joint collaborative technology project with the Machine Vision System firm. The business idea stage is skipped and the starting point for the next minor product diversification analyses the developed technology from the partner company's perspective.

Repeating steps 3, 4 and 5 is useless as there are no actual differences in respect to intellectual qualities compared with the previous diversification cycle. Next, step 6 is less visible and the qualities suggested by the IC-pattern stays vague. This is because the Machine Vision System firm acts as an outsourced technology development department for the principal company. Thus, no new operational entities or restructuring was required except for making the relationship with these two organisations more transparent. Accordingly, the interpretation here suggests only intentional business networks of RC and no SC as included in the definition in Fig. 31.

Also the 7th step is quite an effortless one, as the acts of selling are missing. Accordingly, the acts of increasing the vertical bonding are missing and therefore the social capital enabled business networks of RC are not salient. In other words, the Machine Vision System firm sustained social bonds between technology developers, but not that much with senior management in the other business functions.

The further development from 2003 onwards goes beyond the boundaries of Fig.31, explaining the occurrences of the Machine Vision System firm at the business operation

level. Accordingly, next the intellectual capital interpretation is shown in the next figure here, Fig. 32.

In 2005, the case company met the first distressed period after the first profitable financial year in 2004 due the loss of this big Finnish customer, the net result from 2005 onwards was negative. Consequently, the financial foundation was somewhat unstable and balanced by investors' funding. It shall be noted, that a downturn is not necessarily a reason for the need of restructuring business portfolio. Indeed, in this case there was nothing to restructure, but more to seek new customers and increased revenue.

Then, the next growth cycle since 2004/2005 concerned capturing new market from the adjacent segments to the entry market by present products. The interpretation for this is a minor product diversification as pointed in Figure 32 on the bottom.

Encouraged by partial success in that market, the case firm targeted gaining a big Finnish mobile phone manufacturer as a new major customer. However, the mandatory requirement here was not only providing the machine camera based solution but also a testing service accomplished with technology. From 2006 the case firm started a major product diversification cycle which was characterised by merging a particular business unit from the Finnish contract service provider in the electronics industry sector.

As there was no success in running the service provider business model based operations besides the technology offering businesses, the case firm postponed the first actual restructuring of its business portfolio in 2008. This is interpreted here as a postponed minor reverse diversification as it should have been carried out prior to the major product diversification. Nevertheless, in the restructuring of its business portfolio, the Machine Vision System firm filed for bankruptcy in 2009.

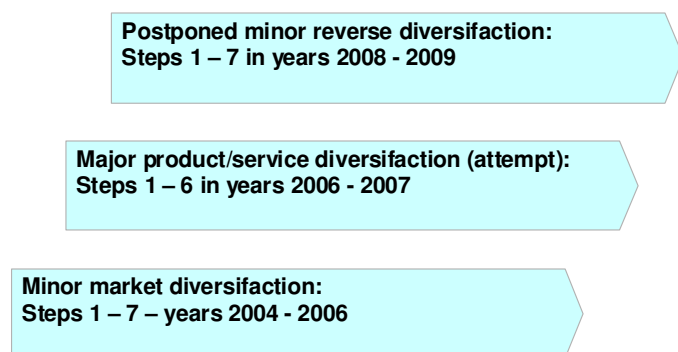


Figure 32: IC interpretation of evolvement of Machine Vision System firm

The subchapter next here summarises the diversification cycles explained here. Unfortunately, a more detailed explanation of the step-wise intellectual capital qualities is not included here.

7.4.3 Generalised IC growth pattern

The IC-growth pattern, as shown earlier in Fig. 29, reveals quite a similar structure from the bottom, null diversification, to the top, major diverse diversification. The first step of any of the seven diversifications is mostly dominated by social capital enabled business networks which, furthermore, belong by the definition of this study to relational capital. Although some of the diversifications are not crafted by precisely the identical intellectual capital qualities, such as social capital not being salient at the 1st step of reverse diversifications or the different emphasises present on the 4th step through the seven diversifications, the overall pattern is feasible for a further generalisation, as suggested here.

Grounded to the fact, that regardless of the diversification type a particular step of the business creation process embodies similar actions from the intellectual capital standpoint. Consequently, the intellectual capital interpretation from the 7*7 matrix can be generalised by just a 1*7 matrix presentation. In sum, there are seven projections in respect to a particular business creation process step yielding a singular pattern.

The conclusion here is that regardless of the type of diversification, major or minor product, market and reverse diversification, the intellectual capital interpretation for a particular step of business creation is constant.

Another important perspective to the IC-growth is the dynamism of intellectual capital. This is seen especially in the way the accumulated intellectual capital in a particular position of the growth supports the execution of the business operation in the next step. From this point of view, the steady growth is dependent not only on filling intellectual capital repositories belonging to a particular step in the business creation continuum, but especially taking care of the transition from one dominant subcapital and secondary subcapitals to the next step.

Dynamism is seen not only on the microlevel through the occurrences expressed by means of intellectual capital value chain, but also within the diversifications, which is the macro view of growth. Precisely the 7th step of the business creation process is pivotal for creating customer relationship and also enabling weak ties, as stated in the theory part. Every new customer relationship opened a new gateway from customer premises onwards within the customer's network. Consequently, the new bondings represented first of all a social network, not a serious business network, offering a rich platform for discovering new business opportunities from the new ideas emerging from the ideas not yet tapped. Eventually, after the 7th step, the development continues again from the 1st step, which is the discovery of new business opportunities.

Hence, a much better illustration model rather than the 7*7 grid is a spiral model, which is shown next in Figure 33. In fact, each of the spheres in the spiral is a description of one of the diversifications which involve the same seven steps at the micro level as in Table 37. Moreover, the model is linked with intellectual capital by the diversifications, as shown in Fig. 29.

The only difference between the table presentations and the spiral here is the stressing of the essence of dynamism in Figure 33, next here. From the micro level point of view, dynamism is highlighted in the texts within each of the sectors like social to human capital, the first and 2nd steps and human capital to organisational knowledge of structural capital, the shift from the 2nd to the 3rd step, and so on. The macro view on dynamism is seen by the leveraging from a certain sphere to the upper one, which is the continuum of sequential diversifications.

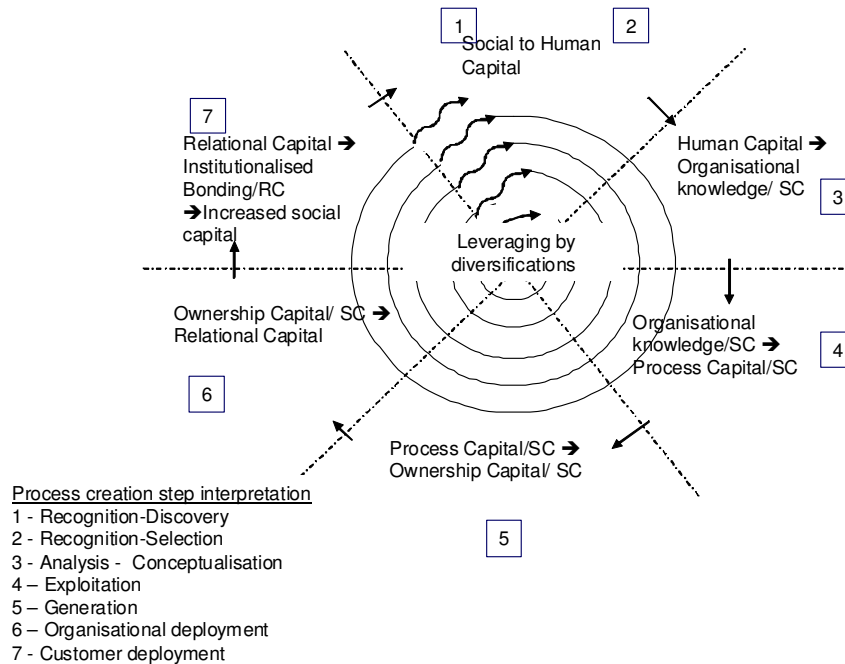


Figure 33: Dynamic intellectual capital cycle model

Considering the spiral model, the impertinent notion is that leveraging is not straightforward propagation between diversifications. More precisely, one type of diversification, for example minor product diversification, is recursively repeated until the maturity for the next diversification is achieved. This phenomenon is seen in Fig. 30 pertaining to the prolonged minor product diversification of the case firm.

The conclusion and answer to the RQ 1 is that the required building blocks for creating the holistic intellectual capital growth model are: (1) the macro level presentation model grounded on successive diversifications; (2) the micro level view in terms of the business creation process; (3) the concept of intellectual capital value chain linked with the business creation process steps as an interpretation key for the next, which is, (4) the definition of cross-reference between intellectual capital definitions and expressions of business operations within the diversifications-business creation process matrix.

The intellectual capital value adding pattern (Fig. 29) and the spiral model derived from it give a general level image of the dominant resource dependency appearing in sequential steps of adding value classified by the three major and minor diversification types. What would be needed more here is a rationale for presenting resource

dependency throughout the business growth expressed by intellectual capital terms, together with business process labels. Probably the latter is mandatory due to the high abstraction level of subcapital definitions? Therefore the next Subchapter focuses on evaluating applicability of the intellectual capital value adding pattern as defined in Fig. 29 and its spiral version (Fig. 33).

7.5 PATTERN MATCHING BY ACTOR CASE ANALYSES

Subchapter 7.5 is dedicated to pattern matching of the intellectual capital growth model, shown in Figure 29, against the risk-taking value adding actors appearing in the case studies. Due to the shortcoming of the intellectual capital pattern staying at a relatively high abstraction level of defining value-adding, the business operation based 7*7 matrix definition is applied here when needed to make a more precise interpretation. Also the variables of business model concept are considered in explaining the strategic importance of invested resources of actors next here in the Tables 38 – 41 and their summary in Table 41.

In the four case studies (Ch. 5.3.1 – 5.3.4) in total 19 nominees, individual persons were identified for an intellectual capital providing investor role. Four of them were formal VCFs or business angels, the rest individuals and teams revealing 6 diversifying profiles. The mandatory selection criterion for the nominees has an outstanding capability of providing intellectual capital. Nominees holding financial capital and tangible assets were not excluded. A second criterion is that they held shares or will become shareholders which would count as investment.

From the actor analysis point of view, this study encountered a problem which arose from the multi-faceted role of founders along their firm growth. For example founder-CEOs (e.g. Machine Vision System firm, Contract Manufacturer firm) shifted into other managerial roles, revealing a shift towards a new intellectual capital provider role. This notion is contingent with the theory of internal accumulation as discussed in the theory of entrepreneur-roles ranging from novice to portfolio entrepreneurs but restricted out here. To solve this matter a third criterion for the actor case selection is choosing investors' intellectual value adding profiles only at their entry point to the investee firm. Consequently, intellectual capital providing in terms of endogenous accumulation which is, in fact, learning, is excluded.

The discussion in subchapters 7.5.1 – 7.5.3 is organised following the three main subcapitals, human, structural and relational capital. Because the intellectual capital value chain is apt for interpreting by the 7 steps business creation process, the order of discussion follow the seven steps. The first Subchapter is dedicated for steps 1 – 3 (discovery-recognition, selection and analysis-conceptualisation) which are dominated by HC and also by the shift from HC to SC. The second Subchapter captures the SC dominated steps 4, 5 and 6 (exploitation, generation and organisational deployment/firm-internal deployment). The RC related step 7 (firm external/customer deployment) is in the third Subchapter.

Within each of the subchapters, the profile analyses are carried out following the steps in question, and second, by considering the three minor diversifications. Investor profiles are termed by the diversification type they are connected to. For example an intellectual capital investor promoting technology product development within a minor product diversification is termed as a technology-orientated innovator. Needless to say, the technology-orientated innovator founder-CEO and co-founder were the most frequently met actor-types in the case studies. Also, the market diversification and restructuring-orientated intellectual capital provider roles were present.

Key to understand the range of contributions offered by these investors is rooted on the concept of seed-bed where the main components are financial, tangible assets and intellectual capital (4.5.3). In the firm cases the character of the intellectual capital investors' seed-bed varied from pure intellectual capital providers to investors holding intellectual, financial and other tangible assets. Other characterisation applied here is grounded on proclivity towards the intellectual capital provider role, which encompasses for example (see definition in Chapter 1) risk tolerance, offered compensation and contractual devices to avoid a premature termination of the partnership. When necessary, investors' relative share of the firm's total shares is mentioned by means of the following ranking: (1) a minor shareholder = 5 – 10 %; (2) a medium shareholder = 10.01 – 30 %; (3) a major shareholder = 30.01 % - 50 %, and (4) a dominant shareholder = 50.01 – 100 %. A minus or plus suffix after the percentage value indicates either the lower or upper half within the given classification of those four categories. Minor shareholders below 5 % of total shares were omitted.

7.5.1 Human Capital Orientation - Discovery, Selection, Conceptualisation steps

The first subchapter is focused on the human capital dominated steps of discovery, selection and conceptualisation regarding all diversification types. The examples here are the CEOs taken from all three case firms, plus the co-founders of the Optical and Spectroscopy System firm. All of them can be characterised as novice entrepreneurs of the entry point at the first step, discovery.

Their seed-bed profile consisted of the full spectrum of human capital qualities, which are knowledge, competence and entrepreneurial capital. Depending on the case firm, intellectual property was accompanied, for example by patents (the Optical and Spectroscopy System firm 1996), or preliminary constructions for the targeted business products (the Machine Vision System firm 1999-2001). The financial resources were substantially low. Vestment schedules applied for founder-CEOs and co-founders were fulfilled by collateral, for example securing bank loans against their private property. Structural capital appeared through organisational knowledge and preliminary constructions for the targeted business products. Structural capital of process capital or ownership capital was not found within these actors. Nor did they possess previous sales experience, and their relationships in the business environment were limited, pointing to little or no relational capital. In fact, this actor type reflected quite much the

expert idea generator profile defined in Table 21 which is the entrepreneurial profiles by Morris (4.5.2).

In respect to the initial growth of firm which is the null diversification, they intellectual value adding ranged from the discovery-recognition through the selection to the conceptualisation step. Sure they offered contributions at the later steps but the discussion carried in this Subchapter is restricted to the first three steps. In the case of a minor product diversification, their value adding was spread as well over these three steps.

The following discussion here of founder-CEOs and co-founders pivotal effort in company growth is summarised in Table 38, next. The entrants through the third step, conceptualisation, were found from the Contract Manufacturer firm and the Machine Vision System firm apart from the founder-CEO or technology-orientated co-founder roles (the Optical and Spectroscopy System firm). This entry point favoured product development practioners joining the case firms and possessing practical engineering skills beginning from the design and concept development which is the step. These people held key positions in the firms in the areas of product technology development and production, holding minor- or minor+ shares, plus a regular salary. Consequently, their compensation package did not reflect a high risk investor, but was rather more like a key employee holding a strategic position in the firm and taking some business risk.

Table 38, summary of founder-CEOs and co-founder in the case firms

REF	Non-IC related variables	Definitions
1	Entry point	Opportunity-recognition step (1 st)
2	Main contribution expressed by steps and diversification type.	Null diversification: opportunity rec., selection, analysis-conceptualising, and continued at the generation step to a certain extent Minor product diversification: opportunity rec., selection, analysis-conceptualising, and continuing further at the generation step
3	Business model	Technology management/ value proposition
4	Entrepreneurial definition	Novice shifting towards habitual along the firm's progress
	Intellectual capital interpretation	Definitions
6	Human capital	Knowledge, entrepreneurial capital, technology-related competences
7	Structural capital	Organisational capital (product constructions), partially product- related assets (IPRs)
8	Relational capital	Low relationship-related RC (bonding with other R&D developers)

These co-founders were found within null and product diversifications, too, like the founder-CEOs. Market or restructuring type diversification-profiled actors engaged with the first three business creation steps were not found within the case firms. Certainly, the engagement between the firm and a potential market or restructuring talent were initialised within these steps but the actual shareholder contract was signed at the later steps, typically at the fourth step, exploitation.

7.5.2 Structural Capital Orientation – Exploitation, Generation and Organisational Deployment Steps

The second Subchapter is focused on the structural capital dominated steps of business creation, which are: the fourth, exploitation; the fifth, generation; and the sixth, organisational deployment. First, product diversification related actor cases are introduced followed with other two diversification types. In respect to these steps, summarises considering the market diversification-orientated profile is in Table 39 and, regarding restructuring in Table 40 at the end of this subchapter.

In respect of minor product diversification, the exploitation step together with generation seemed to be favourable for experienced technologists who were trained not only in product development but also in production practises. In fact, among the case firms two different modalities of exploitation were exposed, which was seen in the way firms acquired external resources. As explained in Subchapter 7.4, less radical minor investments necessitated fewer resources and favoured the intervention of informal intellectual capital providers with no or less financial capital, or there were no external individuals embarking at all into the case firms. In turn, a more risky and challenging business case at the exploitation step favoured formal investors capable not only to bring money but also technology business experience.

Considering the former option, less radical business cases, the two profiles mentioned in the previous subchapter, i.e. product practioner co-founder and founders were the key actors fitting into the role of intellectual capital funding actors. In fact, their contributions were prolonged until the exploitation and generation steps. However, their nomination as investors was contradictory when speaking about exploitation and generation solely. Both of these two types were competent in product development but possessed none of the competences required in production system development, product marketing, design, procurement, knowing customer selection preferences and environment conditions, and product management. As stated by the Metso Corporations' R&D representatives (Interview document 2006) new technology firms are good at innovating new products but poor at productising them. Consequently, no intellectual capital investors holding only intangible contributions in their seed-bed were found at this step entering into the investor role. The investors here were big companies acquiring premature technology constructions, business angels and venture capital firms also capable of allocating money, besides knowledge-based resources.

The exploitation step offered a kind of familiarising period before the actual commitment to becoming a shareholder that happened in the firm-internal deployment stage. In practise, the venture firms responded to the investee firm's call for exploiting resources by becoming a close advisor, marginal investor, or any other less risky role, but postponed their actual investment decision for the generation step.

In sum, the exploitation step was an entry-point for product/service diversification-orientated business angels (Machine Vision System firm in 2002) in allocating their product technology experience and money. Also, the exploitation step seemed to be the

most obvious place for venture capital investors allocating smart money to become a shareholder, which was evidenced by all three case firms here regarding product (Machine Vision System firm in 2006) and restructuring diversification (Machine Vision System firm during 2008 -09). Market diversification called for less financial capital and was taken from institutional financiers, like banks in order to avoid the dilution of the current shareholder's position.

Market diversification-orientated generator type identity, apt to the definition of exploitation and generation steps, was found in the effort carried by the second CEO of the Optical and Spectroscopy System after the initial period of 2001 - 2004. This newcomer could be characterised as a serial entrepreneur who possessed special competences in the sales and marketing of technology solutions, international business and building sales network and distribution channels but inventing new customer segments, too.

He took the lead in 2001, first as contract CEO and minor- shareholder and replacing the first novice entrepreneur co-founder-CEO. His first job, establishment a global sales network took until 2004 and a global sales and distributor network was running in Asia and North America in addition to the company's presence in the EU-area. By definition of the IC-growth pattern (Fig. 29), sales and distribution network building represents generation during which was here carried during minor product diversification. In other words, at the end of null diversification the firm captured the initial market position within industrial and university R&D-units customer segment globally and, then, expanded its product portfolio together with expanding its sales network, which is not yet market diversifying by means of capturing new customer segments.

Following the criteria explained in the introduction, the engagement of the sales experienced CEO was not judged to have an investor role in 2001. This is because his compensation package included just minor shares as well as a fair salary, as well as options. The latter, options, suggest an investor role, but not that clearly as it would in the case of buying a substantial share of the firm's total shares.

The CEO's embarking into an investor's role took place during 2005 -2006, when he derived a management buyout transaction accepted by the other owners, the institutional investors and some of the founders, who granted their shares at a nominal price to the CEO and some other shareholders. This act was preceded by maturation of the initial product portfolio and beginning of market diversification, manifesting the shift from a minor product diversification to a minor market diversification mode. A sign of market diversification was, for example, the CEO's negotiations with the university researcher who possessed patents and prototypes of the feasible add-ons to be integrated with the Optical and Spectroscopy System Firm's products. As stated, the definition of minor market diversification is based on finding new use cases that enable the forming of a new market segment gained by minor product improvements or product add-ons to the existing product portfolio.

The entry point of this second CEO of the Optical and Spectroscopy System included two stages. The first entry point took place at the exploitation step during the minor product diversification when the CEO entered into the payroll as a key employee possessing vital and strategic competence for pacing the firm's growth. The factual entry point following the criterion mentioned in the introduction text here, however, is the second one of the exploitation-generation steps, which manifests leading a market diversification. Probably there were also preceding ideas of market diversification in the mind of the CEO that claim an entry point at the earlier steps of market diversification (opportunity recognition, selection). However, his status as a major owner of shares was planned and signed during 2005-2006 when the market diversification was headed towards the exploitation step.

The investor position of this new CEO represented the characteristics of an intellectual capital investor, namely those of: (1) no factual financial capital investment; (2) the option to underwrite shares; (3) the firm gained a distinctive increase in competitive advantage related to sales and marketing responsibilities; (4) in 2006 he became a major shareholder, which is the most outstanding evidence of an investor role.

Table 39: Summary of market diversification-orientated sales expert

REF	Non-IC related variables	Definitions
1	Entry point	Into payroll: Generation step (5 th) at minor product diversification into investor role: Exploitation at minor market diversification
2	Main contribution steps by diversification type and stage	Product diversification: generation of sales and distribution network Minor market diversification: opportunity rec., selection, analysis-conceptualising, customer deployment
3	Business model	Market segmentation; value chain; competitive strategy
4	Entrepreneurial definition	Serial entrepreneur
	Intellectual capital interpretation	Definitions
6	Human capital	Knowledge, entrepreneurial capital, technology business-related competences
7	Structural capital	Sales and marketing and distributor channel mgmt-related process capital
8	Relational capital	Social capital; relationship related RC with distributors and customers

Restructuring-related generation profile was one of the salient profiles of the intellectual capital investor role. Entrants at the exploitation and generation steps of minor reverse diversification taking responsibility for the firm's change management operation were found from all of the cases, in the Optical and Spectroscopy System firm in 2005 – 2006, Machine Vision System firm 2008 and Contract Manufacturer firm 1994 – 95.

Also the three restructuring levels were found, as introduced earlier (in Subchapter 7.2.1): those of minor cost efficiency improvement, business portfolio restructuring and restructuring of the firm ownership and financial structure. The first profile falls out of consideration as an investor profile. The minor cost efficiency improvements are typically derived by a salaried business controller or, in the case of streamlining business process, by an external process consultant or by firm-internal senior managers.

From the available three actor cases, one example is taken here, that of a seasoned financing expert who came from the investment bank onto the Contract Manufacturer firm's payroll to lead the business portfolio restructuring process during 1994 – 1995. He was granted a minor+ shareholder position and a nominal salary. Later on, he was nominated as head of the firm's internal business development unit until 2002, taking care of strategy planning, investment planning, controlling and fund-raising tasks; in a word, he took care of corporate financing.

His position as an investor can be argued against due to the low share of the firm's total shares and the safeguard offered by a reasonable salary. However, the value of shares was substantial, which is evidenced by the firm's turnover of 5.4m € in 1994. Also the so-called upside, which is the expected and potential growth of the firm later on yielding return on investment, was obvious. Moreover, potential future gain constituted a strong motive for the restructuring talent of the CEO, who in fact achieved a fair increase in his shares, which can be estimated at the point of leaving the firm in 2003 from the revenue figures and liquidity of the shares. At that moment the firm had revenue of 23.6 m € and an opportunity for a cash-out. The financial value of his shares was a result of the merger & acquisition transactions derived from 1999.

The organisational/firm-internal deployment step, the sixth, is occupied by reshaping firm's operational entities, and, when necessary, building new units or affiliate firms - those necessitating ownership and governance issues, as previously defined. The actors with a restructurer profile ranged from the generation step until here as seen in Table 40.

Table 40: Summary of the restructuring diversification orientated expert

REF	Non-IC related variables	Definitions
1	Entry point	Generation step (5 th) in restructuring diversification after minor product and market diversifications
2	Main contribution steps by diversification type and stage	Minor restructuring stage: generation of restructuring process; firm internal deployment (reshaping the composition of business units) and governance and strategy mgmt issues
3	Business model	Market segmentation; value chain; competitive strategy; value network positioning
4	Entrepreneurial definition	Moderate entrepreneurial level/ more like contract manager role
	IC interpretation	Definitions
6	Human capital	Knowledge, corporate financing and strategy management-related competencies
7	Structural capital	Process capital of diverse management systems; ownership management-related SC
8	Relational capital	Social capital; relationship capital with financiers, key customers

One entrant type at this stage is a synergy orchestrator, who was a highly experienced top level CEO capable of restructuring the entire business group portfolio as seen in Contract Manufacturer firm during 2003/4 – 06.

Also secondary investor, a successor to the lead investor, was found entering at this step, providing typically social capital (besides other the factors of the seed-bed compensated by shares), i.e. contacts, and ownership-related structural capital (Machine Vision System firm 2006 – 07), and sales and distribution management-related structural capital.

7.5.3 Relational Capital Orientation - Customer Deployment Step

The market and sales-orientated manager role is one of the distinctive profiles among the value adding actors which came through in all of the cases. Indeed, the entry point of the explained sales force and distributor network builder is connected either with the first step, novice entrepreneur founder-CEO-type, and the generation step, serial entrepreneur contract-CEO. The former option is appropriate for service business models, where the demand for understanding and developing high grade technology products is rather low and the innovation underneath the business model is incremental (all cases). However, the latter type was more visible among market and sales-orientated intellectual capital investors.

Outside the firm cases here, within bigger companies this profile is relatively easy to find among sales executives and large customer key account manager positions, who argue their value as constituting solely in managing sales, winning new customers and taking care of key customers. In fact, the founder-CEO of the Contract Manufacturer firm met these requirements in the late 90s while taking care of four key customers, three of them secured during the restructuring process in 1994-1995. However, his profile was introduced earlier here due to his duties in other positions.

In conclusion here, no intellectual capital investor nominees are introduced. However, this does not necessarily mean a lack of intellectual capital investors at this step, which may be proved by extending the case material.

7.5.4 Generalising profiles

Among the variety of value adding actors within the three firm cases, the intellectual capital growth pattern is an apt concept for matching the profile of any investor who is allocating intellectual capital besides tangible assets and financial capital in a technology growth firm. While speaking about investors providing valuable intangibles, it should be considered that the aim of this study is not to answer the question of what an intellectual capital investor is like, or what the variables are regarding an intellectual capital investor profile apart from venture capital investors including business angels. However, defining profiles appropriate for the nomination of intellectual capital investor, as done in the previous subchapters, is useful for understanding the essence of the intellectual capital growth pattern. In fact, it is seeing the intellectual capital value chain from the value adding actors' perspective. Consequently, this kind of view makes the pattern more understandable and concrete.

The very essence of the pattern is in its characterisation of the firm's dependence on strategic resources required along the growth path. While missing a particular intellectual capital quality imperative for manoeuvring through the steps of a certain diversification, a firm retards or, even worse, collapses. The pattern does not claim that the lack of any intangible resource would cause a threatening situation for a firm's

evolution especially the lack of intellectual capital contributions as defined in Fig. 29 of the IC growth pattern. This is to say that there are investment-like intellectual contributions among any type of intellectual capital value adding.

Next, the discussion here first focuses on profile types, then conclusions are summarised. Three intellectual capital investor profiles are concluded from the actor case analyses of the previous three subchapters, representing human, structural and relational capital orientations. Although the discussion is actor centric it gives a rationale for the relation between main intellectual capital actor profiles and their positioning against the pattern. Finally, further research questions for the exploration of this study are suggested for the themes disclosed in Subchapter 8.1, before final conclusions are drawn in 8.2.

First profile is the actors of venture capital firms. VCFs are dominantly investing money but also they offer strategy and operation management advisory, a rich contact network for accelerating sales and marketing as well as financial and legal advisory (Machine Vision System Firm; Optical and Spectroscopy System Firm). By intellectual capital terms VCFs provide relational and structural capital and less frequently human capital in the form of technology knowledge which was found only in one case (Machine Vision System Firm). The entry point in terms of the steps of business creation process is typically the fifth, generation. However the engagement process between investor and investee firm's owners may take a substantially long period involving the tasks typical for the steps of analysis-conceptualisation and exploitation, the third and fourth steps.

The next is the profile of informal venture capital investor which is a synonym for business angels. One from the eighteen nominees in the cases fit perfectly on this profile. Their entry point was at minor product diversification. The business angels' contribution was providing technology business wisdom. Responsibilities lied on exploiting resources, advising on product management issues and financial funding. Therefore the entry point is earlier than that of formal venture capital investors.

The next profile can be nominated as pure intellectual capital investor, which is evidenced by the restructuring experts (Contract Manufacturer firm) and sales expert (Optical and Spectroscopy System firm) in the previous actor analyses. Although they were granted shares, pointing to an investor role, this interpretation can be questioned because they enjoyed a fair salary and their risk-taking was relatively low. In any case, they are considered true investors because their engagement with the firm was two-faceted. First, they held strategic positions in the firm organisation, as a contract director (Optical and Spectroscopy System Firm) and a close external advisor (Contract Manufacturer Firm), developing later into a partner role, and their effort for the firm was guided by shares. Both entered during the business creation process at the step of exploitation (the former) in minor diversification and generation (the latter) in minor reverse diversification. Hence, their contributions were based on structural capital, besides relational capital.

A second pure intellectual capital value adding profile was represented by the technology-orientated founders and co-founders, who allocated besides their human capital also some money. Their financial stake consisted of bank loans or minor savings and sometimes their salaries were temporally converted to bonds under a tight financial situation which demonstrates a risk-taking propensity. The entry point definition is the 1st step for founders. Co-founders join to the firm typically at during 3rd to 5th steps. Within cases co-founders headed to the minor shareholder position before firm incurred outstanding sunk costs like financial expenses invested in generating new products which is the 4th step (exploitation) before the actual generation, 5th step.

In sum, from the four characterisations above, three main types or main profiles appropriate for speaking about intellectual capital investor can be identified. The first is a venture capital investor, either formal or informal business angel-type VC-investor, both of which add intellectual contributions besides money. Because both are strongly characterised by financial investment, defining them as intellectual capital investor does not make sense. A more correct term applied for them is venture capital investor, which is considered here, by definition, as allocating both money and diverse intellectual capital.

The other two main types are, so to say, true intellectual capital investors. The first is founders and co-founders struggling over the barriers since creating a business idea (founder), or developing a feasible business firm (co-founders). Their profile shows as an intellectual capital investor by endogenous internal accumulation of the firm's intellectual capital, which is seen in the very beginning of the firm's life cycle from business idea generation by the founders and co-founders. The second type is a value adding contributor intervening at steps 3, 4, and 5. Depending on his/her intellectual capital character the diversification type is reverse or market (minor ones considering the case analyses).

Table 41, next here, summarises the findings of entry positions and diversification preferences of intellectual capital investors. VCFs and business angels, who are also intellectual capital investors providing substantial financial funds, are not considered.

Hence, the focus is on the low financial, high intellectual capital providing actors, dividing into three main types: pioneers and intervening actors, and more precisely: (1) founder-CEOs, (2) co-founders, (3) later CEOs holding key positions in sales and marketing, (4) restructuring experts, and (5) VC-firms and business angels. The two right-hand columns stand for parameters arguing against and for the character of an intellectual capital investor.

Table 41 involves, in fact, all minor diversification types. Interestingly, investment-like intellectual capital value adding in minor product diversification is dominated by financial investors. As found from the cases, the need for financial capital at this point, i.e. generating the enhanced product version from the initial one developed at null diversification or generating second main product, necessitates financial funding, which is not possible by intervening intellectual capital.

Table 41: Summary of actor profiles showing proclivity towards intellectual capital investors

REF	Actor type	Diversification; Steps	IC qualities and assets	Contradictory factors to pure IC investing	Consistent factors to IC-investor role
Early stage IC-investors					
1	Founder-CEO	Null, Product; Steps 1-3, 4-5	(1)Human capital, (2)Intellectual property rights	Some financial funding (mostly due to vestment reasons)	Growth enabling IC Low salary (exceptions existed) Major/dominant shareholders Collaterals
2	Co-founders	Product; Steps 1-3; 5	(1)Human capital; (2)Structural Capital/Organisational knowledge from previous jobs; (3)Intellectual property	A fair salary (not always)	Growth enabling IC Minor/major shareholder
Intervening IC-investors with low financial funding (if any)					
3	Subsequent CEO typically 2 nd in order	Market Steps: 4-5	Human capital, process capital/SC	Fair salary	Growth enabling IC; Minor shareholder
4	Profitability/reorganising expert	Restructuring Steps: 5-6	Human capital, process capital/SC, ownership capital/SC	Fair salary; Relatively long contract period considering a board of director member	Business risk mitigating IC, Temporal contract period considering interim managers
Intervening IC-investors with financial funding					
5	Business angels, VCFs and other formal investors	Product, Market; Steps 2-3; 5	(1)Structural capital (process, ownership) (2)HC (e.g. strategy planning, M&A knowledge) (3)RC (business and social network)	Minor shares-, no real upside Reasonable salary No collateral	Growth enabling IC

The conclusion here is that the intellectual capital growth pattern (Fig. 29) strengthened by diversifications and business operation definitions (Table 37) is an appropriate device for defining:

- (1) the entry point of an intellectual capital investor on his/her leaving a preceding role such as working as a non-salaried advisor or as a salaried key employee;
- (2) the actual entry point of an intellectual capital investor;
- (3) an investor who predominantly provides intellectual capital is termed an intellectual capital investor.

A further conclusion grounded on the previous three conclusions is that the intellectual capital based resources required for judging an intellectual capital investment are a greater entity rather than just a value adding defined by one step. Based on the actor case analyses, the range of intellectual capital investment is bounded by one

diversification. Steps 1 – 3 are derived by the founder-CEO and co-founders. Overlapping with the founders' responsibilities in step 3, the intervening intellectual capital investor becomes the actual leader of the growth process until step 6/7 (firm internal deployment), which is the intellectual capital allocated to the firm together with other value adding. Overlapping between the present intellectual capital investor and successor occurs at step 7, which is the end-point of the particular diversification in question.

7.6 DEFINING IMPACT CYCLES AND LEVELS FROM GENERALISED ACTOR PROFILES

In fact, the definition of the impact cycles of actors, like put in Table 41, gives an opportunity to scrutinise the logic of value adding between firms and actors. First, in Subchapter 7.6.1 the 7-step business creation process is compared with the generalised actor profiles defined in Table 41. As a result from the comparison, a more abstract concept of the value adding impact cycles of intellectual capital investors within single diversification is generated. Then, in Subchapter 7.6.2 the focus is expanded from a single diversification to cover the whole carrier path of intellectual capital investors. This pondering reveals deviating intensity levels of allocating intellectual capital which is, too, separating the actual investment-like intellectual capital value adding from any value adding. In fact, this point of view is stated in Introduction, in Fig. 1.

7.6.1 Impact cycles within single diversification

The spot areas of the actors' investment-like intellectual capital value adding, as stated in Table 41, claim for larger entities rather than just single step-sized resource slots within the business creation process. As a remedy, the three major step concept of the business creation process, as supported by the theory in Subchapter 4.1, offers a more feasible pattern for generalising actor profiles within single diversification rather than the detailed seven step model. This three major step concept involves, by definition, the steps of discovery-recognition, exploitation-generation and deployment.

The judgment for shrinking the seven step model back into the three steps comes with actor profiles. Like the seven step model is a rational approach onto business creation from a firm point of view, the three major step model is an apt concept for defining the dominant value adding cycles by actors. Therefore, the first major step is characterised by business opportunity recognition and planning, briefly business planning. This is easy to prove by examining a common denominator for the 1st step, discovery-recognition, 2nd step, recognition-selection and the 3rd, analysis-conceptualising which the business opportunity research and development, or just business opportunity planning from the first vague idea to the concept.

In turn, the common denominator for the 4th, exploitation, 5th, generation and 6th, firm internal deployment step is doing, or just generating in wider sense rather than just the definition of 5th step of generation. Hence, this major step is termed as generation.

Before discussing of the third major step an important notion deserves attention. Namely, the shift from human capital to structural capital (ibid.) is not sharp but characterised by a transition zone which is seen in the IC growth pattern (Fig. 29) and more clearly in the dynamic IC cycle model (Fig. 33). This zone is, in fact, the analysis-conceptualisation step, the 3rd step. The rationale of the overlap between human and structural capital is due to the shift in the intellectual value chain. Precisely, the human capital centric unstructured knowledge is geared towards shareable and structured knowledge within the 3rd step. Accordingly, the first major step of business planning is shifted to the second major step of generation during the 3rd step which is here regarded to involve in both of these two domains.

Defining the third major step, or termed as well as domain, is combining the rest two steps of firm internal or organisational deployment (6th) and customer deployment (7th). Here the 6th step bridges the previous major step (generation) with this 3rd one, termed as deployment. The common denominator for these two is enabling the generated products/service to flow from the supplier to customers. By one word, here the emphasis is on bonding. This bonding between supplier organisation and customer ensures that every management practises are streamlined to support high quality and cost efficient deliveries whereas the customer deployment ensures the longevity of customer relationship and customer satisfactory.

Still, one major step is required. However, as there is no micro steps left from the seven steps of the business creation process, a new layer, is added above the generation major step as shown next, in Fig. 34. In this way the fourth major step, related with the governance issues, is taken into this concept.

This 4th major step is differentiated easily from the others. The essence of it is acquiring required governance tools of managing investments combined with the mandatory business wisdom of operating with them. In other words, a board of directors accompanied with required set of diverse contractual devices is established at the 3rd micro-step, the analysis-conceptualisation step ranging until the 6th, organisational deployment. More precisely, this expertise area comprises analysis-decision making, contract making and implementation tasks necessary for ensuring the stake by investors. From the intellectual capital standpoint it is dominated by ownership management and by definition, ownership capital of structural capital.

Eventually, the presentation in Fig. 34 summarises the discussion until here in Subchapter 7.6. In figure the previous conclusions of linking the business creation process steps and intellectual subcapitals are introduced here, too. To avoid repeating presenting the more detailed view on factors beneath subcapitals, reader is asked to see the results stated in Fig. 29 as well as the shift diagram in Figure 33 available in Subchapter 7.4.

Moreover, another conclusion considering a more generalised pattern of actor profiles is suggested. The major step 1, business planning (=micro-steps 1 – 3) is derived by founder-CEO and co-founders.

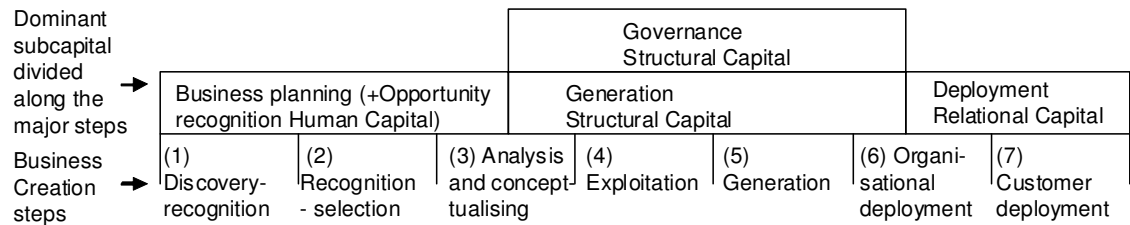


Figure 34: Impact cycles of investment-like IC value adding

Next, an external intellectual capital investor becomes the actual leader of the growth process beginning from the step 3 until step 6 which is the 2nd major step. The major step 3, micro-steps 6 – 7, is dominated with acquiring new customers and more revenue which is dominated by a sales and marketing talented actor. However, this step not necessarily calls for an external talent. Also, the fourth domain is required for the impact of professional governance expertise. The major step 3 (and micro-step 7) is, too, an end-point of the particular diversification in question and the stepping stone for the next leveraging stage as defined in Fig. 33 on IC cycle model.

Conclusions:

- Four feasible abstractions of investment-like intellectual capital value adding actors have been characterised. All of them manifest deviating intellectual capital qualities and, therefore, having an unique identity from the actor perspective.
- An investment-like intellectual capital value adding cycle is the composition of all four major steps, although the emphasis of the impact of a particular actor is framed by some of the four areas.

The argument for the second conclusion is rooted on the intellectual capital value chain concept which stresses the essence of interaction between subcapitals. Because the four major steps are congruent entities with subcapitals it is, too, concluded that interplay is required between them.

7.6.2 Intensity levels of impact cycles

The mentioned four generic intellectual capital actor profiles, referable with impact cycles shown in Fig. 34, can be termed as a business planning-human capital provider type, a generation-structural capital provider type, a deployment-relational capital provider type and governance-structural capital type. Next, evaluating their importance from the firm point of view is considered, which is the final judgement for the intellectual capital investor profiles. Consequently, the true investment-like intellectual capital value adding is separated from any of the forms of intellectual capital value adding.

A room for investment-like intellectual capital value adding is dependent on the firm's need for strong complementaries offered by those actors. This is the first notion and considers all of the intellectual capital investor profiles, but especially the generation-structural capital type. Evidence is found easily. During the generation (major) step

where the significance of using the external sources besides the combination of internal resources is directly proportional to the newness of the particular technology and, too, how radical the innovation is in the core of the business opportunity.

Considering the first profile, business planning-HC, the founder-CEO of the Machine Vision System firm was highly dependent on external resources once developing the first camera based solution during 1999-2000 (see App. 1). Hence, the pure human capital provider necessitates possessors of tangibles and financial resources.

However, regarding the situations where the pure human intellect is bundled with tangibles, the dependency from external sources comes less critical, except financial capital. This is proven by the investor profiles as seen in the Optical and Spectroscopy System firm case, where the founders also provided intellectual property, patents.

In sum, the first case (The Machine Vision System firm) of calls for complementing the business planning-HC with all three other generic intellectual capital investor profiles accompanied with tangibles and financial capital. In turn, the second case manifests only for complementaries by a governance-SC and deployment-RC profiled investors.

Furthermore, the dependency on a rich seed-bed leaves room for opportunistic behaviour. Especially, portfolio entrepreneurs in a close relationship, holding substantial power over the investee firm, may become tempted into non-market based trading. Trading is carried out between the investee firm and portfolio entrepreneur's affiliate companies. Not only shareholders, but sometimes close network partners holding specialist supplies for a particular firm, may abuse a dominant market position (the case reference to is filtered out here for reasons of confidentiality).

Conclusions:

- The deeper the gap the more likely is the opportunity for intervening product diversification related intellectual capital investment (with funding).
- The more radical the product/service creation in question is, the greater the need for strong intellectual resource complementaries is, and, furthermore, the greater the opportunity for intellectual capital investment becomes.
- The more complex the required seed-bed is the more likely the external IC-investors is needed.

A second notion is that any intervention by external actor or actors postulates learning. In other words the intellectual capital which is hold by intervening actor must become integrated into the investee firm's property and shared like Nonaka points out in his quadrant model of tacit knowledge becoming to shareable organisational knowledge, present in this study in Subchapter 3.3.1. Considering the practical situations of the case firms, a relatively long familiarising period was required before the shift to a true investor position as a shareholder. In respect to external talents the familiarising was actualised for example by an advisor role. Regarding the firm-internal people, a key employee position was preceded the shareholder role.

Interestingly, some of the actors in the case material proceeded to the late stage and out from the firm which is evidenced by the restructuring expert of Contract Manufacturer Firm. Yet, the long-term relationship of restructuring expert is captured by other duties rather than just restructuring the business in the later years. During the seven year period, 1994 - 2002, the restructuring period took just couple of years in the beginning followed by financial director and strategy analyses responsibilities. Moreover, a new restructuring period was needed after an intensive merger and acquisition in 1999 – 2003. But this case was directed a new talent capable to orchestrate a business group portfolio, not just business units. From this study's interest area point of view this is an evidence for the end point of investment-like intellectual capital value adding. Like the restructuring expert started his job in 1994 preceded the familiarising period, his effort is identifiable in the pattern in form of deriving a minor diverse diversification. After this contribution his role is not anymore crucial, yet, strategic as a CFO.

The summarisation in Table 41 brings forth all diversification types where the founders and co-founders are pivotal persons paving firm's initial growth which is null diversification as well as the first mover role at minor product diversification. Then the lead of firm's management is given to the sales and market expert for directing growth at minor market diversification. Probably he has begun his working earlier at minor product diversification. Next, restructuring expert takes the lead and passes the firm through a business re-organisation process. After a successful diverse diversification the firm has reached a solid position on main market as well as profitable financial state.

The summarisation together with previous actor analyses proves that the intellectual capital value adding encompasses two to three phases. The first is familiarisation phase where the entering investor candidate stays in the strategic key employee role. This is followed by a true intellectual capital investor role as a shareholder. Third stage is optional where the intellectual capital investor is shifted to a less pivotal director role and, finally, ended by an exit. From these stages the end of first stage is the beginning of the investor's investment cycle and the beginning of the third or the exit, when the third stage is absent, is the end of investing cycle from investment-like intellectual capital value adding point of view. Accordingly, only the second stage is clearly identifiable in the growth pattern.

Conclusions:

- A firm taking the full advantage from the offered intellectual capital is preceded by a familiarising period between the firm founders and the intervening IC-investor(s).
- From the intensity level standpoint, the partnership between a firm and the external intellectual capital investors followed a three phase logic, which is familiarising – actual investment-like IC-value adding – downsizing and, finally exit.

What the pattern does not tell is the depth and necessity of intellectual capital for the firm which is the topic in the next and final discussion before results in this dissertation. Also the intertwinedness of three subcapitals and their internal dependency does not emerge from the actor analyses which are considered in Subchapter 8.2.

8 IC INVESTING

The exploration is now coming closer to the end. So far, the study has introduced two key concepts for the definition of investment-like intellectual capital value adding. The first, the growth pattern composed of the two key concepts, the 7 diversifications macro model and the 7 step business creation process (Table 37) which is, furthermore, transfigured as the definition intellectual capital growth pattern (Fig. 29) is the answer to the 1st RQ of defining the IC-growth pattern.

Subchapter 7.5 of testing that pattern with the actor cases is related with the subquestion of the RQ 2: a) *what are the generic profiles of diverse intellectual value adding actors matched against that pattern.* The second key concept outlined in the analysis part is the single intellectual capital investment cycle (in Subchapter 7.6.) derived from the generic actor types which of defined by the aggregated four major steps of the 7-step new business creation process. It is also the answer to the subquestion b of RQ2 - *what are the feasible IC-value adding spot areas and their levels of importance according to the IC growth pattern.*

However, the outcome of the intellectual capital investment is missing. Accordingly, the emphasis in Subchapter 8.1 is focused on the third subquestion c of the RQ2 – *what is the cause-effect of intellectual capital from investment perspective in company growth?* Second, the interplay of the derived concepts is verified with one of the investment occurrences of the case firm studies, in Subch. 8.2. Accordingly, the comprehensive concept system of the logic of the intellectual capital investment, or investment-like value adding, is stated highlighting the role of IC in company growth.

8.1 DEFINING OUTCOME OF IC-INVESTMENT

The yield of the intellectual capital investment cycle is defined within a single diversification as stated by the concept of impact cycles of investment-like IC value adding in Subchapter 7.6. However, the definition of the outcome of intellectual capital investment is still missing which is the end-point of the investment. Based on the theory it is known that competitive advantage is the direct implication of the intellectual capital value chain, (e.g. Zandler & Kogut 1992; Buenos-Campos 1998, p.221; Roos & Roos 1997, p.8) which, in turn, is the manifestation of the single investment cycle (the derived new theory here). Also, the concept of the business model is a manifestation of competitive advantage factors as shown in Table16, playing a central role here in defining competitive advantage (e.g. Barney 1986b; Dierickx et al. 1989, pp.1507-1509; Roos & Roos 1997, p.8).

To understand the interaction between the elements present in a single investment cycle a look on Fig. 36 is first suggested, which is in Subchapter 8.2. Like put in that figure, the ultimate goal of investment-like intellectual capital value adding is creating competitive advantage for firms' sustainable growth and financial well-being.

Consequently, the operationalisation of the concept of business model is derived grounded on the two analyses. The first analysis in Subchapter 8.1.1 outlines three varying business models grounded on the case firms. Accordingly, this analysis stresses the positive view on the competitive advantage hold by firms. The second analysis, in Subchapter 8.1.2, discusses of gaps which are indicators of the deficiency of competitive advantage. The result from the operationalising suggests that the yield involved in the three diversification types is apt to be defined by the competitive advantage factors. Yet, these factors are crucial for financial well-being of any firm they, too, enable the return on investment which is the compensation to the investors.

The logic of deriving the two analyses and binding them together is shown in Fig. 35, next here.

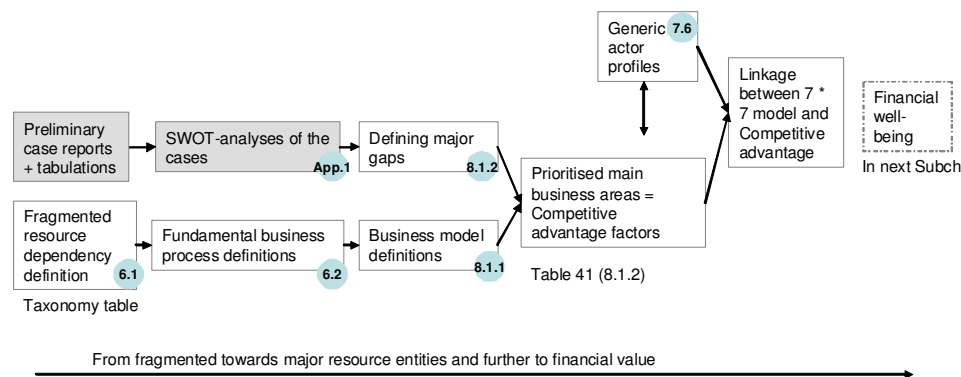


Figure 35: Analytical process of deriving the pattern of core business areas

The lower line in Fig. 35 points on analysing the business models of the case firms, constituted on the business processes. Depending of the well-being of a particular business process, it can be seen in two ways: an enabler and a retarder. A vital business process is an enabler for firm growth which is seen in its strength and capability to open new business opportunities. An improperly managed business process, in turn, retards firm growth and weakens the firm's well-being or even threatens future success.

8.1.1 Three Business Models

The discussion here is founded on the case firm business process summaries present in Tables 28 – 30 in Subchapter 6.2. Here, these summaries are crystallised in the form of composition of intangible business critical resource areas which are comparable with the main processes at 1st level taxa in the taxonomy Table 29, in Subchapter 6.1. Next, the composition is shown in Table 42, where the lines are organised following the business model concept taken from the theory available in Subchapter 4.3.4. Moreover,

Table 42 is a summary of the business critical resource areas and also the main business functions composed of the three different business models.

Three major business model types were identified based on the cases: those of (1) the product, (2) solution and (3) capacity provider-orientated business models. The case firms applied one to two business models at a time, which was evidenced by different units and/or subsidiaries, each focusing on different customer segments by different products/services. The Machine Vision System firm held two units in 2006 – 2008 and the Contract Manufacturer firm ca. ten at the end of observation period in 2007.

Along the observation periods, new business models were exercised due to new strategic imperatives. For example, a change in preferred market of the Machine Vision System in 2006 caused need for the restructure of the business model together with changing the strategic course. A business model change was also engaged with the long-term strategic intentions. Since its foundation the Optical and Spectroscopy System firm focused on becoming a technology product firm besides the solution and consultancy services that were dominating.

The first business model type, the product-orientated business model, is centered on product development, manufacturing, sales and marketing, distribution channel management, quality management and profitability management. None of the case firms here is a pure product business. However, both the Optical and Spectroscopy System and the Machine Vision System firms possessed some product-based offerings besides their more solution-like offerings.

Moreover, these two firms may be characterised as obeying the second alternative, the solution business model. The organisational setting of the solution business model captured from the cases here involves a sound product development and configuration capability, customer problem-solving orientated sales, project delivery tied with service quality management, less marketing like the product business model has, distribution channels grounded on own project management workforce in addition to trusted channel partners, customer relationship management, outsourced product manufacturing in regard to subassemblies and components, profitability control and financial cash flow management and financial administration services.

The third choice, a service provider business model, is centered on providing the desired service capacity suitable for outsourcing on behalf of a buyer firm. Both the Contract Manufacturer firm and partly the Machine Vision System firm (during 2006 – 2008) were constituted on this model. Customer relationship management, together with quality of service, appeared as the central function. Other pivotal functions were sales activities related to key customer relationship management (i.e. selling more); acquiring new customers; less marketing than required within the product businesses; distribution channel management in a less pivotal role, as the key customers hold the channels to their end-customers; channel management for minor customers more like delivery management; basic marketing prevailing; quality management playing an important

role; and profitability management important - partially based on open book accounting principles.

Table 42 considering the main intellectual resource areas of three different business models, next here summarises the pivotal business functions related to the three business model types. On the left column in the table the pivotal business functions are listed. The assessment of their business criticality in respect to the three business models is introduced in the cells. Business criticality is an expression for the dependency on a particular business function/ resource area.

In other words, the lack of indispensable resources leads towards decline, and eventually, to firm bankruptcy, as happened to the Machine Vision System firm in 2009. A decline is also the reverse process of growing, and, moreover, a shrinking business reveals the necessity of the essential resources that would ensure the preserving of the working order. These most vital elements for surviving are the four main business processes: (1) product and technology management; (2) sales, accompanied by some marketing; (3) preserving competitive advantage factors; and (4) ensuring profitable prospects accompanied by cash flow management. Interestingly, these four factors are in parallel with an early stage business embryo as also witnessed in the LDS case witnessed.

Table 42 does not reveal any fundamental differences in regard to the discussion in the theory part, at the end of Subch. 4.3.4, where the business model concept stated by Chesborough is stated.

Table 42: Main intellectual resource areas of three different business models

Business model -> Business function/ resource area (down)	Product business model	Solution business model	Capacity provider/ Outsourcing provider
Service and/or Product & Technology mgt	Indispensable	Indispensable	Indispensable
Sales and marketing	Indispensable	Indispensable	Indispensable
Strategy mgt including competitive advantage mgt	Indispensable	Indispensable	Indispensable
Long term profitability & cash flow mgt	Indispensable	Indispensable	Indispensable
Distribution channel mgt	Indispensable	Important (self-care and by partners)	Low importance (cared for by customers)
Delivery management	Low importance (cared for by distributors)	Important	Important
Customer relationship mgt	Low importance (cared for by distributors)	Indispensable	Indispensable
Quality assurance/ Quality of service/ Total quality mgt	Important	Important	Important
Manufacturing/Production	Important	Low importance (configuration orientation)	Low importance (service production)
IPR management	Indispensable	Important	Not present or low importance

Also the list by Schaefer & Schilder (2007, p.13) is composed of the most frequently allocated intellectual contributions by venture capital firms and business angels, it is an appropriate one for comparing the findings here. Their list consists of accounting, controlling, marketing, technical problems, strategic problems, network advantages, financing, patent protection, and legal problem-solving. If profitability care and cash flow management are replaced with controlling, then these two presentations become identical except for the legal problem-solving appearing in the list (*ibid.*).

The reasons causing the differences between three business models are found with less effort. Specifically, four differences explaining the deviating business concepts are found. The first is the stage of growth, which is in fact an expression of the firm's maturity level as defined in the VC-stage model (4.4.2), reflected the richness of the business process, and, furthermore, the number of intellectual resource findings during the case analysis. As a mature firm, the Contract Manufacturing Firm possessed some main processes (2nd level lines/1st aggregation level) not present in the two other firms due to their size and growth stage. For example, there were non-core process functions like work safety, environmental care and organised employee learning and training carried out by the Contract Manufacturer firm, but not present in the other case firms.

The second differentiator is the type of offerings, which is the most obvious issue explaining the differences in the three business models. Depending on deliverables - products, services or solutions - the composition of the business model varies.

The third differentiating factor, position in the value chain is seen especially in the Contract Manufacturer firm and the Machine Vision System firm cases when they moved forward in the industry wide value chain (the related theory is in Fig. 24, Subch. 4.4.1). From these two case firms, the former made a successful shift from a component firm to a system supplier firm, which is witnessed also by the statement of Jokinen in the company's customer magazine (01/2005): "an exemplary shift towards a system supplier". The latter case firm aimed at subcontractor businesses with standardised solutions and was hence striving ahead in the value chain to a system supplier position. Establishing and caring for a key customer relationship was relatively expensive and risky and the ending of the relationship would bring major financial damages, as happened to the Machine Vision System firm in 2007.

Ultimately, the study here concludes that the position in the value chain is not an independent factor, but influenced by the development of the firm's maturity in long run. Also, the strategic intentions in integrating forward in the value chain dictate the firm's position at a certain point of the firm's growth. Hence, business model and maturity appeared to be the two factors explaining the composition of intellectual resource areas, that is to say business functions of a particular growth orientated technology business firm.

A fourth potential factor, industry sector, did not seem to be a significant differentiator, which was noted on the grounds of relatively high uniformity appearing between cases on the 1st and 2nd aggregation levels. Especially the two young firm cases (the Machine

Vision System firm and the Optical and Spectroscopy System firm) shared quite a similar business function setting, however showing some deviations, which are discussed more in detail later in this subchapter.

In sum four differentiating factors explaining the deviations in resource usage were found in the preliminary assessment on the grounds of the case material. They are: 1) Maturity of businesses; 2) Business model: product/solution/service; 3) Position in value chain and; 4) Industry sector.

8.1.2 Gaps

The second analysis builds another view in finding pivotal resource areas of technology firm growth. Whereas the previous discussion (in 8.1.1) derives from the ‘presencies’ in business model, here the starting point is gaps along the growth path which are, moreover, the signs of deficiencies of competitive advantage.

During the case report writing process an outline of competence gaps and advantages, a SWOT-analysis, concentrating on the resource dependency view was derived. It consisted of an analysis of organisations’ operational gaps and inertia as well as advantages within management and governance activities. Especially weaknesses and threats were considered the points for improving firm operations by external assistance. Both the Machine Vision System and Optical and Spectroscopy System firm cases were compared with the successful Contract Manufacturer firm.

The gap-analysis focused especially on the competence gaps and improvements of advantages and their impact on the team and organisation level. From the firm resource dependency and also investment-like intellectual capital value adding point of view, focusing on individual competences is troublesome. By definition, competence is the qualification to execute a particular task. However, here in this study an individual competence is reflected through the third level taxa, which are the tasks or subprocesses. It was found during the case analysis that the relevant level of assessing resource gaps is the business process level, 2nd taxa in Taxonomy.

The first SWOT-analysis (Machine Vision System firm case) produced 37 objects among the entire variety of business processes and tasks. The total number was reduced to 34 items due duplicate findings. Moreover, contiguous items were classified on the same lines, totalling 19 lines, as shown in Table 43 below. Furthermore, these lines were aggregated following the six point business model presentation suggested by Chesborough in Subchapter 4.3.4. As found in the Table 43 some of the lines and the items on them did not match with the business model criteria stated on lines 1 – 6. Consequently, these leftover items were aggregated, representing 3 other groups on lines 7 – 9 besides the business model areas.

By definition, the six business model resource areas are competitive advantage factors, and, in fact, prominent positions for investment-like intellectual capital value adding. The three other areas were found also to be pivotal for business continuity, but were less likely to manifest positions for investment-like intellectual capital value adding.

The first, value proposition, is anchored by offering either products or services, or both. Central to this area is improving the processes related to satisfying customer demand. Basically, technology firms are competent in the product development and management areas, but sometimes slowness to listen to customers occurred, as with the Machine Vision System firm.

The second, market segmentation focuses on gaining new customers and market segments, as well as managing established relations, making room for external advisory. Partially, the problem herein the case firm was an insufficient sales force due to limited financial resources. Also, some of the contract management issues could have been improved. Further, due to the limited resources, key account management complied more with a tie than a diamond model (these concepts are discussed after Fig. 13 on integrated relationships of relational governance of intentional business relations, 3.4.3).

The third, value chain, focuses on organising the sourcing and distribution channel management operations cost efficiently, where the pivotal factors are close relations with partners, suppliers and distributors. Especially, building a balanced partnership relation was time-consuming, thus manifesting external advisory.

The fourth business model area, cost structure and target margins, is characterised by profitability care. Accordingly, profitability-related processes are emphasised. Related not only to the observations on the Machine Vision System firm, this is one of the problematic areas of any growing technology firm. The founder teams are characteristically focused on market and technology, and not so much controlling cash-flow and ensuring the sufficiency of financial resources.

The fifth, value network, holds the idea of balancing the firm internal core processes and external resources in the most optimal way. Restructuring the business model and finding an appropriate business model for a tailoring and service-orientated business firm is pivotal here. Furthermore, finding new cost-efficient management practises, smart partnering and scale of economies were sometimes disregarded by the case firms. The ability to convert fixed costs to variable costs indicated this issue.

Finally, competitive strategy is centered on competitive advantage as summarised in Table 43, next. The relevant topics for external advice are here competitor analysis and competitive position within the industry. Limited resources forced the case firms to minimise their effort in this respect.

The processes external to the business model core areas consist of three subjects: financing, human resource management and governance, as stated on the last three lines in Table 43.

Because comparable analyses within other cases brought forth no additional main areas, Table 43 is a saturation of all three case firms plus the LDS case. On the task level there certainly are additional tasks, which are seen in the summary tables of cases in Subchapter 6.2. However, this does not change the composition on the main level as present on the left-hand column (besides ref. numbering).

Table 43: Room for external advisory/ investment-like IC value adding

POTENTIAL FOR ADDITIONAL INTELLECTUAL RESOURCES OF DIVERSE BUSINESS PROCESSES			
REF	BUSINESS MODEL DEFINITION	TASKS	RELATEDNESS WITH TABLE 42
1	Value proposition - focus on offerings	Customer solution pre-engineering; customer problem-solving, Product development, Product management	Service and/or Product & Technology mgt (also Manufacturing/Production)
2	Market segmentation- focus on customers	Brand mgmt; sales and marketing; contract management; tendering; Customer relationship management; Internationalising and cultural aspects	Sales and marketing; Quality assurance/ Quality of service/ Total quality mgt
3	Value chain – focus on sourcing and distribution efficiency	Channel management; project and delivery management Partnership and network building Sourcing	Distribution channel and Delivery managements
4	Cost structure and target margins – focus on profitability	Productivity control; profitability management; controlling	Long term profitability & cash flow mgt
5	Value network – focus on cost efficient positioning and resource allocation	Business model and resource restructuring; crisis management Tailoring business maturity; service model	Manufacturing/Production
6	Competitive strategy –focus on competitive advantage	Competitor analysis; Strategy management;	Strategy mgt incl. competitive advantage mgt
		EXTERNAL RESOURCE AREAS FOR BUSINESS MODEL	Customer relationship mgt
7	Financing (debts and equity focus)	Cash management; Financial admin processes	
8	Human resource management (Human capital focus)	Leadership; competence management; personnel match; entrepreneurship; incentive management	
9	Governance (Shareholder value focus)	Financing strategy; funding Owners exit strategy (missing); venture capital industry experience; Spin-out firm ownership arrangement	IPR management

Compared with Table 42, some lines are empty, whereas Table 43 pays attention to Financing, HR management and Value Network. Explanation for this is quite easy; in a troublesome situation the scarcity of resources becomes visible; first, with respect to acquiring external resources, whereas the others are available internally, at least to a certain degree.

In sum, including the content in Table 35, the composition of pivotal intellectual resource areas in Table 41 is an expression of the sustainable competitive advantage factors of firm's survival in competition situation.

Building cross references between the hot spot areas of Table 41 and subcapital and their subfactors is not directly possible. Although it would be alluring to couple between relational capital and customer segmentation, the latter posits diverse management qualities, not only customer relationship, which means need for example structural capital for caring sales and marketing management.

Therefore, a more appropriate connection point is the three diversifications. As a conclusion the following cross reference table defines the linkage between diversifications and intellectual key resource areas.

Table 44: Approximation of linking diversifications and competitive advantage

REF	BUSINESS MODEL DEFINITION	INTELLECTUAL KEY RESOURCE AREA/ BUSINESS MODEL ITEMS
1	Product diversification	Value proposition - focus on offerings
2	Market diversification	Market segmentation- focus on customers
3	All	Value chain – focus on sourcing and distribution efficiency
4	Reverse diversification	Cost structure and target margins – focus on profitability
5	Reverse diversification	Value network – focus on cost efficient positioning and resource allocation
6	All	Competitive strategy –focus on competitive advantage
7	All	Acquiring financing (debts and equity focus)
8	All	Human resource management (human capital focus)
9	All	Governance (shareholder value focus)

Table 42 is also the conclusion of the subquestion c of the RQ2 focusing on the cause-effect of intellectual capital from investment perspective in company growth.

8.2 ROLE OF IC AMONG RESOURCE ALLOCATION IN INVESTMENTS

The illustration next in Fig. 36 defines the concept of intellectual capital investment embodied with tangibles and financial capital within a single diversification. Hence, the challenge here is to generalise the investment process appropriate for any of the investment cycles of growth.

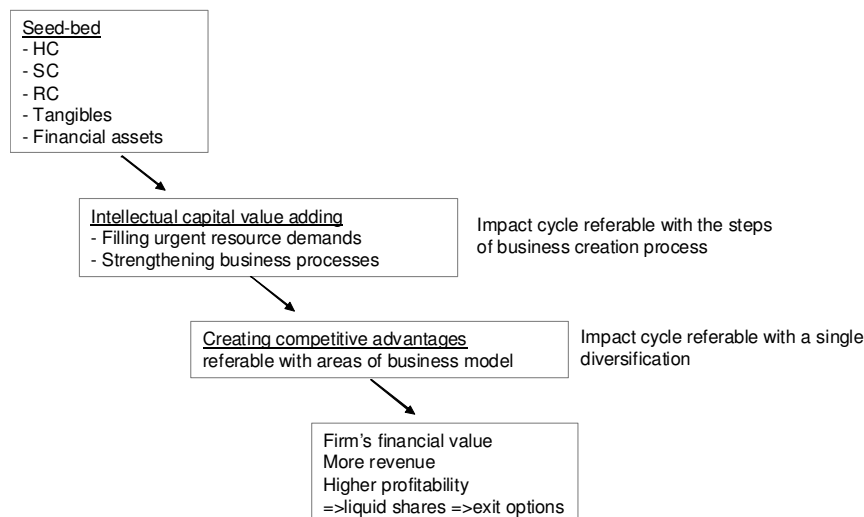


Figure 36: Investment-like IC value adding as part of entire investment cycle

Generalising is carried out by validating the derived key concepts as a concept system. Therefore, the concept of business creation process (Table 37), intellectual value chain

(Fig. 29), value adding impact cycles of investment-like intellectual capital value adding and their referable generic intellectual capital investor profiles (Subch. 7.6, Fig. 34) and diversification (Table 37) are once more presented. However, they are considered this time together as an entire concept system explaining the essence of investment-like intellectual capital value adding.

The first of the concepts is investment cycle. As proven by the case studies, the firm's growth continuum can be divided into multiple investment cycles. This point of view is seen, for example, in Appendix 1, which is a long description of the Machine Vision System firm. There, the entire growth path is divided into a 2-3 year long period, each of them grounded on a deliberate strategy. In turn, each of the strategy lines are titled separately, as found in the contents of Appendix 1.

Moreover, the single investment cycle is framed by one diversification. This can be easily proven in terms of the seven step business process, which is per se one diversification capturing the logic of investment. Specifically, steps 1 to 7 are one investment cycle involving the allocation of all three subcapitals, HC, SC, RC, together. Thus, the subcapitals stand for the intangible capital expenses which are the investment accompanied by tangibles and financial capital. Eventually the cycle is ended at the expected return on investment, which is the money dwelling in customers' cash.

Although the financial returns play a pivotal role in the firm's growth, the ultimate goal at the end of a particular cycle, single diversification, is gaining new success factors. This is to ensure firm sustainable growth. In turn, these success factors are the competitive advantage of the firm, which has an impact on increasing income financing either by increased sales or improved productivity, or both, depending on the type of diversification – product, market or reverse one. The two right-hand blocks in Fig. 36, below, delineate the value chain of investment, where the input on the left side is materialised to competitive advantage, and financial value on the right.

A look at Fig. 36 reveals the fundamental role of intellectual capital as a key resource factor at the beginning of the investment value chain (on the left). However, here it is bundled together with tangible resources. Conversely, isolating tangibles and financial capital, apart from the investment process and focusing only on intellectual capital, leads to a distorted view. As stated in the actor analyses (in Subch. 7.5), the financial aspect is present always in growth firm investments. Thus, a pure intellectual capital investment is a marginal phenomenon within a growth investing context, and acquiring external financial funding and tangible assets becomes mandatory.

Therefore, an imperative for understanding investment-like intellectual capital value adding is scrutinising the entire investment process and not focusing only on intellectual capital. Accordingly, for seed-bed theory (Subch. 4.5.3), three main resource factors for nurturing business growth are needed: intellectual capital, tangible assets and financial capital. Following the theory, this three-faceted resource pool is termed seed-bed.

The second left block in Fig. 36 stands for the micro level occurrences constituting the observable actions of the investment cycle. These acts are familiar from the concept of

business creation process and the four major steps as defined earlier in Subch. 7.6. From these the linkage between diverse subcapitals and the business creation process becomes clearer. However, here the steps are in full effect when provided not only with intellectual capital but also with financial and tangible assets.

Certainly, the illustration is an approximation from a real business situation. Rather than pointing out subcapitals and their factors with each of the micro steps in the seven step presentation format, for simplicity reasons only the dominant subcapital is involved in Fig. 36.

The validation of the concept system was already shown in Subch. 7.4.2, where a relatively long period of the Machine Vision System firm during 1996 – 2002/3 is present. In fact, this 6 – 7 year long development holds two investment cycles, which are, by definition, diversifications and match with the idea embedded in Fig. 36 above. First, a null diversification took place in 1997 – 1999, when the firm was paving the way to the entry market with its initial offering. The second is a prolonged minor product diversification in two phases. Both of these diversifications increased the revenue figures and profitability and made the company a more attractive object of investing.

Not surprisingly, the conclusion is that generating new offerings is grounded on a seed-bed composed of: (1) intellectual capital; (2) tangible assets and, (3) financial capital, which is in line with the definition of the seed-bed available in the theory part, 4.5.3. In fact, a seed-bed is firm-internal and external resources that a particular firm can easily access and the deployment of those resources call for no, or just minor, negotiations and contracting with the possessor of the resources. Seed-bed is also considered to cover minor financial resources to cover incurring expenses that facilitate key employees or imminent intellectual capital to operate temporarily. Thus, the financial resources means here compensating for operating expenses, not capital expenses arising from investments.

The concept of intellectual capital value adding impact cycles (Subch. 7.6 Fig. 34), the four major steps of business creation process, emerge through the stages of brainstorming opportunities involved in the new machine vision based technology, generation of the 1st and 2nd generation camera systems and deploying the first customer relationship. Accordingly, the human capital dominance of human capital, structural capital and relational capital are obvious. The fourth major step, governance, is present by means of first investors who invested their financial and governance expertise since 2001 (see Appendix 1).

Conclusions:

- Single diversification is a feasible device for the definition of the investment-like IC value adding within one investment cycle.
- Any of the seven diversifications are feasible for defining a single investment cycle.

- Filling resource gaps postulates allocating more fragmented intellectual capital which is more like value adding in nature, rather than investment-like process, in turn, calling for the more comprehensive entity of for the definition of investment-like intellectual capital value adding.
- Feasible operationalising units for defining the investment-like intellectual capital value adding in respect to the filling of gaps is the seven step business creation process and the four major step concept for the intellectual capital investment kind of value adding.

Considering the last statement, it is likely, that an intellectual capital investment process contributed by an actor or actors, requires a familiarising period before, and a maturation period after the high impact cycle as discussed in Subchapter 7.6.2 which of can be defined by the micro and macro level concepts involved in the growth pattern. Yet, this view is discussed more profoundly in Subchapter 9.1.

9 CONCLUSIONS

Chapter 9 is divided into five subchapters, 9.1 – 9.5. Subchapter 9.1.1 is the assessment of the results in respect to the objectives and the achieved results. Subchapter 9.1.2 summarises the results in accordance to the four research lines. Both the theoretical and practical contributions are discussed in the second subchapter (9.2) divided respectively into the two subchapters. The reliability and internal validity of the study are assessed in the next subchapter (9.3). Self-criticism is exercised in Subchapter 9.4, where is also the external validity discussed.

9.1 SUMMARY OF RESULTS AND RECOMMENDATIONS

Chapter 9.1 is two-fold. First, in Subchapter 9.1.1, the results derived along the analysis process, in Chapters 6, 7 and 8, are highlighted and the pivotal findings, as well the main constraints, are considered in accordance with research questions 1 and 2. After that, in Subchapter 9.1.2, come the recommendations, where the emphasis is on explaining the usability and value of the results.

9.1.1 Assessment of Research Objectives vs. Results and main constraints

As suggested in the scope of this study, shown in Fig. 1, the most interesting area within the overall scope of any intellectual capital contributions for technology business growth relates to the space suitable for investment-like intellectual capital value adding. In that domain, growing firms are dependent not only on financial, but also on intangible resources.

A more focused goal of the study is enclosed in the two research questions: RQ 1 on generation of the intellectual capital growth pattern, and RQ 2 on describing the intellectual capital value adding cycles framed by investment in technology company growth (in more detail, p.8).

The answer to RQ1 is finalised through research streams 1 and 2. It is achieved after a relatively burdensome operationalisation process in Subchapter 7.3 and Subchapter 7.4, preceded by Chapter 6, a precursor and an attempt to build the growth concept from a business process basis.

Research stream 1 is dedicated to the delineating of the technology business growth pattern from the business process point of view. The research process here follows a deliberate research strategy, where the first phase of the strategy is characterised by

exploration-description as shown in Fig. 6 in Subchapter 2.3. Consequently, exploration is dominant here, because the utilisation of only a few operationalisation devices.

However, in respect to the RQ 1, the result is not satisfactory for two reasons: (1) business processes as such are not manifestations of a particular subcapital but definitions of business function entities encompassing the whole range of intellectual capital; (2) defining the point of appearance of a certain business process at a particular position of the firm's growth is impossible as they are present since the foundation of a firm as embryonic entities becoming more powerful and maturing as business processes gradually. Despite a less successful outcome, research line 1 affords a rich foundation of the case analyses to be utilised in the next chapters of the thesis.

Research line 2 is centered on investigating RQ 1, too. It captures the overall pattern of the business firm growth successfully. The pattern is first expressed by the business operation terms (Table 37 Subch. 7.3) bridging to the actual result, which is the pattern expressed by using the intellectual capital terms (Fig. 29 Subch. 7.4). Subchapter 7.4.2 gives an example of applying the derived pattern in practise for one of the case studies.

More precisely, the pattern captures the idea of the integrated micro and macro level growth concept grounded on the 7 step business creation process by 7 diversifications. Here the seven diversifications are the levels of the technology growth firm of the growth from embryos up to mature firms. The more detailed character of the single diversification is the definition of the 7-step new business creation process which is apt for any of the seven diversifications. However, a more detailed examination reveals differences between diversifications, which is seen looking vertically diversifications at one column standing for one step in Fig. 29

In other words, the 7-step business creation process in terms of intellectual capital embodies only slight variation among a particular step of each of the seven diversifications, whereas the operation management explanation discloses varying definitions of the steps depending on the type of diversification. Therefore, the latter comes more accurate than the former, the intellectual capital based pattern. The remedy here is to provide the IC-pattern by business process attributes when necessary.

In subchapter 7.4.3 these variations within seven diversifications framed by one step are approximated and a more generalised presentation of the intellectual capital growth pattern is achieved. Indeed, the pattern holds now one projection from the seven different diversifications. Now, any of the seven steps hold a unique IC-characterisation regardless the type of diversification. Moreover, the dynamism of shifting between these diverse IC-qualities is discussed and the spiral form presentation of IC-growth model is illustrated in Fig. 33. In turn, the spiral presentation advocates the idea of successive leveraging tied with the diversifications.

The weakness involved in building the growth model is in the expansion of the occurrences of observation along the firm growth. This matter is seen, for example, in the number of business processes of the mature firm (the Contract Manufacturer firm) compared with the case firms amidst the growth continuum. A direct consequence here

is the bounded evidence of defining the major diversifications, although the order of major product/service, market and restructuring is stated here, and as well as their match with the micro level 7-step model. Especially the explanation of simultaneously running minor and major diversifications remains incomplete here. However, the stated growth pattern is an ideal model and it does not include all of the imaginary options beyond the regime of cost efficient and wise strategy management.

Research line 3 is focused on concluding the answer to the 1st and 2nd subquestion of RQ2 (*a: what are the generic profiles of diverse intellectual value adding actors matched against that pattern and, b: what are the feasible IC-value adding spot areas and their levels of importance according to the IC growth pattern*). The starting point of the investigation is the testing of the growth pattern by actor cases. First, the growth pattern is tested successfully against the actor cases present in the firm cases. This pattern matching not only tests successfully the derived IC-growth model, but leads to the summary of actor profiles showing proclivity towards investor-like intellectual capital value adding actors. This view is achieved by considering two variables, diversifications and business creation process steps, and five actor profiles are identified, as stated in Table 41.

Further elaboration towards the intellectual capital based interpretation of the actor profiles disregards the variable of the diversification type because of the reason that all intellectual subcapitals appear the same throughout the seven diversifications. Finally, the first partial result of RQ2 is achieved. Namely, it is the generalised pattern comprising four major steps within a single diversification framed investment cycle, as defined in Fig. 34. Each of the major steps is characterised dominantly by a particular intellectual capital. The first major step, called business planning, is dominantly characterised by HC. Next, the regime of generation is divided into the two major steps because of the two different organisational levels, which are the operation management and the board of director levels. The intellectual capital characterisation at the operational level is process capital and organisational knowledge of structural capital, whereas the governance level is dominated by ownership capital of structural capital. The fourth major step is called deployment, characterised dominantly by relational capital.

In other words, the single diversification is framed by the single intellectual capital investment which is composed of the four major steps as the representatives of four different intellectual capital qualities. Moreover, this concept glues together the three cycles of the dominant subcapitals of the intellectual capital value chain and the impact cycles of the intellectual capital investors, as illustrated in Figure 30 on pointing out the major steps of diversifications.

Accordingly, understanding the concept of investment-like intellectual capital value adding goes through the division of the intellectual capital value chain into the four domains, each of them providing a unique discipline of value adding. Moreover, this is the answer to the 2nd subquestion of RQ 2 (*what are the feasible IC-value adding spot areas and their levels of importance according to the IC growth pattern*).

Research line 4 encompasses the definition of the outcome of the single investment-like intellectual capital value adding cycle, or just intellectual capital investment cycle, in Table 44 (Subchapter 8.1). The outcome from a particular investment cycle is the increased value of competitive advantage factors. In turn, they are the intermediating factor of increasing the financial value of growing firms.

The first task is involved in the operationalising of the concept of business model which is two-staged. First, grounded on the case firm studies, the three business models are found providing ten key areas aligned to the concept of the competitive advantage factor. Second, the ten factors are furthermore elaborated against the results of the gap-analysis of the case firms. It provides the manifestations of the fundamental intellectual resources from the resource dependency point of view. Together these two analyses matched with the business model concept stand for the definition of the 9 competitive advantage factors as suggested in Table 43. Comparing these competitive advantage factors with the three diversification types is exercised in Table 44. This summary is, moreover, the definition of the outcome of the intellectual capital investment cycle.

The conclusion is that the competitive advantage factors are the end-point and the yield of the single intellectual capital investment cycle framed by the single diversification. However, depending on the type of the diversification, the yield is defined by the varying competitive advantage factors. For example, market diversification strengthens differently the competitive advantage factors rather than product diversification.

Finally, the comprehensive concept of intellectual capital value adding is introduced in terms of the compound framework constituted on the those three approaches :1) the IC-growth pattern in terms of 7-step micro and 7-stage macro growth concepts; 2) the four major step framed intellectual capital investment cycle, and 3) the definition of the outcome of investment-like IC-value adding. Hence, the validity of the model is bounded by these three concepts. Yet, the explanatory power is increased in next subchapter, where the role of intellectual capital in company growth is reflected against the diverse modes of IC value adding in the continuum stretching from advisory to venture capital investing.

9.1.2 Recommendations

In fact, the recommendations are partially disclosed in the previous subchapter, as all the three key concepts: 1) the IC-growth pattern, 2) the four major step framed investment cycle, and 3) the entire investment process highlighted by IC value adding, are the new theoretical findings and feasible new concepts for the use of further research studies.

However, central to this study is the overall concept of the role of intellectual capital in growth companies, which is the compound concept of those three key concepts. First this concept is depicted in Fig. 37, emphasising the essence of the company IC-dependency view but also including the opportunity point of view of intellectual capital

value adding actors. In turn, Table 45, later here, concentrates especially on the actors' point of view examining the entry and exit schemes.

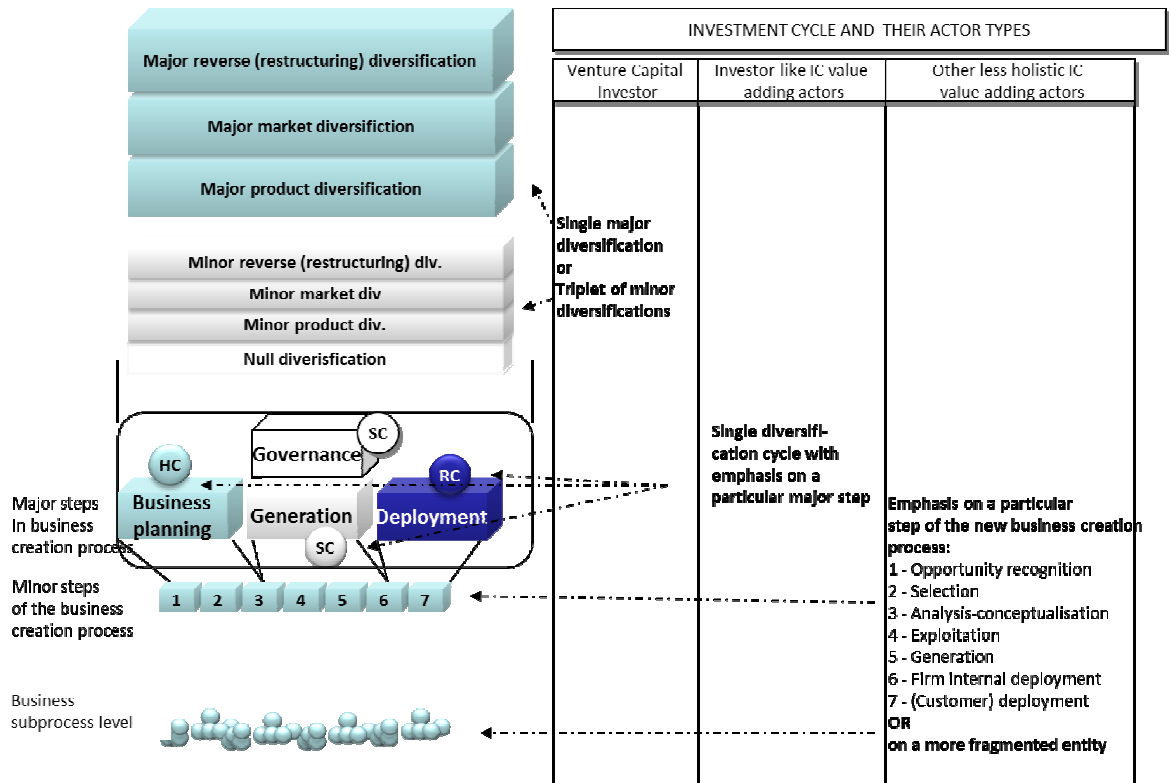


Figure 37: Summary of the diversification & business creation process & IC-orientated research line

Indeed, Figure 37 holds an intellectual capital value adding hierarchy, where the entities at the lower level are encapsulated by a single entity in the next level. Beginning from the bottom, a group of business subprocesses is encapsulated by a single step in the business creation process. It shall be noted, that a single main business process is not equal with one business process step. For example, it would be alluring to define the step of generation equal to product management. However, there are also other business processes running simultaneously during the generation step rather than the product management related processes and the simplistic way of equalling these two entities is not workable. Then, the major step level, 3rd from the bottom, is build up by four major steps, each of them comprising more than just one business process step. Above this level, 4th from bottom, is the single minor diversification level, where a single diversification holds a sequence of the seven business process steps. Next, comes the 5th level, the major diversifications, which of superior to minor diversifications in respect to the invested resources.

On the right hand in Figure 37 are the actors. They are more precisely described in Table 45, next here, which is a summarisation of the actor types and their positioning

according to the diverse cycles of adding value. Like in Fig. 37 the cycles in Table range from a single step of the new business creation process (ref. 1) up to major diversification (ref. 5). In between lies the one diversification framed investment cycle characterised by major steps (ref. 2) and the cycles of single diversification (ref. 3) and the triplet of minor diversification (ref. 4). Thus, the size of cycle from the first line (ref.1) down to last line (ref. 5) is growing.

However, attention is given here only to the actor type of interest of this study, the investor-like intellectual capital value adding actor type. This profile is best and easiest found on the line 3 (Table 45). The study does not say that investor-like IC value adding actors are absent at the levels with reference 4 and 5. More precisely, the preferred profile here is a venture capital investor offering also intellectual capital. It can be also a combination of a VC-firm and affiliated intellectual capital provider, acting as an investor, too. The second option is an institutionalised investor with financial capital and less intellectual capital, which is served by an affiliate of that investor, such as a VC-firm. In fact, a continuum of the investor profiles from a pure intellectual capital investor through the business angels and the formal VC-firms up to more institutionalised investors is formed as the size and risk of a particular investee increases (Harrison et al. 2004).

A more thorough look on the actor profile present at the 3rd level in Table 45 highlights the depth of intervention and the length of the partnership with the investee company. The partnership of the actors adding intellectual capital would be relatively long due the varying intensity levels of value adding. At the beginning, during the familiarisation period, an actor would take a director role referable with the definition on the line 2 in Table 45. Next, comes the factual cycle of investor-like intellectual capital value adding, a single diversification framed cycle. Within that cycle, the urgent demand on those offerings by actor is, moreover, framed of the high impact level cycle matches with the concept of the major step as pointed in Subchapter 7.6 and as well as in Fig. 37 here.

As a conclusion, in respect to the external actors entering to the firm, provided with high intellectual capital and low financial resources, the most likely area of the utmost contribution, referable with the concept of investment-like intellectual capital value adding, is found in the middle of the investment cycle framed by the generation major step. In turn, internal actors such as founders and co-founders are the intellectual capital investors framed the business planning major step. They do have also importance in a longer run in their career path in the other positions of the investment cycle due achieving financial success and business experience.

The important notion here is that, investment-like intellectual capital value adding is not a solo game but a team-play, rooted to the rationale of the intellectual capital value chain. Second, the return on investment to the investors providing intellectual contributions comes not after the single successful diversification. More likely the exit point appears after minor product, market and reverse diversification after achieving profitable business and a solid foundation of product and market portfolio. In turn, a

single and successful major diversification may offer a feasible exit, however, not satisfactory proved in this study.

Ultimately, the concept of investment-like intellectual capital value adding becomes cumbersome and requires consideration in conjunction with the entire pool of resource offerings. Eventually, the rationale of an intellectual capital investment process is feasible not until intellectual capital is considered together with financial capital and tangible resources. In necessity of substantial financial capital, a pure intellectual capital investor must be accompanied with financial resource. Thus, the profile found in the line 4 in Table 45, the domain of the early stage venture capital firms and business angels, is an appropriate intellectual capital investor type.

Table 45: Summary of investment cycles, generic actor types and their contributions

REF	Cycle	Generic actor type	Impact	Expected compensation
5	Single major diversification	Financial investors at the later investment rounds	Increasing the firm value; Enabling a firm trade/ M&A-operation	Return on investment thorough exit
4	Range of all minor diversifications	Actors providing financial and IC capital; members of the board of directors	Increasing firm value; Enabling M&A-operation	(Financial) return on investment by exit
3	Single minor diversification (any of the three types)	Highly expertised actors in chief position who are probably members of the board of directors	Impact on certain key areas+ (shared) control of the entire diversification in question	Shares to be sold in future plus a decent monthly fee
2	Major step within a single diversification	Actors in executive role	Impact on key areas: business planning, generation, deployment (not governance)	Periodically paid financial compensation
1	Single micro step (of the 7-step new business creation process)	Actors in the managerial and director roles:	Impact restricted in a few developmental steps	Salary, monthly compensation

Here in Table 45, the length of investment cycle typically comprises the triplet of minor diversifications which is aligned with a particular venture capital investment cycle from the entry through value adding and maturation of the firm until to liquidation and the exit of investors. The 5th line pertains with investors at the later investment rounds not evidenced by this study.

The third actor category consists of experts taking responsibilities of the more fragmented business entities such as a particular business step or a particular business process or a subprocess. Furthermore, these actors do not claim for intellectual capital value adding at its most strategic forms.

The third main theme and the closing of Subchapter 9.2, considers the question of the quality of intellectual capital apart from any intangible resources is necessary to avoid confusion between the terms of intellectual capital investor and intellectual value adding actor.

First, some of the actors may provide patents or other intangibles which shall be differentiated from intellectual capital. As discussed in the theory part, intellectual capital may range between low structured tacit knowledge to intellectual property, the latter not considered intellectual capital, but an asset.

Second, to deserve the nomination of capital, intellectual capital must also meet the criterion of capital. Plausible evidence for calling intellectual resources as capital will occur when a particular growth company is unable to acquire the critical intellectual resources with direct financial stakes, and attracting the necessary intellectual capital providers goes through investment logic.

Found from the case firms and supported by the theory (4.3), the following factors below point out the preconditions for judging intangible resources as investable intellectual capital. A particular intellectual resource entity:

- is valuable
- has no or just a minor market
- contributes highly to the desired business goals when its inherent value is improved/developed
- is flexible for recombinations with other intellectual resources
- embodies ultimately a positive impact on cashflow indirectly through a value chain of other qualities of intellectual capital
- enables the creation of competitive advantage and is found in the business model configuration
- is interdependent on other intellectual subcapitals

In respect to the list above, an interesting point of reference is exposed by resource based theories. In accordance with RBV-theories, the competitive advantage creating character of intangible resources can be defined by VRIS-factors. VRIS stands for valuable, rare, unimitability, unsubstitutability (Vesalainen 2010; Barney 1991). However, this discussion is not anymore revised here, but the reader is invited to have a look at Subchapter 3.1.1.

9.2 CONTRIBUTION

The contribution of this study is discussed in two areas. First, the implications for theory are discussed. This is followed by implications for practise where the practical findings are present.

9.2.1 Implications of Theory

What it comes to the native theory of this study, IC-theories, the novelty of this study falls in the four notions. Research studies in this field stay on a rather general level, highlighting a limited variety of factors explaining the three subcapitals for example the

study by Martin De-Castro et al. (2007). From this point of view, this study forms a foundation for a comprehensive IC-indicator system of growth technology companies. The main level presentation of intellectual capital, the triplet, divides into eleven subcapitals, which are next defined by factors, some 35 in total. In turn, these factors, appropriately modified, offer a foundation for the indicators that will form both the content of questionnaires as well as the variable for the quantitative surveys.

Second, the intellectual capital theory is also silent about the cause-effect mechanism of intellectual capital value adding, except a few studies like Roos & Roos (1997), or intangible monitoring systems based on the value chain view by Kaplan & Norton (1993, 1996, 2004).

Third, ownership capital is considered here which is not included in the IC-concepts apt for SMEs. As discussed in the beginning of Subchapter 3.1, for example, CIC-IADE-, DSG-concepts and the concept by Roos & Roos (1997) are silent about ownership management or the factors related to it. Nor do the well known IC-indicator systems for corporations, like the Intangible Asset Monitor by Sveiby (1997), include ownership perspective.

Fourth, the involvement of reverse diversification, the restructuring perspective, improves the applicability of the IC-growth pattern, which is a mandatory aspect for any IC-monitoring system studies in the field of growth technology companies. Although not seen identifiable in all of the cases here, the restructuring period is constantly followed more or less visibly after minor product and market diversifications. In respect to the case firms here, the less visible role of restructuring is due to low awareness of knowing how to manage a distressed situation. Like the firms here, the encountered cash-crisis is most often alleviated by less sustainable corrective measures rather than leading a thorough restructuring process by experienced talents.

Outside the IC regime, but viewing a theory very close to this study, in terms of venture capital theory, some value is brought forth in this study. In VC-theories, some of the main views on growth companies are the financial accounting perspective (e.g. Manigart et al. 2002), entrepreneurship (e.g. Ucbasaran et al. 2003), knowledge based value adding or so called smart capital (e.g. Luukkonen 2008; Schaefer & Schilder 2007), VC-investor actor studies (e.g. Harrison et al. 2004) and strategy management related studies (e.g. Ala-Mutka 2005).

Besides these views, there are also cross-over studies dealing with both venture capital and intellectual capital regimes like Okkonen (2006) on social capital, Watson et al. (2003) on human capital, interpersonal processes and organizational demography, Sapienza and Amason (1993) on the effects of innovativeness, and venture stage on venture capitalist-entrepreneur relations (Sapienza & Amason 1993). However, this study adds one landmark to the theoretical writings stretching from the intellectual capital domain to venture capital regime. More precisely, the contribution here is related with defining the concepts of growth firms in intellectual capital terms, comparable for example to the venture growth models.

9.2.2 Implication for Practise

Based on the theory here, the study emphasises the cycles of generation and governance as the most feasible area for intellectual capital value adders during a single diversification cycle. The practical settings in business life consider two salient profiles, which are sales & distribution orientated and product/service generation orientated leaders. Yet, both are parallel with the results of this study within market and product related diversifications. However, the study suggests a third diversification type, restructuring, where the accompanied practitioner is profiled as a chief restructuring officer or just a hired-CEO responsible for redirecting the company's business portfolio.

The first two types, product/service and market diversifications, are salient in business life and are granted appropriate attention and autonomy in leading a company's expansion. In respect to the third diversification type, restructuring, it is not so often given the importance it deserves. In practice, companies passing through a distressed period should hire a CRO, chief rescue officer. A talented CRO has a sound understanding of the technology and market the company in question is operating in. The core competence requirements are the ability to make comprehensive business portfolio analysis, a restructuring strategy including divestiture, outsourcing and scrapping of unprofitable businesses plans. Yet, he/she should possess satisfactory leadership skills.

At least for the author of this study, a comprehensive presentation of the growth path scenario or scenarios of a new technology firm would have been illuminating when pondering alternative job positions such as the CEO of a growth technology firm and other positions. At the beginning of the life-cycle of growth firms, the future prospects and wealth creation look very vague. Especially, questions about personal exit perspectives, sharing the ownership with investors, team building, competence management, risk management, preserving personal status and especially growth strategy options are unknown territory for less experienced entrepreneurs, even if possessing the merits of large business corporations.

In fact, this study gives a theoretical framework for writing a survival guide type of business book about the pros and cons of technology business entrepreneurship. Moreover, the author of this study has prepared guidance material for managing new business creation from university research and generating new technology business firms with the participation of researchers (Kamaja 2006).

As this study has increased understanding of the dimensions of the growth firm at the micro and macro levels, the practical outcome is a scenario analysis consultancy tool. In fact, the author of this study has already applied this tool to the planning of firm growth strategy of growing SMEs. The starting point is the vision for growth, which can be an overall view of the desired volume of business. Then, through the assessment tool it is possible to define the growth stages. This is done on the basis of description of the preliminary growth path, which offers analysis on tangible and intellectual resources required along growth from the current situation until the achievement of the vision.

Next to the definition of the resources, a financial investment plan can be estimated grounded on the sales revenue estimates. Further on, based on two or three scenarios, the points of discontinuities are disclosed that may suggest changes to set vision(s) which are impossible to achieve.

The explained approach of applying the scenario tool may raise accusations of copying the idea of real option modelling. However, the use of real option analysis estimates the optional ramifications from the current situation and calculates the successive investments (see e.g. Balasubramanian et al. 2000). The major difference between real option modelling and the scenario tool is that the latter defines the boundaries of achievable growth as well as partitioning the resource elements. Thus, real option modelling can be seen a continued processing for this particular scenario tool rather than a competitive solution of mapping growth scenarios. Ultimately, the suggested scenario tool does not require real option but a cash flow analysis.

An intellectual capital indicator system for growth technology companies is one of the practical implications that can be derived on the basis of the theoretical findings here. The basic idea is explained in the previous subchapter. The value of the new indicator system is its explanatory power to anticipate the near future problems in the resource pool of analysed firm. Basically, the idea here is consistent of the Balance Score Card system, where the indicators belong to the four main categories (Kaplan & Norton 1992; 1993; 1996). However, here the system is designed especially for growth technology companies.

9.3 RELIABILITY AND INTERNAL VALIDITY

The most frequently introduced parameters for evaluating the value of research studies and among them also qualitative research studies, are reliability and validity (Yin 2003, pp.33-39; Seale 1999, p.53). Following Gummesson (1988, p.81), reliability means that two or more researchers studying the same phenomenon with similar purposes should reach approximately the same results. Reliability appears in divergent perspectives like reliability of the data sources, data access methods, deriving analytical induction, etc. Even more, a particular piece of research may appear satisfactory even when generalisation has been left out and the research strategy is grounded on descriptive findings. However, a sound qualitative study is not a description of the object of the study, but rather embodies a hypothesis formulation challenged by testing it with the research data (Koskinen et al. 2005, p.32).

In respect to the generalisation within case studies, one aspect in terms of research is the number of chosen cases. Besides the additional case material not separately mentioned in this study, but introduced in general in the beginning of Chapter 2, this study relies on four case studies. Following the theory, a case selection like this would give an adequate foundation for generalising reliable results. For example Koskinen et al. (2005, p.46) and Seale (1999, p.109) that research studies grounded on analytical induction, even one or two cases intimately investigated and complemented with

adequate theoretical discussion would be sufficient and feasible from the generalising point of view.

When the researcher, like the author of this study, is able to act in a participatory role or otherwise intimately once collecting the case data, it moreover justifies speaking about in-depth case analyses. Two cases meet the criterion of in-depth cases, the Machine Vision Firm and in a certain degree, the Spectroscopy Firm case. Then, generalising becomes feasible even with a very limited number of cases. This is evidenced by Seale (1999, p.109), who finds an empirical generalisation feasible where the core is founded on one case and generalising rests on other cursorily investigated cases. This procedure ensures that findings grounded on one or two in-depth cases are not extraordinary ones, but are present as well in other cases. This point of view is claimed by Normann (1970, p.53) who states that: “[I]f you have a good descriptive or analytic language by means of which you can really grasp the interaction between various parts of the system and the important characteristics of the system, the possibilities to generalise also from very few cases, or even one single case, may be reasonably good.”

The generalising aspect is affected also by using multiple iterations of where the validity area is adjusted. This approach is, in fact, the concept of saturation, which is a progressive process and implies unfolding several studies along the course of the analytical process. While increasing the range of phenomena of the study, it is compared with new case data. The comparison and taking in of new research material is continued until no supplementary findings are met. Hence, the phenomenon appears in the form of a generic concept that eventually results in saturation (Seale 1999).

For this study, even the two in-depth cases would have afforded reliable case data from deriving the micro-level concept of 7 step new business creation process and the understanding of the sequence of minor product, market and reverse diversification and their successive levels at major diversification levels. The saturation is seen here in the way of using four cases as well as the applying of triangulation explained later here. However, the explanation of the occurrences of running minor diversifications in parallel with major diversifications stays incomplete, which implies descriptive analysis rather than explanatory analysis. However, the explanatory regime of this study covers the area of minor diversifications, including the micro level concept as well as the internal pattern and the order of appearance of major diversifications.

In increasing the reliability of the study, a feasible remedy is the logic of triangulation based on using multiple data collection sources, researchers, research studies, perspectives on the same data set and methods (Seale 1999; Yin 2003). This requirement of triangulation is considered in several ways. Likewise, this study grounds the data collection sources not only on the four cases but also other views. The only pre-seed case of this study is strengthened by the researcher’s own well-documented technology commercialisation studies (Kamaja 2006) within measurement and ICT-technology industry. Supplementary data for the three firm cases of this study is derived from: (1) interviews with nascent technology business firm owners, as pointed in the references in Subchapter 7.2.1, (2) six well-documented restructuring case studies by

Ratia (1997), and (3) the author's participation in three Finnish consultancy or co-entrepreneur associations since 2003 and work with SMEs. Appropriate observations among growing large companies with annual turnover of over 100 million € are based on the author's managerial job positions in three Finnish companies within three industries: paper converting, and telecom and automation systems manufacturer industries during 1990 – 2002 and 2006-2007.

The researcher triangulation is fulfilled by close interaction with the venture capital research team of Tampere University of Technology during the years 2005 – 2007. The research method of triangulation is based here on applying divergent access methods, as discussed in Subchapter 2.4. The methodology of triangulation is grounded not only on case-study research methodology theory (see Subch. 2.4.2), but also on grounded theory methodology and, in general, the principles available within analytical induction related research methodology theories (see Subch. 2.3). Triangulation theory is present in the two main theoretical approaches. The intellectual capital theory foundation is introduced first in Chapter 3. Second, the umbrella concept of resource dependency-related theories comprises the essential views on firm growth. Furthermore, the robustness of the study is also strengthened by appropriate case selection, thus increasing the validity as explained in Subchapter 2.4.2 (Eisenhardt 2007; Siggelkow 2007; Seale 1999).

Ultimately, reliability within qualitative research studies may become blurred, especially when the role of the researcher as a data collection device is pivotal and intervening methods like participant observation or research action are applied. In this study the latter is, however, in a minor role and used only in the Machine Vision System firm case in 2008 – 2009 on an organisational development method basis. Regarding the case studies, the participant observation method is also used sparingly. Hence, the narratology method applied in this study in describing the longitudinal evolutionary paths of the case firms is grounded on insightful and intimate research data without strong impact on the course of events. Especially, the cases of the Optical and Spectroscopy System and Contract Manufacturer firms are grounded on indirect data collection methods. On the other hand, it should be noted that even a reliable writer's text involves biases (Koskinen et al. 2005, p.138), and, lastly, reliability is dependent on the qualifications of the researcher or the research team.

The concept of validity is twofold, including internal and external validity (Yin 2003). Internal validity focuses on the integrity of the chain of deriving evidence and finally, results from the research data. In turn, external validity exposes the research area, where the results of a particular piece of research provide a plausible explanation for the research problems.

First, internal validity is considered by the reliability of the data sources and the data obtained. This matter here is alleviated by using redundant acquiring methods for the same object of observation. For example, documents describing important moves within the case firm's evolution are reflected also in interviews besides using literal documentation. However, the oldest occurrences are supported by thinner

documentation, whereas the more recent data is rich. Luckily, the early years of the firm growth paths comprise fewer events, exposing more coherence between cases. Therefore, a lesser amount of information is, however, supported by similar ideas emerging across the cases, whereas the subsequent years of growth bring forth diverging points of interest.

Second, internal validity is dependent on the most important assumptions made in the course of the research work. Certainly, choosing the qualitative research approach and crafting analytical tools deserves special attention. Probably the use of survey methods would have given supplementary perspective on the occurrences within the cases. However, the structured case reports are organised in a similar fashion to survey forms, consisting of 11 large questions in sequential order, year by year. In this study, instead of the respondents' answers to these questions, the answers are analysed by the researcher on the primary data basis created by those respondents.

Third, the whole research framework of this study is compatible with the model pointed out in Figure 6 (in Subch. 2.3), which is gradual and proceeding by small steps. Accordingly, the integral validity from this perspective is sound as the analytical work is build level by level grounded on the conclusions in the previous chapters.

The first attempt towards building the growth pattern (Ch. 6) offers exploration within the cases as well as description of the taxonomy of the intellectual resources. Exploration is continued in Chapter 7. Here, the theoretical business growth related concepts, together with intellectual capital value chain model, operate on the basis of the four case studies. Hence, the output from Chapter 7 is a generic and preliminary conception about new technology business growth at micro and macro levels interpreted by the common operation management and also intellectual capital terminology. Moreover, the pattern is tested at the end of Chapter 7 and additional explanatory power is brought in terms of investment cycles.

The model building is completed in Chapter 8 where the outcome is organised in the form of comprehensive growth framework involving those micro – macro and resource dependency – intellectual capital perspectives framed by intellectual capital investing cycles and, yet, provided by the definition of intellectual capital investment logic.

Although the research framework is claimed here to be robust, proceeding gradually without major leaps threatening the internal validity, there are nevertheless some pitfalls. The first is the overall effort dedicated to the entire research project. The researcher's time was needed for collecting data, analysing it, deriving structured case reports, selecting and testing the most appropriate theoretical growth concepts, running trials with concepts and gaps in fitting theory and available data, collecting additional data, improving the theoretical framework, etc. And this was just fitting the data with the theoretical concepts. Next was considering the methodology and developing a feasible research framework. This gave feedback for deciding on the scope of the theoretical framework and choosing the data access methods. Finally, a researcher may despair or find an appropriate combination among these elements. In this research

project the latter came up after one iteration round, paving the way to a satisfactory view of the required research framework as pointed in Fig. 26 in Chapter 5. In fact, the most troublesome question was inventing a reliable approach for validating, linking and expanding the validity of those theoretical key concepts introduced in Chapter 4.

9.4 CONTRARY VIEWS ON CURRENT THEORIES AND CHALLENGES TO EXTERNAL VALIDITY

One of the accusations of the poor external validity may stem from the reason that only the two of the three business model types are present within the case firms. Indeed, the case studies emphasise the service and solution business models (6.2), and the required evidence of the functions embedded in the firms underpinned by a product business model, the third type, is not present here. The defence here relies on the supplementary case firms as presented in Subchapter 7.2.2.

One disputable subject might be the consideration of restructuring as one of the three diversification types (see Ch. 7). As evidenced, it comprises all seven steps required to meet the criterion of a new business creation, and therefore the claim for considering restructuring a true diversification type is valid. Moreover, it has a unique character apart from the two other diversification types. This character is the impact on profitability and long-term sustainability enabled by a restructuring act which is not present in minor and major product/service or market diversifications.

The next accusation could be pointed towards the order of how minor diversifications are claimed to be succeeded by major ones, as discussed in Chapter 7 (Table 35). Specifically, this study argues that major diversification is not followed until the occurrence of the minor product and market and restructuring diversifications are completed, where the last one is less visible within the highly successful growth firm cases. But, once the company has shifted from the first three minor diversifications to the first product diversification, it is not questioned the probability of minor diversifications occurring during major diversification cycle. This can be understood from the viewpoint that minor diversifications are equivalent with the size of single product business whereas major diversifications match with the size of a merger and acquisition operation. Therefore, the concurrence of these two different size diversification main types may be possible, but not proven in this study.

One of the disputable definitions of intellectual capital here is ownership capital. It belongs to structural capital as claimed by the business process continuum definition available, e.g. in the definition of step 5, Table 37 and also from the theory point of view in Subchapter 3.3.3. Intellectual capital theories, however, bring forth ownership capital only weakly. In particular, arising from the intellectual capital tradition, only the concept by DSG (Deutsche Schmalenbach Gesellschaft für Betriebswirtschaft) claims investor capital to belong to relation capital (Subchapter 3.1.2). The stress involved in it is in taking care of investor relations and attracting new funders to pace the firm's growth. In this study, ownership capital involves caring for relations and by definition

here (Subchapter 7.4) emphasising the discipline of governing the object of ownership by shareholders, too. Due to its disciplinary character, ownership capital is considered to belong to structural capital.

Finally, the most obvious factor restricting the external validity of the entire study is grounding the selection of the case firms within Finnish industries. The defence here is that all three firms are internationalised and challenged indirectly by foreign companies to introduce similar or even better ways of growth. However, this does not legitimize calling this study a multinational one.

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APPENDIX 1 – IN DEPTH CASE DESCRIPTION – THE MACHINE VISION SYSTEM FIRM

1996 – 1998 FIRST YEARS – ENTREPRENEURIAL LEARNING AND PREPARING FOR INITIAL MARKET ENTRY

Intended and realised growth

During the period 1996-1998 the Machine Vision System Firm was more in pre-seed stage. This time was dedicated more on entrepreneurial training of CEO and elaborating new business ideas. In 1998 took off the preparing of the first business plan aimed on getting seed investment for further product development project as explained in next subchapter (period 1999-2001).

The Machine Vision System Firm joined into the Tekes¹ driven pro-plastics consortium which paved way to the new customer and product ideas. The new product idea considered a machine vision based quality control system for cast plastic component quality assurance and inspection purposes.

Business model

The business idea was to sell analysis and engineering services for plastic manufacturers' injection moulding process. The value proposition based on cost savings involved in the plastic raw material usage with more precise calculation. The Machine System Firm was a direct subcontractor for plastic engineering firms those supplying plastic components for mainly automotive industry. The revenue was composed of services' income that was aimed to be enlarged by import business. Cost structure was low. The Machine Vision System Firm value creating network consist of a first customer, which helped the firm's market entry and productising. Competitive advantage comprised high-level engineering services, flexibility and competitive pricing due to the low cost structure.

¹ Finnish public funding agency for technology and innovations

Financial status and cost structure

Revenue was round 10.0 k€ in both of the years. Company made loss of 0.2 k€ in 1997 and 19.0k€ in 1998 which was almost double the revenue. CEO's working hours were dedicated during 1998 for making business plan and raising seed funding which impacted on sales revenue negatively.

The headcount was one person.

1999 – 2001 SEED STAGE - BUILDING THE FIRST PRODUCT AND MARKET ENTRY INTO GROWTH BUSINESS

Intended and realised growth

The cycle 1999-2001 covers the seed funding period which was dominated of developing the machine vision system, the first actual product. The promising market expectations attracted new investor, the first in 2000 and another, which in fact was a business angel in late 2001

The Machine Vision System Firm was paid for the project and the moment was beginning of the machine vision system business.

The intended strategy considered a new product (a machine vision based inspection system) and expanding customer basis within current plastic industry market, i.e. plastic manufacturers for electronic industry. The market potential for the new product was estimated 2.35m€ within 5 years penetration cycle. A second reference [minutes of the board of directors meeting, 2001] estimated the growth to begin from 2Q2001 which was based on selling 12-16 units in the domestic market representing 0.75 – 1.0 million EUR market. Also rent-business was considered as a secondary offering. Thirdly, Germany and Sweden market volume was identified of 1.2 million EUR.

Business model

The business idea was slightly changed. Following the new product technology program analysis services were replaced by inspection systems gradually. The value proposition still based on cost savings involved in customers' production yield but now offered in terms of machine vision technology, not mould inspection calculation system. Moreover, customers could obtain savings in labour costs. New market segments were won through plastic component suppliers such as electronics industry. The Machine Vision System Firm stayed in the same position concerning the value chain but its role was changed from a knowledge based subcontractor into a product supplier. The revenue was composed of machine vision systems sales together with old services excluding the import business which was discarded. Cost structure increased due to new personnel and office. Due to the TEKES' consortium The Machine Vision System Firm value network expanded by an order of magnitude

(kertaluokkaa isommaksi). Competitive advantage comprised high-level engineering services, flexibility and competitive pricing due to the low cost structure.

Financials (P&L-figures and Balance changes)

Seed-Consortium consisting of banks allocated subordinated loan and TEKES allowances and subordinated loan. In total The Machine Vision System Firm was funded by 165 k€ for building inspection system technology development program.

During the period 1999-2001 the business growth was steady and the firm succeeded in doubling the revenue each of the years. In accordance, the operating revenue, sales income of products and services (pro forma revenue), were 28 k€ (1999), 81k€ (2000), 134 k€ (2001). However company's EBT (earnings before taxes) was negative, -17k€ (-99), -62 k€ (2000), -119 k€ (2001), in total a loss of 192 k€. Together with R&D spending activated in balance sheet, 197 k€, The Machine System Firm needed additional funding to fill the gap. A share issue directed to a private investor was executed in 2000, called later the Corporate Financing Expert. The Machine Vision System Firm got 84 k€ new money compensated by 10.7% of total shares, CEO holding the rest. Financial reserves for covering negative losses and R&D spending lasted to the beginning of 2001. Some minor loans secured by CEO were allocated to ensure the cash reserves in 1Q2000.

The liquidity problems retarded the growth pace in 1-2Q2001 and The Machine Vision System Firm prepared for a new investment round. Obviously the Corporate Financing Expert, a corporate financing specialist, could help proceeding of a new investment round. In May 2001, the meeting of shareholders deputed the board of directors to issue bonds with warrants or a share issue for re-capitalising The Machine Vision System Firm. The transaction was operated by a Finnish banking house which carried a due diligence and a selection of the new investor processes. The chosen new investor, was truly a business angel, had a long experience within electronic and IT firms and start-up firms since end of sixties. Furthermore, the CEO of the banking firm also made a minor investment into the Machine Vision System Firm in terms of a convertible bond and and the new shareholder agreement was signed in July 2001. Finally, the case firm was funded by 218 k€.

Ownership management and governance

The banking firm CEO's bond was converted to shares and he possessed now 553 of the total shares of 11981. Furthermore he was given a warrant enabling to subscribe 467 shares until 31.3.2002 which he never used. After the carried transactions the shares divided in the end of 2001, founder CEO 70%, A 8.4%, B 16.3%, banking firm CEO 3.9% and personnel 1.6%.

The original contract of the shareholders from 1998 was now replaced with a new among the parties (Founder-CEO, Business angel, Corporate financing expert and Bankin firm CEO).

Key competences - Board of directors, Personnel & Shareholders

The board of directors was seated by the former plastic industry firm CEO until Feb 2001. Hence, at the end of 2001 founder CEO and investors were occupying the seats in board of director meetings.

Personal contribution besides the funding consists of founder CEO possessing entrepreneurial drive and emerging sales and marketing skills, the Corporate Financing Expert, since Aug. 2000, providing financial director skills and a second investor, since Sept. 2001, a Portfolio Entrepreneur join who possessed a technology business background.

The first recruitments were carried in 1999. Two key persons begin to work within technology development tasks. The headcount was increased by one in 2000 by two persons in 2001, in total 6 persons including CEO.

2002-2005 - PERLOS DOMINATED GROWTH

One customer, Perlos PLC, boosted the growth and this engagement brought up The Machine Vision System Firm in a level of 1 million € revenue in 2005. In good and bad², Perlos was dependent on Nokia's presence globally and moved its manufacturing capacity following the Nokia's movements. The Machine Vision System Firm followed Perlos abroad in Hungary and USA during the years 2003-2005. Along with the Perlos globalisation the other opportunities appeared either in the low labour cost countries not feasible for advocating the investments on sophisticated machine vision inspection systems or they were in the countries too far for running a profitable business. The size of a small technology company with no local partners or a global service network made a bottleneck for continuing this marriage. Finally, in the end of 2005 the signs of drastic end of Perlos relationship materialised and the case firm's business declined significantly.

Intended growth

One of the starting points for shaping a strategy for the next years, 2002-2005, was the Machine Vision System Firm's board of directors estimation in 2000 that the demand of the firm's initial product, XYZ Vision, would take off in 2Q2001 and the volume in the domestic market will be 0.75- 1.0 million € and in the EU-countries 1.2 – 1.7 million €. The realised growth was substantially lower than that in the strategy statement as the table below denotes.

² The good is the expanding cellular phone market and the bad Nokia's way treating its sub-contractors with continuously tightening cost efficiency demands.

The intended strategy for the period 2002-2005 was like a concept of a machine vision department store – all relating with automated inspection knowhow under the same roof. The declaration of the business idea as stated in the minutes of board of directors meeting in January 2002 was as following: *“The firm’s focus area, the branch of business, is quality inspection and engineering, design and manufacturing of machinery, peripheral devices and developing software applied on the sorting and assembly of discrete manufacturing industry. The firm may do import, consultancy and service businesses related within this particular industry”*.

Further, in 2004 after not so high growth (see below the financial figures in table) as expected The Machine Vision System Firm business had reached a substantial maturity level and firm’s credibility was improved in the eyes of the customers. Accordingly, the business finally began to expand. Obviously, the board of directors was enthusiastic now to see a big leap upwards and set a revenue target of 2.5 million € for 2005 and 5.5 million € for 2006 as stated in minutes of the meeting held in November 2004.

Realised growth

In turn, the realised strategy emphasised product and customers, not import business or any other secondary businesses. Company spent roughly two years, 2002-2003 for finalising the second generation product, Vision Manager launched in 2004, a derivate of the XYZ Vision system. The new product was developed in co-creation mode with main customer Perlos, but it offered a solution for a wider application spectrum within other industries. During the period of 2002-2005 the two first years were dedicated for growing with the present customers in terms of specifying on niche solution, IMD-lenses, but also diversifying the product functionality to meet other customer segments since 2004.

Business model

Although the Machine Vision System Firm was in juridical sense an independent entity it actually acted like an in-house technology department of Perlos during 2003-2005. This was due to the very close relationship between technology specialist of the case firm and Perlos’ production people, the users. This benefited remarkably its technology development and product management.

The starting point for expanding business was specialising on machine vision inspection of IMD-lenses, the transparent window protecting mobile phones’ display electronics. *Value proposition* was the same as earlier, a promise of lower personnel costs and higher production yield in terms of automated quality inspection. As said, the firm stretched into new industries due to the new features embedded on the Machine Vision System Firm technology. For the reason the name of the company was put just briefly The Machine Vision System Firm Ltd instead of the original name denoting plastics engineering. This name change emphasised a move from plastics industry to serve any discrete manufacturing industry. The Machine

Vision System Firm contacted some German partners in order to strengthen its distribution channel, especially in sales in Germany and other mobile phone manufacturing countries in the EU. The channel to the main market, Perlos, implied no other parties and was highly cost efficient due to the low sales and marketing costs.

Revenue and cost model was based on the project delivery earning model. In difference with period of 1999-2001 the deliveries were emphasised more and more on international destinations. In turn, the Machine Vision System Firm had to bear now higher travelling, working hour and customer support costs which were compensated adequately by Perlos. the Case firm here recruited own project engineering staff and supplier and resourcing network was not really enlarged. Competitive advantage rested more on the improving technology offerings and flexibility to follow customers' demands.

Financials (P&L-figures and Balance changes)

The revenue, EBIDTA and profit/loss figures are as below.

Table of the financial figures

Year	2002	2003	2004	2005
Revenue	175,0	196,2	788,7	1016,6
Gross profit	96,2	157,3	518,2	823,2
Gross profit %	60 %	77 %	66 %	80 %
Income from operations (EBIDTA)	-89,7	-53,7	198,9	80,6
EBITDA %	-56 %	-26 %	25 %	8 %
Profit/loss after taxes	-157,1	-112,0	144,8	20,4
Profit/loss -%	-90 %	-57 %	18 %	2 %

Revenue growth was steady and reach the best result ever in 2005, 1.0 million €. It is notable to consider here that Perlos bore all costs arisen from extra working hours of the Machine Vision System Firm's project personnel involved in implementation stage on site.

Profitability increase was parallel with revenue and company made its best result in 2004, 145 k€, which is 18 %. Income from operations (EBIDTA)³ stays substantially high during years 2004-2005, which indicates the ratio between product and services sales turn to stress more the latter. The peak was reached in 2005, 1017 k€, the best result ever in history. Behind the profitability increase is the opportunity to deliver the one and the same product following the mass product concept.

³Income from operations= revenue – variable costs.

During the period 2002-2005 the cumulative profit and loss figure was -104 k€ and spending on R&D capital expenses was some 150 k€⁴, in total of 254 k€. A noteworthy matter is the increase of current assets from -14 k€ (2002) to +122 k€ (2005) which is reflected by a stage wise jump in sales. Thereby, the need of new capital was roughly 390 k€ which is in line with the increase of the balance value by 413 k€⁵

Company was funded during 2001-2003 by a share issue, convertible bonds, subordinated loan and raising the bank credit limit which ensured adequacy of financing until.

First time in firm's history, during 2002-2004, the balance short term debts escape into new level which implies a tighter component and finished goods stock control and material resource planning. The figures of the short term debts are 141 k€ (2002) to 240 k€ (2003) and 340 k€ (2004) wherein especially the accounts payables increased noteworthy to the level of 22 k€ (2002), 60 k€ (2003) and 82 k€ (2004).

Headcount was 6 in 2002, 2003 and increased in 6-7 (2003), 10 (2004) and 15 (2005)⁶.

Ownership

Available only in the document written in Finnish.

Key competences - Board of directors, Personnel & Shareholders

The integration of the software development competences as a part of the Machine Vision System Firm's businesses took a substantially long time. This could be explained by the background of founder-CEO in mechanics and plastic engineering automation and the first two key persons since 1999 possessing an automation system background. In this circumstance the role of VTT as an external software technology development partner for the case firm here, became crucial and lasted until 2003-2004 when Perlos driven co-creation of the firm's machine vision system ended.

The text continuing here is available only in the Finnish version

⁴ Depreciations are considered in net income figures, earning after tax.

⁵ The figure is the closing balance value in 31.12.2005, 662k€ minus corrected by zero value of current assets (285k€-36k€) in 31.12.2001 which gives 413 k€, not precisely the 390k€ due to some minor correction needs not present here.

⁶ the value 15 is picked from payroll system, in the financial statement stands 10.

2006- 1Q2008 INTERNATIONALISATION AND FORWARD INTEGRATION ATTEMPT

The most fundamental factor effecting in the beginning of the period of 2006-1Q2008 was the loss of Perlos customership. Unfortunately, Perlos made a significant strategic change in 2005 and closed its sites in Finland moving them abroad as explained earlier. Accordingly, the Machine Vision System Firm's technology followed the Perlos' factories into new locations in faraway countries such as Mexico which made the customership highly complex to continue and in practise terminated the relationship among the business parties.

Without Perlos the Machine Vision System Firm was now bare and the significance of the other business imperatives, others than developing an excellent product, came out disadvantageously. First, the new market in German speaking area and new segments other than telecom were still nascent, yet not proceeded to take off. Secondly, distribution channels partners acting both as customers and system integrators of the case firm's technology were not properly in place. The case firm had some partners in German concentrating mostly on the promotion activities not really on co-branding or any marketing campaigns. Beside this the Machine Vision System Firm would have been required local project force involved in implementation and technical support issues.

Intended growth strategy

Owners set an ambitious target for the new growth. As articulated in the correspondence among principal owner and CEO, revenue of 3 million € with 200 k€ profit had to be achieved in 2008. In practise this vision necessitated a 50-80 % annual growth by a lower starting level of revenue of 500 000 € due to the loss of Perlos rather than applying directly the financial figures of 2005.

The intended strategy comprised three key targets; conquering position in international market, integrating forward in value chain by scaling up towards bugger solutions and moving on total cost of ownership-concept which overlapped partly with the second option.

The first strategic choice was an intention to grow horizontally by diversifying into new segments and strengthening the Machine Vision System Firm's sales force in German speaking countries.

The second, forward integration denoted producing on-line machine vision units with automated object handling equipment. This vision was inspired by the opportunity of getting a supplier status for Nokia. The case firm developed a feasible technology XYZ 500 developed on the ground of Quality Manager-solution for automating Nokia's manually operated printed circuit board inspection. The size of market was 25m€ and based solely on Nokia's production capacity renewal demand along the next 5-6 years. In this case the Machine Vision System Firm went on directly with no manufacturing sub-contractors between it and the end-customer like the situation was in Perlos' case and this decision was part of the strategy on embarking into the quality printed circuit board quality inspection business. Therefore, the

product strategy was a mixture specialised tailoring business and a niche (standard) product strategy.

Thirdly, IMD-lens inspection business was not thrown away. An ambitious global niche strategy based on rent of the machine vision technology, or expressed in business jargon based on the total cost of ownership concept arose later in 2007.

Realised growth

The new compensating market for loss of Perlos rose painful slowly to recover the turnover gap and the Machine Vision System Firm was forced to re-organise its organisation in terms of decreasing the headcount ca. 30% in 2006. Penetration into new segments, electronics at first followed later by fine machining and car-industry in German speaking countries proceeded and the firm got new customers beginning of 2006. This was in fact the moment the Machine Vision System Firm opened a field office in Germany and became international.

Keeping an eye on Nokia's business opportunity a subsidiary was established in Salo, near the Nokia's site in the end of 2006. The personnel (8) consisted of factory automation and production testing specialists of Cencorp PLC, an automation system supplier for automotive and industrial electronics and telecom sectors which reduced its operations in Salo. Unfortunately, after a long competition process, including costly trials on the customer's site ending in May 2007, the Machine Vision System Firm lost the deal for Orbis, partly due to not receiving an official supplier status on behalf of the Nokia's procurement authorities.

The Machine Vision System Firm had now a dilemma how to redirect the utilisation of its new resources in Salo. Rental business didn't succeed to catch new capital investment and fall flat encompassing only a few trial customers. Luckily, the German operation produced positive results and during 2007-2008 the Machine Vision System Firm acquired two major customer, size of 300 000-500 000 € projects which employed Salo people. The Machine Vision System Firm's main site stayed in Tampere where the technology development resources and coordination of the business and customers resided.

As discussed in more detailed in the next subchapters the Machine Vision System Firm applied a capital investment in summer 2007 from TESI, Finnish Industry Investment Ltd, a government-owned investment company for starting a quality inspection systems rental business. Following the TCO-concept customers would have been paying only of service capacity and time. Instead of applying institutional capital the business angel owner was eager to fill the capital gap in terms of issuing a convertible bond. Although it raised controversy opinions and leave of the corporate financing specialist from the board of directors the BA's investment offer was accepted.

The Machine Vision System Firm found in late 2007 an appropriate partner candidate for strengthening its distribution forces, a European Automation Company, a Belgian factory automation firm offering turnkey automation systems for the production, testing and treatment of printed circuit boards (PCBs) and for final assembly and final test. Company was an ideal partner for the case firm here possessing global presence. Company had also an official

supplier status of Nokia hence offering access for the firm's technology into the Nokia's subcontracting business. Moreover, a European Automation Company had an occasional need for complementing its labour intensive services, such as testing, with a sophisticated machine vision technology. Until now a European Automation Company acquired machine vision technology from a company, a partial competitor in service businesses. To crown all, a European Automation Company intended strengthening its position in European Nordic countries in testing and inspection service businesses. Therefore, an engagement between both of the firms appeared a highly brilliant idea which would solve the Machine Vision System Firm's financial problems as well as offering a sound distribution.

In December 2007 a European Automation Company and the Machine Vision System Firm settle upon a letter of intent considering a share issue that will give after contract sign 51% of shares to a European Automation Company. In brief, the proposal offered owners a minor cash money within contract signing, a claim for cutting debts into a more tolerable level from ca. 2.1 m€ to 1.0 m€ and crediting the current owners by 4*EBIT-value in 2012 of the rest of shares given to a European Automation Company. In practise this contract proposal compelled BA, a major creditor, to accept a loan cut of some 0.5 million⁷ against estimated credit of some 1.45 million⁸ € after four years denoting 30 % value measured by internal rate of return, IRR. Sure, the gain was an abstraction basing on a business plan predicting the Machine Vision System Firm's businesses to grow 40-60 % on annual level due to buyer firm's synergy.

Obviously, BA found the future promises grounded on business plan not plausible and disqualified the proposal. Holding almost the half of the Machine Vision System Firm's shares he played a role of central decision maker and in practise negotiations between the firms were closed.

At the same time, in 2008 the rental business together other business conceptions didn't take off properly and until the spring 2008 the Machine Vision System Firm had grown remarkably slower than the ambitious strategy postulated. An unbalance between cost structure and income became intolerable for the BA owner who had financed the firm since the end of 2007. Following the bond contract ca. 700 k€ was now lent until May 2008 when the firm started purposeful reorganisation process. That was the moment when the author of this dissertation joined into the firm.

⁷ other loan holders are neglected here

⁸ the estimated revenue in 2002 was 6,0 million € and EBIT 1,46 m€ which gives 5,85 m€. In 2002 BA would possess ca. 25 % of shares standing for ¼ of exit value of 5,85 finally yielding 1,46 m€.

Business model

The strategy as discussed emphasised two options, solution and product business model the first in Tampere and the latter in Salo. The Machine Vision System Firm had now a top class technology and also market existed. Beside the brand the main problem was lack of a sound distribution channels which will ensure a smooth access to the desired market segments.

The first option considered selling directly tailored machine vision systems for customers in automotive, fine mechanics and telecom sectors.

The Machine Vision System Firm needed a cash-cow which would entail a continuous and predictable income and therefore offer a sound business foundation for more risky tailored big delivery projects.

The first, solution business the value proposition is the same as expressed earlier (please see the passage of business model considering the years 2002-05). In order to ensure the match between delivery capability and customer's problem the Machine Vision System Firm necessitated pre-engineering that could first take a look on finding feasible solution for the customer problem.

The market segmentation was changed in some degree. Domestic market, due to the loss of Perlos, was forgotten now and the focus was now in German speaking countries and EU-countries. The Machine Vision System Firm preferred telecom. The range of applications served varied from surface and dimension inspection offered for fine mechanics and automotive electronics industries into more complicated inspection solutions for telecom electronics manufacturers.

The revenue generation mechanism met now notable changes with the prevailed situation with Perlos.

The firms' bottleneck was still the underdeveloped distribution channel for project deliveries. Although the firm had now a sales agent in Germany it lacked of local partners capable for implementation and support of firm's technology.

In turn, the network structure was now changed likewise. The core technology, software engineering and the camera and illumination technology was now in the Machine Vision

System Firm's own control and the dependency on outer parties had lessened, such as VTT co-operation. After the vigorous technology development years with Perlos, especially the software development was manned now by own specialists.

Competitive strategy emphasised superior technology and therefore met well the definition of differentiation strategy which is discussed later.

Business model: Product business model

In practise, the Machine Vision System Firm's product business model embedded three alternatives varying on market and distribution channels. Namely they were selling service business model following a TCO, total cost of ownership-concept, OEM product and license selling.

TCO, or as the Machine Vision System Firm itself called it a service business model was aimed to be applied on Nokia's printed circuit board quality testing business. The idea of total cost of ownership-concept comes close to the rental business logic, *pay as you use*. However, the main differentiating issue is considering the risk of the operational reliability and service level which belongs to supplier. Hence, the supplier is responsible to provide maintenance services. In practise, TCO-concept necessitates a standardised solution for securing profitable business on supplier. Not only the technology but the service model including the service processes and required information technology infrastructure shall be in place.

The Machine Vision System Firm longed still after the IMD-lens inspection business which was the first alternative, a kind of niche market consisting of cellular phone plastics manufacturers. Although the technology solution was trimmer with Perlos the Machine Vision System Firm would need a distributor outside EU-area to care of customers after the implementation. Value chain position necessitated direct contact with end-customer. The cost structure and target margins were quite well-known and probability for a profitable business existed. Competitive strategy was grounded on product differentiation.

The second was selling XYZ Vision manager system packages including the software, camera and illumination without object handling following OEM⁹-logic for system integrator. This option included also software licensing. The third option was delivering the full system, an on-line system, following the system integrators specifications. Considering value proposition this choice left out the Machine Vision System Firm to do the feasibility study job and therefore minimized technology risk embedded on non-articulated requirements arising from end-users' operation and management circumstances. Market segmentation considered mostly the global factory automation and telecom electronics system integrators of world class customers. Distribution channel was the partner itself. The case firm has to arrange appropriate product management and sales support for partners. In the case of software licensing, the licensor, the Machine Vision System Firm, delivered only the software and training for the licensee.

Financials (P&L-figures and Balance changes)

The drop of the revenue from 1 million € down to 418 k€ in 2006 was a tremendous collapse. The Machine Vision System Firm made some cost cuts. The personnel costs decreased from 475 k€ to 311 k€ which was more cosmetics than reality because the firm allocated personnel salary costs of ongoing R&D activities, some 208 k€ of, into capital expenses. Another attempt was realisation of the obsolete current assets.

⁹ An original equipment manufacturer, or OEM is typically a company that uses a component made by a second company in its own product, or sells the product of the second company under its own brand [Wikipedia].

The number of permanent employees stayed same, 10. Obviously, the board of directors and owners had a strong belief on quick recovery because the reorganisation measures executed were rather mild and in the end of 2006 started Salo's unit with 7 new employees plus a new CEO. Following the negative net income, -175 k€ the case firm needed new capital during 2006 and more in the following years, in total nearly 900 k€.

In 2007 new customers brought income of almost 500 k€ consisting almost entirely of Tampere unit's customer projects. The role of Salo transformed more on project organisation rather than a true business unit as planned. Still the consolidated result was negative, -323 k€, increasing the case firm's despair. The firm booked 205 k€ of personnel salaries tied in R&D activities into capital expenses.

Cash flow

During the 2006 the Machine Vision System Firm needed new money some 650 k€ to avoid a liquidity bankruptcy what was threatening due to excessive cost compared with the income and R&D spendings. The cash flow from operations was -361 k€ and added with financing costs the cash flow was in total -380 k€ which is the net result corrected with depreciations. Still, the firm needed to cover capital expenses of some 200 k€ for R&D and 70 k€ in order to cover Salo's salaries both present in balance sheet. On the other hand the value of current assets decreased by 134 k€ which was probably more a speculative change than an actual cash flow transaction. To fill this gap the business angel settled a subordinated loan of 310 k€ and TEKES, Finnvera and Nordea bank granted loans all together 550 k€. Obviously the Firm was ought to use its own cash reserves.

The next year, 2007, was even worse than 2006 although the revenue growth was 20 % and gross profit doubled due to declined material costs due to the current asset realisation project. Still, the net result was -324 k€ including depreciations of 80 k€. Hence, the cash flow from operations together with remarkably increased financing costs (78k€) totalled 264 k€. The change in balance sheet value of capital considered ca. 205 k€ for new R&D activities, capitalisation of Salo unit by 105 k€ and an increase in accounts payables, 152 k€ totalling 530 k€.

The Machine Vision System Firm raised its private equity following a share issue directed to existing shareholders and a new VCF by 100 k€ in the beginning of 2007. Later in autumn 2007 business angel settled a loan, 657 k€, originally meant to be a convertible bond as explained in next subchapter. Business angel had allocated some 300-400 k€ until 2006 and hold now roughly 1.1 million € money either in form of equity, subordinated loans or debts.

Table of financial figures

Year	2006	2007 consolid	2008 consolid
Revenue	418.0	493.6	520.0
Gross profit	213.8	466.5	123.0
Gross profit %	47 %	95 %	22 %
Income from operations (EBIDTA)	-361.9	-167.0	-310.0
EBITDA %	-27 %	-34 %	-56 %
Profit/loss after taxes	-415.1	-323.7	-365.2
Profit/loss -%	-42 %	-66 %	-70 %

Ownership management and governance

In the end of 2006 the business angel had raised his portion of the shares from 17.9 % into 43.7 % whereas Founder-CEO owned now 41.9 %, corporate financing specialist together with his affiliated companies 11.1%, the banking firm (former) CEO and key personnel, 1 % of the shared in total, 23872.

A new partner, called here the new VCF Ltd, was contacted first time in 2005 as a potential channel partner for SER-solution, a waste material sorting fulfilled by a machine vision technology. Later there were even talks of a joint venture firm. Although SER-business didn't grow a big success, the new VCF became in the beginning of 2007 a partner due to a share issue. Obviously, the newcomer offered goodwill value consisting of the advisory for penetrating new markets and experience in fostering growth businesses.

After the share issues directed to The new VCF and existing owners executed in the beginning of 2007 the number of shares in total was 71257 wherein business angel owned now 46.7 %, Founder-CEO 28.1 %, Corporate financing expert, 11.2 %, The new VCF 12.6 % and others 1.4 %.

The board of directors formed now of Business angel, Corporate financing expert, Founder-CEO and The new VCF.

New venture capital for service inspection business

Business angel paved his way of becoming into a more centric role for the case firm. Not only the increase of his relative share of firm's ownership and investments but also the eagerness of operating through his other technology companies strengthened his position to control the Machine Vision System Firm. Namely, ABC Ltd, a business angel's fully owned small SME in the field of electronics, signed a technology supply contract with the Machine Vision System Firm considering certain sub-assemblies used in the XYZ 500 inspection systems in 2006. The value of the contract was 270 k€ allocated for the period 2006-2007.

One interesting episode was the attempt of raising capital for the nascent inspection service business concept. The concept as said was a TCO-model. As an evidence, the Machine Vision System Firm advertised this new service offering to discharge customers own support needed

running inspection systems. A business plan was present for investors and the Firm got a term sheet, an investment proposal, from Teollisuussijoitus Ltd. The board of directors, especially echoed by business angel, finally rejected it in summer 2007. Instead, the business angel made his own proposal in terms of bond with warrants (convertible bond) of 997.5 k€ in maximum. The conversion rate was rather low 2.1€ per share and maximum number of shares converted was restricted up to 475000¹⁰ which would have been raised his relative share round 92% and even by the realised bond, 657 k€ he would catch up 90 %.¹¹

Business angel's soloist behaviour evoked dissatisfactory attitudes among the other owners. Due to the vagueness involved in the convertible bond preparation work done mostly by one of the owners, the corporate financing specialist quitted the board of directors working in the end of 2007. Later in the 2008 the bond agreement was disputed by auditors and thereof considered among liabilities in balance sheet. Onwards the power equilibrium (voimatasapaino) was a game of the business angel and CEO.

In the end of 2006 the Machine Vision System Firm was formed of two business units, a small size consolidated company. Preparation work of creating the Machine Vision System group was minimal and some essential questions have not been discussed in details. Primarily Salo was intended taking a business unit role in owners' plans but it turned out to be a nondependent part of the parent company. This was due to reasons like unclear transfer pricing and unarticulated relationship between two CEOs embedding mistrust but most of the unsuccessful Nokia deal shrinking the Salo unit's importance in its first year of activity. After all, the problems were resolved when the founder-CEO from Tampere unit was nominated as CEO of the Salo unit and Salo CEO, now former, as a chief technology officer.

In founding of Salo unit the Tampere unit took a 55 % share of Salo the rest belonging to new Salo unit's CEO. Later Tampere took a full ownership of Salo when Salo CEO converted his shares to parental unit's shares in Sept 2007 owning now round 3 % of the Machine Vision System Group.

Key competences - Board of Directors, Personnel & Shareholders

The Machine Vision System Firm succeeded in integrating new key competences related with customer relationship management. In 2006 the Firm's board of directors was vitalised by a newcomer, the new VCF, which possessed a substantially large contact network. It had for example a close relationship with Nokia's top directors a fundamental piece in the puzzle of

¹⁰ Author passes here the more detailed technique like applying coupons etc..

¹¹ Following Finnish law the business angel would have been forced to buy the rest of shares whilst exceeding the 90% of ownership.

gaining the earlier discussed Nokia deal. The new VCF brought also a good deal of management practises within international sales and project management.

A second major change in regard of the key competences was the build-up of a software engineering team which, in fact, created a foundation for the Machine Vision System Firm's own software development. It seemed out that the Firm couldn't engage high level software development gurus before the decline of business which influenced on unmanaged software production disciplines. Behind the curtain war especially the principal owner's reluctance, the business angel's, will to hold on a share issue for personnel incentive purpose other than executed in early years 1999-2000 before his join into the Machine Vision System Firm's owners. In certain degree the Firm suffered change of talented persons in software function's key roles.

Due to the establishment of Salo unit the Machine Vision System Firm acquired project management and testing automation skills (the project team), sourcing and supplier management competences (one seasoned person) trained in Nokia cluster and sure electronics industry specific business logic knowledge (the Salo unit's leader).

2Q2008 – 1Q2009 - DOWNSIZING AND DRIFTING TOWARDS INSOLVENCY

The period from March-April until Feb 2009 was dominated by surviving. Like in a domino pieces in a row, a sweep of one piece causes the others collapsing, the Machine Vision System Firm businesses drifted also into insolvency in March 2009. The approval of a business and debts rearrangement plan in the court Dec 2008 could have been brought a new life for the Firm whereas the diminishing income ruined the business. The near future plan encompasses continuing on ground of the new owners and new company.

Intended growth

the Machine Vision System Firm's balance of costs and income following a net result zero analysis pointed a need of 1,3 million € revenue instead of the realised 0.5 million € in 2007 to bear the existing cost structure of variable and fixed costs, the latter consisting mainly of the personnel costs. Assessed reversely, staying on a level of the prevailing revenue level, 500 k€, the Firm would need a cost cutting of 580 k€ in order to fill the financing gap consisting of the negative net result, 323 k€ and R&D expenses related solely of labour costs, 254 k€, to ensure zero level.

A vigorous attempt for rescuing the business began in June-July 2008. The starting point for the rehabilitation process was that the Machine Vision System Firm had an intolerable amount of debts and was declining towards bankruptcy. Business angel was, wisely, unwilling to finance the Machine Vision System Firm anymore and the board of director working was more nominal than a real work.

A new intended strategy, in fact, a turn around plan focusing on preserving the valuable sides of the Machine Vision System Firm was outlined in the end of June by a crisis team, founder-CEO and the restructuring consultant supported by the owners' opinions. The plan embodied three main aspects, sales volume increase, cost cutting, and rearranging debts.

A hopeful estimate between these two zero analyses expected 0.8-0.9 million € revenue based on the Albea project's income and other prospective customer projects and partnership relations initiated since 2007. Albea's project constituted the major business effort and represented 450 k€ income during 2008, as discussed later on more details.

In order to ensure a zero net result, the target for the last quarter in 2008, the fixed costs should have been pressed down to 500-540 k€ what was estimated following the Machine Vision System Firm's cost structure embodying roughly 38 % of variable costs of the revenue. In turn, the fixed costs were controlled dividing them into two categories, burn-rate¹² and other business operation¹³ costs wherein the first stand for the monthly based obligatory payments and the second occasional fixed costs.

The cost cutting actions comprised the shutdown of Salo unit, decrease of the headcount in Tampere, reorganising interests, rescheduling the payback of the supplier's short term debts and decreasing other fixed costs. This program had an effect since late September 2008. Measured by the sunk costs, called also a burn rate consisting of obligatory fixed costs, decreased in the first half of 2008 from the level of 70 k€ down to 35 k€ and even more to 30 k€ in the beginning of 2009.

The rehabilitation of the Machine Vision System Firm's businesses depended not only on redirecting the Firm as a profitable company but also restructuring the incurred debts in total of 2.65 million €, dividing into 2.1 million € of Tampere and the rest coming from the Salo unit.

Realised growth

Continuous cash flow problems eased by Finnvera and the business angel.

Since 2006 the Machine Vision System Firm had gone for mainly on borrowing money whereas the private equity was in a minor role. Therefore there was an increase of long term and short term debts of the total value of debts 2.6 million €.

¹² included personnel related costs, facilities (office, datacom services), services (cleaning,...). Financing costs are excluded.

¹³ including both fluctuating (e.g. travelling expenses) and occasional costs like sales promotion and non-regular services.

The strengthening of cashflow began with restructuring short and long term debts. The unsettled balance of short term debts included suppliers' and tax and insurance authorities' payables what was in total some 320 k€¹⁴ regarding Tampere and together with Salo round 500 k€. Due the delayed payments any of the creditors consisting of the Machine Vision System Firm's loan holders, suppliers, tax and insurance authorities, in total some 40, would dispute the debts and engender a lawsuit in court proceeding finally until filing of a bankruptcy for the Firm. Therefore, negotiating a six to eight months period for relaxing temporally the pressures in respect of debt collection and interest payments giving time for balancing costs with income was among the first actions.

Accordingly, settling the new payment schedules with suppliers and authorities and yet running negotiations with creditor in respect of freezing temporally debt repayments and decreasing interest rates were the first actions. Unfortunately, this effort met resistance on behalf of a couple of the suppliers and, in general, the relaxing period turned out to be too short, only some 2 – 4 months excluding some exceptions. Luckily, debtors delayed their collection measures during June-August whereas they undoubtedly demanded paying cash this in turn effecting negatively in the firm's cashflow.

A new attempt of enforcing financial capital structure and way to global markets

The Machine Vision System Firm required desperately new equity to cover the continuously decreasing capital in the balance sheet that was due to the successive negative results since 2006. Negotiations with a European Automation Company were revamped in June-August on ground of the anterior offer received in March -08. Yet, discussing on trading Salo unit instead of share issue of 51 % of total share of whole firm were carried on between parties since it turned out that a shareholder status would not possibly be in the highest rank in a European Automation Company's considerations.

A European Automation Company was welcomed not only on account of a financial remedy but also due to providing a distribution channel, a customer basis extension, bringing industry specific experience and a global contact network for supporting the Machine Vision System Firm's new business recognition. In fact, the capital investment included rather strict conditions such as cutting long term debts¹⁵ and only a minor down payment.

¹⁴ Figures in the end of 2008.

¹⁵ This was a bit more complex debate among owners and main debt holders, especially with the business angel a debt and shareholder, how to compensate a cost cutting or preferably a conversion of BA's loans to capital. The most prominent solution was compensating by shares and thus changing the relative share between existing the shareholders.

A European Automation Company was not the only investors contacted. Some ten candidates consisting of VC investors, two of them in Germany, and industrial players, one of them competitor, were contacted with no major success. The Machine Vision System Firm's poor economical status was too frightening.

In turn, a European Automation Company, look over the poor P&L and balance sheet figures and continued the negotiations with the Machine Vision System Firm. This Belgian company intended strengthening its presence Nordic and Baltic area and saw a proper opportunity to establish a true country organisation in Finland and in Salo was Nokia attracting telecom service providers to come over there.

Finally, a very modest conclusion was finalised because of a European Automation Company was now more prudent allocate its financial resources rather than a year ago. It suggested only a few recruitments from the firm's Salo unit and sharing the costs incurring of holding an office in Salo. Yet, the forecasts in summer 2008 pointed declined increase in the cellular phone market demand, subcontractors and other facility providers in telecom sector deferred their investments decisions.

For the Firm the new deal with a European Automation Company was a tiny money instead of trading a business unit or the firm that would have solve the troublesome situation quickly.

The Machine Vision System Firm was overmanned and lacked of customer projects in 2006-2008. Albea GmbH was contacted as early as in 2005 and now three years later this German plastics manufacturer, a part of automotive supply chain via Preh GmbH until BMW Plc, the famous Bavarian car manufacturer, was captured by the Machine Vision System Firm. The contract of delivering four XYZ 500 units was signed in late spring 2008.

At first, Albea preferred local suppliers and contacted the Machine Vision System Firm after a long run when it turned out that Germans cannot provide a feasible machine vision solution. In turn, due to the delayed vendor selection process Albea set a very tight time schedule for the case firm here and four XYZ 500 unit's assembly work was done on Albea's site! Still, the whole project embodied a good deal of product development work, because no prior solutions were delivered (see Technology). And last but not least, the project personnel had been promised summer vacation during July-August which was now partly cancelled due the project. Although the whole project was full of risks from the design stage along the assembly phase to the implementation stage the Machine Vision System Firm was compelled taking the project or otherwise close the firm. Therefore, new income, the contract worth of 450 k€, was welcome to the case firm here.

The co-operation among parties was from time to time painful because Albea was a very demanding customer. In practise, the whole project was an establishment of new plastic manufacturing production lines featured with the Machine Vision System Firm's technology on Albea's site. The quality assurance tests and production capacity trials held by formed the gates for proceeding to the next phase in project. Accordingly, the payments for the Firm were triggered with Albea's successful passing through gates.

The co-operation of Albea and Preh seemed troublesome and meeting the Preh's requirements was tough effort for Albea. Yet, this was reflected to payment schedule towards the Machine

Vision System Firm. Payments were delayed and disputed. Albea utilised the loopholes left in contract unscrupulously for its own benefit. In September -08 Albea made a financial restructuring and sold its production machines to Suedeasing, a financing company in Germany.

Finally, the Albea drifted into troublesome situation in insolvency in Feb 2009.

Salo's unit trading attempts

The skinny deal with a European Automation Company was less than pursued and the remedies such as ownership based co-operation between parties were not captured. Anyhow the nascent partnership was promising sales prospects those raised on table within the negotiations in June-July. Unfortunately, the expected a European Automation Company boosted sales revenue increase turned out to cover only one materialised prospect during 2008 which impacted on cashflow only by tens of thousand euros. Despite of the delayed schedule of concrete steps, the Machine Vision System Firm relied on building distribution channel and customer basis with a European Automation Company so far. On the other hand, the highly desired other assets, financial capital and new owners strengthening the board of directors working were to be found elsewhere among other industrial players, now, feasible with a European Automation Company as a new prerequisite.

The board of directors permitted the crisis team, Founder CEO and Restructuring consultant, to contact potential buyers for the Firm's operations as such or only Salo operations. In fact, this was a continued negotiation process among the earlier contacted Finnish industrial companies limited now on companies matching together with a European Automation Company. The attempts of trading Salo or a particular combination of the Machine Vision System Firm's business operations ended in the beginning of September 2008.

The inconclusive endeavour of finding new investor and difficulties with the cash balance (see the subchapter, Cashflow) forced the board of directors, authorised by shareholders, to close Salo. In theory, Salo unit could have been absorbed into the parental company in Tampere which would have meant transferring debts as well. In any case this would have been a new nail into the Tampere unit's coffin. Instead of absorbing, the Machine Vision System Firm decided to shutdown Salo unit and let part of the employees to go. In 10th September the board of directors filed of a bankruptcy application in the court in Salo approved two days later.

Filing of the restructuring application – shelter against debtors and immediate bankruptcy

The severe cash management problems (discussed more in subchapter, Financials) afflicted The Machine Vision System Firm, especially in August and early September when the planned cost cutting were not yet in effect, the temporal cash balance increase in terms was spent for Albea project's material and personnel costs and Albea payment schedule was arbitrary. As the realised proceeding of the turn around process was weaker than planned in June 2008, consequently the remedies were more painful than considered at first. The closing of Salo unit was not anymore an option but a mandatory measure. Moreover, in September 2008 the rest of the Firm in Tampere needed protection against bankruptcy as there were some suppliers and insurance authorities claiming for the lack of obedience in respect of the

debt collection schedules included in the temporal relaxing agreements confirmed in June-early July (2008). In fact, the Machine Vision System Firm was temporally insolvent and paralysed to care any of its financial liabilities.

Therefore, the Machine Vision System Firm filed of a restructuring application¹⁶ to become pending in 16.9.2008 in court. The proceeding of a restructuring is roughly a three stage process. The first is the pending of restructuring application stage. Then, the second stage comprises planning of the detailed restructuring programme among the debtor and creditors commencing after approving the application in a court. The third is the implementation of the restructuring programme plan after the enforcement in court. In fact, no firm can wait until the confirmation of the restructuring plan but the rehabilitation or as expressed here, turn around process, is activated gradually when preparing the restructuring application as did in this case.

Consequently, the Machine Vision System Firm debt collection measures on behalf of the creditors were relaxed until approval of the application. The application for the restructuring included a documentation of the carried and planned further measures such as mastering a new business concept, cost cutting program including the closing Salo's subsidiary, restructuring the ownership and financing structure and it was approved in Dec. The key issue for receiving the positive result in court was the letter of intent document signed by the Machine Vision System Firm's shareholders. In fact, the paper was a preliminary contract embodying the guidelines of the aimed new shareholder contract. The contents of the document considered a plan of reorganising assets and liabilities. The main points were increasing the Firm's financial capital by converting business angel's loans into capital compensated by a relative increase of shares up to 43 % and, secondly, assigning The new VCF to take the leading role by 51 % of total shares.

The contract proposal necessitated the new VCF to bear all the business risks, strengthen cash balance and summon up a new board of directors capable to enforce the Machine Vision System Firm's recovery and new growth.

All the other building blocks rather than capturing new customer projects were in place in the end of 2008 after the approval of the restructuring application in court. The cash balance was still poor and despite of promises, the new VCF allocated no working capital to cover instant payments now obliged settling as the restructuring was in progress. However, the main reason for the wreck of the legalised restructuring proceeding the Machine Vision System Firm's main customer, Albea. After retarding payments to the Firm during the end of 2008 since

¹⁶ Restructuring proceedings may be undertaken in order to rehabilitate a distressed debtor's viable business, to ensure its continued viability and to achieve debt arrangements. In the proceedings, a court may approve a restructuring programme with instructions regarding measures on the activities, assets and liabilities of the debtor, as provided in this Act [Finnish law of restructuring of enterprises act 247/2007]

August, Albea drifted also in insolvency in Feb 2009 due to the production quality problems and global recession effecting significantly on automotive industry.

Albea's diving towards a cash crisis influenced the foundation of continuing the the Machine Vision System Firm rehabilitation following the legalised restructuring proceeding to collapse and it was interrupted 25th February 2009 by court's decision.

The new VCF co-operation took place during autumn 2008 as it was eager to establish a small size IT-business group consisting of re-directed the Machine Vision System Firm's businesses and a one other firm possessing technology easy to create synergy with machine vision technology.

The transfer of the viable sides of the Firm's businesses for the new VCF were initiated in the end of 2008 and the first customer project signed with the name of a successor firm for the Machine Vision System Firm, DEF Ltd realised in Dec. 2008. The destiny of the Machine Vision System Firm's tangible and intellectual property is still open and will be cleared in terms an insolvency suit undertaken in April 2009. Besides debts, the Firm possesses a valuable property for continuing a viable business. The intangible assets embody customer relationships, sales lead and prospects, application related machine vision knowhow for divergent customer solutions, insightful market knowledge, competitor and machine vision industry knowledge, immaterial property rights related with software, technology related competences, and the sophisticated product form the value of firm which is very likely to be sold for the interested buyers during spring 2009 thus securing a new life for feasible technology.

Refreshing what was earlier mentioned, the Machine Vision System Firm has still a solid competitive advantage involved in technology offerings as witnessed by a citation of the production manager and project prime contact person from Albea, *"after making a search among German machine vision system suppliers I'm convinced of the Machine Vision System Firm's technology's superiority to build flexible, versatile systems with a quick cycle rate"*.

Business model

The intended strategy in 2006-07 embodied two business models wherein the offerings would be the same as spoken, quality inspection solution for increasing production yield and decreasing inspection costs.

The intended, a second, business model was related with highly standardised solutions delivered following the capacity rental or the more comprehensive total cost ownership concept. In turn, this necessitated a long relationship with big companies capable to order multiple systems, like Nokia or RIM or like the IMD-inspection, a niche market available among telecom subcontractors, located mostly in China. Obviously, the Machine Vision System Firm estimated the big customers act as well as a distribution channel like Perlos did when it allocated own resources in implementation process. However, this business model never took off either does the two adaptations from the standard product business, license and OEM-sales.

The main business model, a solution business model, was based on customer problem solving with the Machine Vision System Firm's competences and the XYZ 500 technology platform. Targeted customers were in a distance of round 2-8 eight hours flight trip from Finland, in practise in EU-area, probably Russian market captured later on. Target price and cost structure was calculated following the cost-plus principle, adding the desired margin on top of the turn key delivery project costs. Distribution was managed by own personnel and facilities conducted from Tampere.

During 2008 the solution business model encountered minor changes when the Machine Vision System Firm had an extending delivery base of XYZ 500 systems was gradually extending. The offering for customers was still the higher yield and lower inspection cost. Nevertheless, customers expected more understanding of their production as the system were more complicated and versatile enabling functions not present earlier in the Firm's deliveries.

Later on, in autumn 2008, the solution business model was challenged due to loss of experts in Salo who were a half of the project implementation force. Accordingly the business model was now simplified as the target market shifted towards smaller solution entities, on-demand tailored camera-illumination-inspection software packages constructed in-line. In order to preserve XYZ 500 platform business, hopes were put on a European Automation Company partnership.

Financials (P&L-figures and Balance changes)

Revenue, cost structure and balance sheet changes

The profit&loss figure during 2008 was -510 k€ considering Tampere and together with Salo, -928 k€. The beginning of the year until May was hard since no major projects were running. The Albea project, a total value of 450 k€, was in effect since June 2008 and lasted to the next year, until collapse of Albea. The Machine Vision System Firm succeeded to capture roughly the half of that money. The biggest cost factors were material costs, personnel costs and travelling costs as stated in the table next here.

Table: The consolidated financial statement 2007-2008 ¹⁷ of units of Salo and Tampere.

	2007 ZET S	2007 ZET A	2007 consolid	2008 Tre	2008 Salo	2008 consolid
Sales revenue	470,0	23,6	493,6	450,0	50,0	500,0
Variable costs	-92,0	-43,5	-135,5	-202,0	-150,0	-352,0
Gross margin	401,9	64,6	466,5	248,0	-100,0	148,0
Personell costs (fixed+var)	-206,6	-110,4	-317,0	-340,0	-208,3	-548,3
Other oper.charges	-263,1	-53,4	-316,5	-284,0	-50,0	-334,0
Depreciation	-71,4	-7,8	-79,2	-64,0	-40,0	-104,0
Finance expenses	-62,8	-14,7	-77,5	-70,0	-20,0	-90,0
Profit(loss) for the year	-202,0	-121,7	-323,7	-510,0	-418,3	-928,3

The main reason for the underachievement of the estimated revenue of 800-900 k€, created in June 2008, 800-900 k€, was the Albea project's collapse together with the delayed payment schedule. Also, the global recession influenced in shifting, or cancelling customers' investment decisions.

During 2008 the Tampere unit incurred negative cash flow of 630 k€, wherein the cash flow from operations constituted 446 k€ and investments 166 k€.

The change of non-current asset included no new R&D expenses but only new expenses (166 k€) incurring in Salo's payroll and project material costs financed by the Machine Vision System Firm Tampere. So, the need of new capital was 630 k€ which is the adjusted value on the ground of the balance sheet figures present in table next here.

Until end of May 2008 the capitalising of Tampere unit operations constituted on a minor revenue, 100 k€, Finnvera's new loan (90 k€) and business angel's financing of some 300 k€ which was the rest of the disputed bond issued in the end of 2007.

After beginning of the turn around proceeding in June 2008, the Machine Vision System Firm raised yet some financing but now against Albea project payments as securities. Business angel allocated 100 k€ for securing a bank guarantees demanded for, in turn, securing the first payments from Albea to the case firm here. This was because of Albea didn't accept delivered systems as real securities. Also Finnvera lent 108 k€ for increasing working capital which was paid back in half. Moreover, the Machine Vision System Firm was credited also by suppliers while their trade creditors had increased during 12 months, Dec. 2007 – Dec. 2007 from 34 k€ to 290 k€. Other creditors were employees, the insurance and tax authorities and the credit card companies, in total of 150 k€.

In turn, Salo unit made loss of -438 k€ and the needed additional financing was some 400 k€. Losses were covered by Tampere unit's subordinated loan (170 k€), Finnvera and Tekes loans until the beginning of September 2008 when the unit was shutdown.

¹⁷ Figures in 2008 of Salo considering personnel costs and depreciations are approximations within a margin of error of +/- 10%

In the end of August 2008 the gap between the initial turn around plan cashflow estimate and the actual cashflow situation was four weeks, in cash some 80-100 k€. Moreover, the cost cutting plan was in effect since beginning of September and in September the Tampere unit was temporally insolvent. Although Albea's behaviour was arbitrary it accepted settling prepayments for financing project workforce actual costs in advance thus enabling travelling and salaries paid for employees.

However, on the insurance and tax authorities and supplier's side the pressure became too hard tolerate anymore and the Machine Vision System Firm filed of a restructuring application in September 2009 which obliged the Firm to balance its costs and income. Yet, the unbalance remained and the Firm incurred minor new debts, round 15-20 k€ per month, since September ahead, however, the application was approved in court in Dec. 2008 on ground of future sales prospects, letter of intent of shareholders for the new structure of the Machine Vision System Firm's businesses and the main creditors common will to save the Firm. Unfortunately, the future prospects and especially receiving payments from Albea turned out troublesome on the reasons explained earlier, the case firm here eventually loosed it working order in the end of Feb. 2009.

Table: Balance sheet of 2008

	2008	1.1.-10.9.2008		2008		
	Tre (abs)	Tre(+/-)	Salo (abs)	Salo(+/-)	Consol.	Consol(+/-)
ASSETS						
Subtotal- Non-current assets	895	166	417		1312	166
Subtotal- Current assets	464	-127	85	-22	549	-149
TOTAL - ASSETS	1359	39	502	-22	1861	17
LIABILITES						
Subtotal -Capital&reserves	-350	-509	-534	-566	-884	-1075
Subtotal - Long term creditors	1023	95	735	376	1758	471
Trade credits (short term debts)	290	234	60	28	350	262
Other short term creditors	366	189	70	-31	436	158
Subtotal - Short term creditors	656	423	130	-3	786	420
TOTAL - LIABILITES	1329	9	331	-193	1660	-184

Ownership management

In the beginning of June 2008 the Machine Vision System Firm Tampere owned fully (100 %) Salo unit and the relative share of ownership of the Machine Vision System Firm Tampere were business angel, 46.7 %, Founder-CEO 28.1 %, Corporate financing expert, 11.2 %, the new VCF 12.6 % and others 1.4 % of the total shares, round 73 000 that was the same as mentioned in the previous section.

The aimed restructuring would have been changed the power setting so that the new VCF would have become the major owner by 51 %, business angel 43 %, Founder-CEO 3% and the rest holding micro ownerships. However, the new structure offered no real gains for the existing major shareholders, Founder-CEO and Business angel, but scarcity.

The incentives still remained, at least in a certain degree. A substantially high share for business angel would offer him an exit opportunity within 2-3 years compensating therefore

the losses. Instead of the Machine Vision System Firm's shares, the Founder-CEO's incentives were founded on continuing the business and building a new position within the new VCF's IT-businesses.

Finally, the restructuring never actualised and a new deal of ownership will take place along the Machine Vision System Firm's insolvency in court during spring 2009.

Key competences - Board of directors, Personnel & Shareholders

The board of directors consisted of Founder-CEO, Business angel and the new VCF. The working was formal and occasional. As spoken, Business angel's thoughts were directed elsewhere since the growth path of the Machine Vision System Firm was something else than his expectations of 3 million € revenue by 2008.

Since commencing the turn around proceedings in June-July, a supportive advisory, a crisis team, was formed of the Finnvera's representatives, a major creditor for the Machine Vision System Firm, and the Restructuring consultant, the author of this dissertation. At first, the mission was creating a foundation was re-capitalising the Machine Vision System Firm, later added the formal restructuring proceeding in court.

During the period Oct. 2006, since the establishment of Salo unit, until August 2008, the Machine Vision System-group, two units employed at maximum round 19 persons, one of them a sales agent in Germany, divided into project engineering, product development embodying software engineering and machine vision specific engineering sales and marketing and management. Other duties such as sourcing, operations management and product management were shared responsibilities among two to three persons. Customer care and after-sales responsibilities, typical of similar companies, were not exposed significantly.

In September 2008 the whole personnel of the Firm's unit in Salo was resigned and also three persons left Tampere Unit. The Machine Vision System Firm's working order and reliability of delivery was barely saved by capturing a couple of experts in the Tampere unit's payroll. Following the Tampere unit restructuring program in the end of 2008 company had seven workers one of them a new recruitment in Germany, a Finnish engineer supporting locally customers.

The cash problems reflected on salary payments. Earlier along the deepening cash crisis in spring 2008 the suppliers were flexible to tolerate the Machine Vision System Firm's unsettled payments whereas after the filing date of filing of restructuring, 16.9.2008, they would cause an interruption for the restructuring proceeding in court by claiming against unpaid receivables. Nevertheless, the Machine Vision System Firm incurred continuously slightly new debts. The weakest link in chain instead of suppliers was personnel whose resilience lasted until the end of Feb 2009, partly because of the governmental guaranteeing system.

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APPENDIX 2 – TAXONOMY OF THE INTELLECTUAL RESOURCES OF CASE FIRMS – (WITH CODING)

STRATEGY RELATED		OPERATIONS RELATED		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
PRODUCT AND TECHNOLOGY ORIENTATED ACTIVITIES						
OPPORTUNITY RECOGNITION AND RESEARCH ACTIVITIES						
		Industry foresight & technology trend monitoring		HC	1	
F02			Co-researching	HC	1	No systematic analysis Loose timetables, waiting times due to University's restricted capacity (when using their assembly + other services)
All			Anticipating unarticulated customer/ market driven product features Innovating new ideas for customers (value-added manufacturing)	HC	1	
PRODUCT DEVELOPMENT						
F11			Carrying own research activities	StOC+ HC	1	1) Scarification resources for a non-profitable work probably entailing income in future. 2) Get stuck on research activities leading not towards a commercial products Guided more by the own observations than by systemic analysis on market
F02	Product roadmap		Generating new lead products	StOC	4	Credibility problem, "a small firm cannot be reliable"-thinking prevailed.
F01			Accomplishing new product improvements - ADD ONS	StOC	3	Fulfilling customer projects' delayed/emerging new-ex post requirements they will certainly inflict on profitability negatively.
F02			Accomplishing customer specified new product improvements	StOC	2	Version management and the risk of developing one-time solutions; Lock-in to a certain customers/ their solutions dictates to much the technology development activities
F03			Rapid product development capability	StOC	3-4	
X?		Product data management		StOC	3	
F01 Application F02 analysis			Developing feasible products for other application purposes	StOC	4	Threat of dispersing
F03			Accelerating time-to-market cycle of a new product	StOC	3-4	
F03	Establishing a joint R & D management operation model with key customers			StOC	4-5	
PRODUCT MANAGEMENT (initial to full scale)						
F03			Productising	SC	2	Need of an babysitting and delay in the project implementation due new features
F01			Joint product development activities with customers	StOC	2-3	
F02			Solving customer problem by a new version or by changing customer's opinion	StOC	2	Provider will get a "weak" supplier status who follows customers' opinions (works in certain circumstances but not in a long run)
F03			Scalable manufacturing from production of components to sub-assemblies	StOC	5	
PRODUCT MANAGEMENT STAGEY VIEW						
	Product lifecycle management			ALL	3	The software version management required a more systematic methodology
F02 co-operation	Contracting with partner			ALL		Threat of abusing (hwäksikäyttö)
F02 profitability F03 analysis		Developing a rule for a continuous terminating unprofitable products		ALL		A certain products bearing some strategic importance would cause conflict situations between product and sales responsables.
F03			Capability to do co-production activities with customers	8ReAl	2	

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
SOURCING (incl. SUPPLY WEB MANAGEMENT)						
F03		Searching new cost-efficient raw materials and items and utilities		RC	1	
F01				RC	1-2	
F03		Selection of sub-contractors and key material suppliers		RC	3-4	
			Applying buying power	RC	4-5	Bargaining worked in certain cases, but due to the liquidity problems and firm size (small) no significant advantage was gained.
		Subcontractor selection		RC	2	
			Contracting with the companies subject to shareholder's power	RC	1-2	Non-tendered subcontracting
			External expertise contracting	RC	1-2	Experience and culture of outsourcing relatively low. Some trials within IT-area.
X		Ensuring critical supplier's delivery times		RC	3-4	On-demand deliveries from supplier would fail
F02		Ensuring availability of the critical components		RC	2-3	
F03			Cooperating with critical system/component suppliers	6RC HC	4-5 1	IC: e.g. Machine Vision Oy stored itself critical components -> not before expansion stage
IPR MANAGEMENT						
F02	Immaterial property management			HC		
F02 F11			Novelty study research for identifying opportunities of the new innovations	HC		
F02 F11			Freedom-to-operate study for identifying the occupied technology rights/ room for new patents	HC		
F02 F11			Filing of a patent application	HC		
F02	Management of (the costs of) a multi-national patent portfolio management			HC		
F02	Competence in defending patent rights			HC	2	
T			Licensing and applying other commercialisation methods	HC	2-4	

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
PRODUCTION						
PRODUCTION PROCESSES STREAMLINING						
	Managing contract manufacturing			5SC	2-	
F03				6RC		
F02		Analysing production process costs	Executing cost cutting/ continuous cost control	5SC		
F03			Cost efficient raw material selection	5SC		
F03			Cost efficient work method know-how	5SC		
F03			Developing automation	5SC		
F03			Co-production activities with customers	5SC		
			Simplifying work processes and eliminating non-productive work	5SC		
F03		Co-innovating more cost efficient production practises and machinery improvements with key customers		7SC or 3SC		
F03			Working on the customer's premises	7SC or 3SC		
F03	Establishing new production capacity/ unit for a new customer			7SC or 3SC		Learning new production technology and recruiting new people constitutes a potential risk
F03			Value added manufacturing involving product design	7SC or 3SC		
PRODUCTIVITY MANAGEMENT						
F03			Improving an operation cell (in production) functioning	SC	3-4	
F03			Implementing a productivity measurement system (p.57)	SC	3-4	
F03		Monitoring of work image and related content of work processes (p.57)		xSC		
PRODUCTION CAPACITY MANAGEMENT (basic + enhanced)						
F03			Capability of producing unique items	4SC	1	
F03		Capacity forecasting	Balancing capacity peaks	4SC		
F03			Flexible manufacturing system adoption (personnel, machines,..)			
F01 F03			Balancing season dependent and long run fluctuations of the production capacity changes			

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
SALES AND MARKETING ORIENTATED ACTIVITIES						
MARKET RESEARCH - DOMESTIC				RC/HC	1	
F02		Customer acquiring based on pull marketing strategy	Sales by CEO		1	No growth potential due to the size of market
MARKET RESEARCH - FOREIGN (Difference between the born global firms with service firm)				RC/HC	1/5	
		Main segments analysis (for new applications)			1/5	
	Collecting information related with			RC	1-2	
	SCM intelligence management			RC	4-5	
F01		Regional market-study			2	
F02		Competitor analysis			3	
F11		Sub segment analyses			2	
F11		Value chain analyses			3	
F11		Buyer behaviour analyses			1	Executed occasionally and non-systematically based on customer feed-back
F02		Market entry planning			1	
			Sales and channel partner search	RC	1	Closing the co-operation deal
			Establishing operations in foreign countries	ALL	5	
F01	Product pricing strategy					
F11						
F01	Competitor follow-up					SMEs do not follow systematically the competitors' pricings. A certain well-known means are most often used to spy competitor pricing
F02				RC	1/3	
MARKET COMMUNICATION AND BRAND MANAGEMENT						
F02		Market communication strategy and channel management (mix)			4	Balancing mix and following efficiency is based on CEO's experience (which is in most cases enough)
			Obeying a regular-basis marketing event schedule		4	
			Participating in exhibitions		1	
			Product brand management		4	No real branding
F01		Firm reputation and credibility			3-4	Loosing deals; wasting time for arranging securities
F02			Firm brand			
F03			Acquiring a quality management certificate (ISO 9001 & 14001 and kind)		2-3	
F03			Participating in the quality management competitions (e.g. Malcom Balbridge)		4	
MOVE ?? THE PRODUCT LAUNCH HERE						
F11			Conducting a new product launch		1	
F11			Conducting marketing material preparation		1	
F02		Creating a pull market strategy plan	Implementation and managing a pull marketing strategy (plan		3	The idea of a comprehensive pull marketing was not follow systematically but more like following a 80/20-rule

sales and marketing continues in next page

SALES AND MARKETING ORIENTATED ACTIVITIES						
STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
CUSTOMER ACQUIRING - selection and attracting			Push sales is dominant	RC	1-3	
T	Executing a stage-wise market-entry			RC	1	
F03			Convincing a targeted customer by a sound service concept (that it "rocks")	RC	2	
			A portfolio of services (richness) enabling to solve a particular customer problem in alternative ways	RC	3	Extending and maintaining a large service grid
F01 F03	Pursuing bigger customers in terms of global distributors partnering			RC	3-4	
SALES MANAGEMENT				RC/SC	(1)3-4	
F02 F11 19		Sales efficiency control		SC	3	
	Sales channel partner search			RC	3-4	Problems in capturing bigger players capable also for distributing
	Entry-market selection		Selecting/selling exclusively to familiar customer group	RC	1	At least researchers tend to sell to other research institutes that limited the market potential. A pro salesman was required when entering on the other markets
F02			Entering on US market	RC	3/5	Requires special experience and relations
F02			Entering on Asian market	RC	3/5	Requires special experience and relations
F02			Entering on French speaking EU-countries	RC	2/4	
F02			Export into the Russian market	RC	3/5	Learning delay when done self
			Sales lead generation management/system	SC	4-5	Domestic & Scandinavian market research gave poor results
			Customer analysis when selecting new	RC	3	1) The firm was pressured to take diverse customers with diversifying requirements -> potential profitability risk
F02	Extending sales rep network				2-3	Other countries would have needed a local partner not easily found.
F02			Sales support for sales partners (new ones)	RC	3	
F01 F02	Establishing a foreign sales agency			RC	3-4	SMEs stumble sometimes when establishing a foreign sales office. Typically the localisation fails somehow.
F02	Predator pricing/ price discrimination			RC	x	Gaining new customers, returning and competitors' customers
SALES - Tendering				RC	1	
			Sales	RC	1	Highly dependent on CEO
		Assessing the value that the offering entails to customer (pay-back calculation)	Analysis tool for evaluating customer investments	RC	3-4	
			Customer solution outlining/ Pre-engineering	RC	1	The work was unpaid
						1) Competition limited raising the pricing; 2) A lack of a comprehensive purchasing and stock management system set limitation for automating tendering
F01 F11			Tendering	RC	1	
			Preparedness for sales argumentation and negotiation skills	RC	1	Highly dependent on CEO
SALES - Contract management				SC	4	
		Managing project delivery's cash flow -> need for own contract templates		SC	4-5	A better consideration of cash balance fluctuations was not in the term of payments; other issues, see memo
		Technical specification (in sales contract)		SC	1	Feasibility studies would have mitigated the pricing risk for vendor and ensured the requirements met for the customer

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
CUSTOMER RELATIONSHIP MANAGEMENT ORIENTATED ACTIVITIES						
DELIVERY MANAGEMENT				RC	3	
F03			Delivery reliability		3	
F03			Just-in-time and need delivery management		3-4	
X		Developing an own project management guideline and contract template	Project's steering group working		4	Loopholes or "leakages" in the terms of delivery and technical specifications aroused due to buyer's bargaining power
			Project management		2	Bargaining power within managing the changes in the project scope
			Working hour cost follow-up		2	Resource and culture problems and a lack of proper tools
			Chargeability control		4	A lack of a proper system and discipline
			Project implementation		4	Ensuring agreed work to paid in contrary to the donated work
			Implementing a customer solution (delivery) in the co-managing manufacturing as a part of key customer production process stretching up to end customers		2	Customer took the project management role in certain cases
					x	Increased customer dependency
TECHNICAL & COMPETENCE CENTRE SERVICE; ACCOUNT MGT				RC	4 3	
F03		Competence centre service		RC	3-4	Lack of industry specific knowledge and thus anticipating customers' further requirements arising from production processes
X			Responding on customer problems	RC	1	"Exotic" solutions induced troublesome situation
			Account management	RC	4	Held by CEO
F02			Additional sales			
TECHNICAL SERVICE/ CLAIM HANDLING				RC	2	
F03			Collecting and processing customer claims	RC	4-5	
F03			Executing corrective actions due to claiming	RC		
CONTRACT MANUFACTURING/ CONTINUOUS PRODUCT AND SERVICE SALES				RC	1-5	
F03			Modifying products on request		1	
F01			Decreasing costs of delivered products (to customers)		2-3	
F03			Sharing production service (or any delivery related) cost and pricing information for a customer (high integration)		4	
F03			IT-system connectivity			
			Intensifying communication between key customer's production responsables	6RC		

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
CUSTOMER RELATIONSHIP MANAGEMENT (in project/solution business)						
				RC	(2)3-5	
F03	Investing in customer specific production capacity thus signalling high commitment			RC	4-5	
		Knowing customer decision making process and its complexities		RC	3	
F01 F02	Analysing of key or dominant principal customer behaviour			RC	3-4	Were not fully analysed. High growth expectations attracted F01.F02 to hang-up in a close relationship within a dominant customer
F01 F02 F03	Managing relationship with a dominant key customer or a few key customers			RC	2	Small companies are mostly clueless to manage a big-brother relationship. The relationship entails a risk of high dependency when the dominance is high
F03			Managing relationship with key customers by the delivery related factors like reliability, quality, timing, service	RC	4	
F01 F02	Relaxing customer's dominance position			RC	3	Threat of loosing the relationship with the big one
X F03 ?		Customer profitability analysis		RC	X	
F03	Customer profitability management			RC	4-5	
F03		Continuous customer satisfaction data collection	Customer satisfaction analysis and planning of corrective actions	RC	5	SMEs sometimes neglect this and very seldom this is executed appropriately
F03	Reaching a trustful and open partnership with customers			RC	4-5	At interdependent and integrated levels
F03	Open-book accounting			RC	5	
F03	Customer to supplier communication of strategic issues and major moves impacting on the			RC	4-5	
F03			Taking and carrying out a forerunner role in customer partnership relations	RC	5	
F03			Offering superior business intelligence and quality of operations than that possessed by the customer	RC	5	
	Working for the key customer's well-being			RC	3-4	

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
VALUE CHAIN RELATED ACTIVITIES				SC/RC		
DISTRIBUTION CHANNEL MANAGEMENT				SC/RC	3-5	
F02: F01: Channel strategy				SC/RC	2-3	Building channel mix necessitated to manage probable channel conflicts. The partners in value chain were mostly integrators, OEM-vendors, sales companies, industrial value adding firms (in the same industry), individual sales rep and own sales force
F02: F01: Analysing and anticipating changes in value chain(s)	Channel partner search			SC/RC	3	
F02: F01: Continuous monitoring (based on close relationship)				SC/RC	4-5	
F02: F01: Building co-operation with channel partners candidates					3-4	Rejecting offerings aiming at a close relationship necessitating sharing of ownership
F02: F01: Managing co-operation with channel partners					3-4	
F02: Building co-operation with a competitor					x	Imitation risk and losing of IC
F03: Implementing a new factory abroad					5	
INTERNAL LOGISTICS & MATERIAL FLOW				SC	3-4	
All			Inventory control			Occasional, not regular care of obsolete components; Inventories slow turnover time
All			Interim stocks (WIP)			Obsolete customer products and trial products
F03: F01: Raw material stock management						

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
COMPETITIVE STRATEGY RELATED ACTIVITIES						
LONG TERM STRATEGY				OC	1-5	
F03	Developing a feasible strategy management system for long and short term strategy planning purposes					
All	Strategy planning					High, sometimes unrealistic expectations; No formal methods
F03	Continuous growth					
F03	Implementing the long term strategy breaking it into sub-activities					Growth objectives were given but the means were left unarticulated Due to lack of proper channel partners ZET's resource were spread in diverse market operations
	Market strategy				HC	
F03; F01	Growing with customers					Ceasing the relationship may be disastrous for the supplier firm
All		New business case opportunity recognition				Dispersion of the customer requirements blurred the coherence of the business focus
F03	Preparing a strategic investment (landscape evaluation)					
F03	Analysing of a strategic investment -> corp. financing					
F03	Roll-out of a factory management concept in the bought company					
F02	Establishing and maintaining an emergency plan	Anticipating major changes (PESTE) in the business environment				Small firms very seldom do this kind of a plan
STRATEGIC INVESTMENT MANAGEMENT (after minor diversification)				SC	3-4	
F03; F01	Strategic investment planning					
All	Entering on new business areas (either new products/ services and/ or market area)				3-4	
F03	Handling the new site establishment projects		Managing strategic development projects			
F03		Developing feasible project management principles	Implementation of project management concept			
F03			Managing internal development projects of operations			
F01 F02		Customer project related small investments				Small investments included in a project's scope inflicted pressures on time schedules, allocating expertise in contrary to other customer's service
STRATEGIC ALLIANCES				SC/RC	4-5	
F03;another firm	Negotiating cross-ownership based alliance with another firm	Creating a joint-venture or a comparable ownership structure for strengthening alliance				

Competitive advantage related lines are continued in the next page

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
INTERNATIONALISATION AND LOCATION MANAGEMENT (True, not just the sales office)				SC/RC	4-5	
F03 Country specific business imperatives, major barriers and business culture in general						
F03	Adapting the business control and operation management concepts to meet the local requirements					
F03	The multisite company structure enables localising getting regional grants					
F03 Location selection for new sites and business operations	F03 Choosing the most fortunate locations to ensure profitability and compliance with strategy					
KEY CUSTOMER PARTNERSHIP MANAGEMENT				RC	5	
F03 Creating a development program for key customer relationship management	Implementation a partnership program (in long term)	Measuring the progress	Carrying corrective measures			F01 lacked of this when it mainly operated with technology and production people
ECONOMIES OF SCALE ADVANTAGE EXPLOITATION				SC	5	
F03	Capability to create internal value chain					
F03	Pooling of manufacturing resources					
F03	The multisite company structure enables balancing customer orders to be run in another site when necessary due to the capacity problems					
F03	The multisite company structure enables localising getting regional grants					
(TOTAL) QUALITY MANAGEMENT - including performance management				SC/RC	4	
F03						
F03 F01			Implementing ISO 9001 and kind of quality management systems			Considering F01 the QM-system was established but never fully captured by the organisation. This was mainly due to a low commitment on behalf CEO who was burdened with other stresses.
F03			Filing and getting a quality assurance certificate			
F03			Making quality contracts between supplier and customers			
F03			Establishing of quality indicators and target levels			
F03			Conducting corrective actions (performance management)			
F03 F03			Just-in-time delivery Quality assurance and precision control of manufacturing	6RC		

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
ENVIRONMENTAL MANAGEMENT (firm's reputation and brand)				SC/RC	4-5	
F03			ISO 14001 environmental management system			
COMPETITOR ANALYSIS AND POSITIONING IN VALUE CHAIN				SC/HC	2-3	
Conducting competitive advantage factor analysis	Seizing new competitive advantage factors					
Monitoring the emerging substitutive approaches those of competitive for own offerings						
F02						
F11			Competitor analysis			
F02			Competitive product offerings analysis			
F11						
Positioning in value chain/ chains	Tending from product manufacturer to system supplier					
F01						
F03						

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
LEADERSHIP & HUMAN RESOURCE RELATED ACTIVITIES						
MANAGEMENT TEAM RELATED SUBJECTS						
	Replacing Receding of the present CEO into the board of directors role and recruiting a new CEO					
			Motivation and spirit	HC/SC	4-5	
	CEO sparring (by the board)		Delegation			CEO had multiple responsibilities not necessarily coordinated by one person. See the comments in the implementation box of the long term strategy planning
			Team working			One unbalanced episode occurred in 2006-07 when the roles of the heads of two units were not properly defined
F03 F03			Internal competition Customer and supplier cooperation managing (chemistry) Systemised collection of			
F03		Analysing personnel feedback				
F03	Internal communication and strategy					
ENTREPRENEURIAL DRIVE						
F01 F02 F11	Accepting multi- role "game"		Balancing entrepreneurial intentions with tied commitments on other career building	HC	1	Overburdening the entrepreneur cause overburden activity on desired responsibilities. Close partner & network relations within distressed situation would cause a two seat problems. Researchers are troubled with this problem when tending to entrepreneurs
F01 F02			Management team's self- organised role changes when necessary			Due to the imperatives set by growth the need of recruiting external talents would give a cause for human tensions within team
HUMAN CAPITAL CARE						
F03			Internal competence Caring skilled people craftsmanship and competences after a M & A-operation	SC	4	Rather high rotation in the IT-function and loss
F03	Incentive management					Lack of a proper system, e.g. an employee stock option, for vesting key employees outside the board of directors
F11			engineering skills and when possible attracting low cost resources			expertise needs that cannot be met by own personnel. Further, this would have a negative impact on profitability if not considered with the
F03			Attracting and recruiting skilled employees (blue collar)			
			Temporal lay-offs (of employees)			Loss of working order
LEARNING AND TRAINING (F03)						
F02			Self-motivated well-being Internal product and firm guideline learning Guided personnel training following learning by doing	SC	4	
F03 F03 F03		Managing training				
F03			Applying mentoring	SC	4-5	
HUMAN RESOURCE MANAGEMENT						

Table continues in the next page

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
HUMAN RESOURCE MANAGEMENT						
F03			Balancing temporal workforce deficits between other units within a multisite corporation	SC	4-5	
F03	Re-defining of the	Executing a value				
			Developing employees to			
F03		Productivity related compensation tied partly with productivity				
F03		Sick-leave percentage control	Managing sick-leave and well being			
F03			Managing work safety ruling			
F03			Training of work safety			

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
FINANCIAL ADMINISTRATION AND FUNDING RELATED ACTIVITIES				SC	1-5	
FINANCIAL ADMINISTRATION AND MAIN OPERATIONS				SC	1-3	
Budgeting for the next year	Budget reporting	Budget follow-up	Budget management and carrying on the corrective measures			New firms and firms evolving greatly (growth or other turbulence situation) do sometimes big mistakes in sales figures
		Mid term (3-6 months) cash balance estimates	Cash management			The need was minimal - see below fund raising
			Accounts ledger operations			Travelling, accounts payables and receivables could be improved, a resource problem
	Artificial tuning of F & A figures		Debt collection			Problems in debting of foreign receivables
INCOME FINANCING & PROFITABILITY MANAGEMENT (restructuring related operations)				SC	3	Hiding problems
F02		Cost structure analysis				Sometimes firms are poorly aware of the cost
F01 Business model & F02 cost-revenue F11 structure	Executing a profitability increase programme					Fixed costs were relatively high in contrary to variable costs. This is discussed more in pricing and productivity boxes.
F01 A crisis analysis F11	Executing a severe restructuring programme Managing/ balancing		Managing key employee retention			Non-vested key employees tend to leave first in a crisis situation
			Pricing control			Start-ups suffer sometimes from an one-sided Lack of means for increasing prices
F01 F03			Productivity management (continuous increase)			Due to internal resources of specialised people the utilisation rate would stay low and cause lowered productivity
FUNDING AND CASH MANAGEMENT				OC	1-5	
	Financing strategy					The got new convertible loan would have used for leveraging new capital -> one reason for drifting towards insolvency
	Business planning (presentation)					
F01 F11	Knowing appropriate investors					capable not only to dose money but accelerate the firm success
	Attracting new investors		New funding			The dispersed intentions of the current owners especially since 2007 discouraged new investors, especially, one major distribution
	Executing financing		Working capital raise (cash balance problem)			The income financing was inadequate (except 2004- 2005) which urged living with a scarce
	Governing venture capital process					The exit-plans were unclear or the shareholders preferred to go by they own. The latter choice would seem to be a plausible explanation cause the new investment offerings were not accepted
F01	Managing cash crisis		Managing lender relations			

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
CASH MANAGEMENT						
F01	Managing cash crisis			OC	2-3	
			Improving debt collection			
			Delaying payables to suppliers			
F03	a petition of seeking liquidation is					
KEY RESOURCE HOLDERS/ STAKEHOLDERS						
All	Managing relations with creditors			RC	1	
All	Managing relations with risk financiers		Joint activities with public funding agencies (Tekes, Finnevera)	RC	1	Byrocracy
All	Managing relations		TE-keskus	RC	1	

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
GOVERNANCE AND LEGAL SUBJECTS						
OWNERSHIP MANAGEMENT (from first IPRs)				OC	1-5	
	Balancing mutual intentions					Monopistic intentions appeared in the end of 2007 on behalf of the BA which were not confronted
F01 F11	Growth management					The problem here is frequently met when the firm/embryo is moving into the next level as stated in the introduction considering the venture capital process. Consequently the power setting among shareholders may need restructuring due to new owners
F02	Capturing and integrating the exploited new business opportunities					A risk of dispersing the business focus -> see next
F02	Managing conflicting or dispersive new business opportunities					A few weaknesses would arise when taken a minor role in a joint venture operation.
F03	Planning new ownership structure of a merged firm/ bought business					
CORPORATE FINANCING				OC	1-5	
F03	Monitoring partners feasible for ownership based firm alliances					
F01 F02 F03	Due diligence of business transactions	Execution of a: M & A-operation; technology trading or new factory establishment				The time delay from a decision vary. From the F03 firm it took 1,5 years from decision to execution of a M & A-transaction due to Burocracy
F03	Making of a strategic investment plan					
F03	Analysing the most feasible division/unit structure of a particular corporation	Re-organising corporation's business unit structure				
COMPANY GOVERNANCE						
F11	(Major) supply contract management Other commitments and contracts	Establishing a firm				
RISK AND CRISIS MANAGEMENT				OC	1-5	
	A crisis plan for the major unforeseen business					Timing and activation of crisis management operations would have been more prompt.

STRATEGY EMPHASIS		OPERATIONS EMPHASIS		REF CODES		
Analysis & Planning	Implementation	Analysis & Planning	Implementation	IC	Cycle	Weaknesses and/or threats
INFRASTRUCTURE RELATED RESOURCES						
IT-SOLUTIONS						
			Technical procurement system integration			A more sophisticated purchasing system connected with FinAdmin was not completed
	Quality management systems		A comprehensive quality assurance system			Not in use properly, Cash flow management module was not in use, see also FA related lines above.
	Electronic invoicing and FA-systems					
	Internal communication platform					
	Design system for customer tendering					template library of the most common subassemblies was archived along product development but due underusing it had become obsolete
	Sales tendering		Creating in- and outbound system integration with strategic			A modest price configurator used by CEO
MANAGEMENT SYSTEMS WITH LOW IT-SUPPORT						
		Management team reporting		SC	2-	

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APPENDIX 3 – SUMMARY OF THE BUSINESS PROCESS APPEARANCES ON GROWTH STAGES 1

APPENDIX 3 – SUMMARY OF THE BUSINESS PROCESS APPEARANCES ON GROWTH STAGES

			Enhanc
1	PRODUCT AND TECHNOLOGY ORIENTATED ACTIVITIES	IC	Initial
2	OPPORTUNITY RECOGNITION AND RESEARCH ACTIVITIES	HC	1 all
3	PRODUCT DEVELOPMENT	StC	1- 3-4
4	PRODUCT MANAGEMENT - OPERATION MANAGEMENT LEVEL	StC	2 6-7
5	PRODUCT MANAGEMENT STRATEGY VIEW	ALL	3 4-5
6	SOURCING (incl. SUPPLY WEB MANAGEMENT)	RC	1 4-5
7	IPR MANAGEMENT Content relates with HC	StC	1 1
8	PRODUCTION		
9	PRODUCTION PROCESSES STREAMLINING	StC	2- 6-7
10	PRODUCTIVITY MANAGEMENT	StC	3 5-7
11	PRODUCTION CAPACITY MANAGEMENT	StC	1/4-5 6-7
12	SALES AND MARKETING ORIENTATED ACTIVITIES		
13	MARKET RESEARCH - DOMESTIC	RC/HC	1 4-5
14	MARKET RESEARCH - FOREIGN (Difference between the born glo	RC/HC	1/5 4-5
15	MARKET COMMUNICATION AND BRAND MANAGEMENT	RC	3 6-7
16	CUSTOMER ACQUIRING - selection and attracting	RC	1-3 3
17	SALES MANAGEMENT	RC/StC	5 6-7
18	SALES - Tendering	RC	2 5
19	SALES - Contract management	StC	3 5-6
20	CUSTOMER RELATIONSHIP MANAGEMENT ORIENTATED ACTIVITIES		
21	DELIVERY MANAGEMENT	RC	3 5-6
22	TECHNICAL& COMPETENCE CENTRE SERVICE; ACCOUNT MGT	RC	3 7
23	TECHNICAL SERVICE / CLAIM HANDLING	RC	2 7
24	CONTRACT MANUFACTURING/ CONTINUOUS PRODUCT AND SER	RC	1-5 6
25	CUSTOMER RELATIONSHIP MANAGEMENT (in project/solution bu	RC	(2)3-5 5-6
26	VALUE CHAIN RELATED ACTIVITIES	RC/StC	
27	DISTRIBUTION CHANNEL MANAGEMENT	RC/StC	3-5 5-6
28	INTERNAL LOGISTICS & MATERIAL FLOW	StC	3-4 6-7
29	COMPETITIVE STRATEGY RELATED ACTIVITIES		
30	LONG TERM STRATEGY	HC/StC	1-5 3-4
31	STRATEGIC INVESTMENT MANAGEMENT (after minor diversificati	StC	3-4 6-7
32	STRATEGIC ALLIANCES	RC/StC	4-5 5-6
33	INTERNATIONALISATION AND LOCATION MANAGEMENT (True, n	RC/StC	4-5 6-7
34	KEY CUSTOMER PARTNERSHIP MANAGEMENT	RC	5 6-7
35	ECONOMIES OF SCALE ADVANTAGE EXPLOITATION	StC	5 7
36	(TOTAL) QUALITY MANAGEMENT - including performance manag	RC/StC	4 6-7
37	ENVIRONMENTAL MANAGEMENT (firm's reputation and brand	RC/StC	4-5 6
38	COMPETITOR ANALYSIS AND POSITIONING IN VALUE CHAIN	RC/StC	2-3 6-7
39	LEADERSHIP & HUMAN RESOURCE RELATED ACTIVITIES		
40	MANAGEMENT TEAM RELATED SUBJECTS	HC	
41	LEADERSHIP	HC/StC	4-5 6-7
42	ENTREPRENEURIAL DRIVE CARE	HC	1 3-4
43	HUMAN CAPITAL CARE	StC	4 6-7
44	LEARNING AND TRAINING (F03)	StC	4 6-7
45	HUMAN RESOURCE MANAGEMENT	StC	4-5 6-7
46	FINANCIAL ADMINISTRATION AND FUNDING RELATED ACTIVITIES		1-5
47	FINANCIAL ADMINISTRATION AND MAIN OPERATIONS	StC	1-3 6-7
48	INCOME FINANCING & PROFITABILITY MANAGEMENT (restructur	StC	3 4-5
49	FUNDING AND CASH MANAGEMENT	StC	1-5 3-7
50	CASH MANAGEMENT	StC	2-3 5-6
51	KEY RESOURCE HOLDERS/ STAKEHOLDERS	HC	1 4-5
52	GOVERNANCE AND LEGAL SUBJECTS		
53	OWNERSHIP MANAGEMENT (from first IPRs)	StC	1-5 1-7
54	CORPORATE FINANCING	StC	1-5 6-7
55	COMPANY GOVERNANCE	StC	
56	RISK AND CRISIS MANAGEMENT	StC	1-5 6-7
57	INFRASTRUCTURE RELATED RESOURCES		2-
58	IT-SOLUTIONS	StC	
59	MANAGEMENT SYSTEMS WITH LOW IT-SUPPORT	StC	2-

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