

# **Development of a Framework for the Commercialization of Research-Based Innovations in Measurement Technology**

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## **Executive Summary**

The Measurepolis network was established 2003 to improve co-operation considering measurement technology related research within the Finnish universities. Still, after the promising start even new challenges has arisen considering stringent requirements for the universities' industry integration that are influenced by Finnish government. In turn, this progress manifests to search a new operation model for the Measurepolis network to glue market and universities with even a closer relationship.

The dialogue between business and research is a complex setting and that cannot be explained only in terms of the macro-level determinants. The continuity of emergent business from research to business or actually to capital is the pivotal thread that bridges those two worlds that represent different human mindsets, values and motivators as well risk taking propensities and competencies regarding of creating business. Therefore, a sound growth progress call for considering the dynamism of the ownership management that implies a look from the core of the new business embryo outwards to the outer stakeholder levels of the entire network.

For science parks to participate in this process, they need to identify their contribution for the network that has a strong scientific orientation as well the requirements set by the measurement technology industry on the other side. In practice, this means moving from facility to service focus and ability to co-operate with university driven network. Furthermore, as a challenge for the science park experts, relationship and trust between the parties postulates common language and understanding the technology in question as well reasonable understanding of the technology management and productizing.

## **1. Introduction and background**

Countries the world over are today increasingly forced to improve their public-funded and public-private-funded research commercialization measures while the interest of private investors and corporations has lessened in regard to ventures in their early stage, i.e. capitalizing prospective seed-phase business embryos. This phenomenon is well known and expressed, e.g. in publications by the Finnish Ministry of Trade and Industry as well in research carried out at Tampere University of Technology. It is not unusual for lucrative innovations embedded in technology research projects as well as entrepreneurial activity involving prospective business opportunities to fail to meet up with the capital market. This study highlights the three main ramifications of commercializing research-backed innovations; namely, technology trading, licensing, and new business enterprise start-up. The first two represent conventional commercialization paths with the firm start-up option challenging them. As is discussed later, creating new business in the university environment is a complex process and requires strong support, which is characterised in this paper in terms of the research-to-capital framework supported through a nation-wide measurement technology network as part of the framework.

## **2. Background for building the framework**

### **The Finnish measurement-technology market and R&D developers**

Measurement technology is one of the fast-growing industries in Finland. The turnover of Finnish companies operating in this field is estimated to be in excess of € 1 billion. The rate of growth during

the past few years has been about 11% and it is expected to remain at this level, or even exceed it, in the future. In order to sustain its competitiveness, the Finnish measurement-technology industry has to continuously renew its technology base. With this purpose in mind, the industry's annual direct investments in research and development (R&D) exceed € 100 million. In addition to the R&D work conducted in companies, the industry makes efficient use of the R&D work done within public research organizations and at universities. The various university and research institutes in Finland have approximately 300-500 people working with subjects related to the development of measurement technology. The role of universities and research institutes is particularly important in the development of emerging measurement technologies. Unfortunately, only a small fraction of the innovations made in research organizations have been commercialized so far. This presents a starting point for a great business potential not only in the Finnish marketplace, but also the global marketplace.

### **Measurement technology – a new emerging industry?**

The need for new technology in the area of measurement and control is increasing for a number of reasons. The performance requirements for industrial processes are becoming more and more demanding. For economic reasons, the energy consumption of processes should be reduced. For environmental reasons, the control of environmental impacts of processes is becoming ever stricter. During the past couple of years, security issues in several fields, e.g. security in society in general, security at workplaces, and safety of food, have also become increasingly important. Measurement information is an important decision-support tool also in trade, healthcare, sports, and many other sectors. Consequently, there clearly exist growing markets for new measurement and control technologies in many different fields of life and industry.

### **Requirements and challenges for building national forum**

Reflected by the measurement technology firms research institutes and universities are struggling respectively with the growing demands of the markets as well new technical requirements enabled by new technology related to the opportunities as listed below.

The initial, and particularly the life-cycle, costs of measurement devices should be affordable, devices should be miniaturized as regards their size, they should be self-sustainable, measurements should be made and the results should be available in real-time, devices should be controllable and measurement results should be readable remotely utilizing wireless technologies, and so on. Another challenge considering development of new measurement technologies is its increasingly multidisciplinary aspect. We need to be aware of new sensor technologies, intelligent electronics, embedded software, efficient production technologies, and industrial design.

Perhaps the biggest challenge for universities is market transparency. Knowing the target market and the requirements for creating real value for customers are crucial considering launching of new measurement-technology applications. In the business-to-business market, we need to be able to clearly indicate the superior characteristics and robustness of a particular measurement-technology innovation and especially its profitability potential with regard to the customer's process. Furthermore, the markets for measurement technologies are fragmented, which implies a need to apply a horizontal approach. For example: in order to win a bigger market share, a particular innovation needs to be applicable to more than one industry. This aspect becomes especially emphasized in Finland because the market for measurement devices in Finland is very small and most industrial measurement instruments must be sold globally to ensure business profitability. This underscores the point that even small companies have to be international from the very beginning.

The nature of measurement instruments is mostly complex as they are not comparable with COTS (commercial off-the-shelf) products. Similarly, the distribution and sales channels need strong support considering sales product support as well after-sales and customer-care processes. Thus, special attention should be paid to finding appropriate distribution channels. In conclusion, in order to commercialize new measurement technologies, multiple aspects must be considered and the targeted new forum needs to bring together experts in all of the aforementioned fields.

### Measurement-technology research operators at the national level

The measurement-technology industry in Finland is quite fragmented; research and development in this area is done throughout the country. Among the key players in measurement technology research are the University of Oulu, the Tampere University of Technology, the Helsinki University of Technology, and the University of Joensuu, but measurement-technology-related research is also done at the Universities of Turku, Kuopio, Jyväskylä, and Lappeenranta, as well as at the State Technical Research Center of Finland (VTT). At the moment, there is no centralized co-ordination or co-operation between all of these institutes and co-operation is rather low key, which implies that there is a need for co-ordination.

The preliminary role of co-ordinator has been assigned to the National Centre of Expertise for Measurement Technology since 2003, and Measurepolis, based in Kajaani, hereafter simply Measurepolis, which refers to the intended national level network. Kajaani is also co-ordinating the so called "Idänkaari", the Eastern Arc, co-operation body between the measurement-technology research institutes in Eastern and Northern Finland. Kajaani is the capital city of Kainuu Region.

### 3. Research project and conceptualizing of the framework

#### Research setting, current situation, and vision

Building a consistent framework for university-driven technology development involves matching two divergent environments. The first is that of universities, which are traditionally dominated by research and education functions standing far back from making business. However, from the business point of view, they have an outstanding indirect value for business enterprises, which today are making increasing cuts in their research budgets. The second is that of the market-driven business enterprises, which necessitates adopting the utility-driven short-term profit-seeking mode contrary to the universities, which function in a slower mode. As the entitlement of running a business enterprise is its long-term profitability and shareholder value, it is ultimately governed by the capital markets, either directly or indirectly. This, then, is the explanation for the second nomination of this study – research to capital.

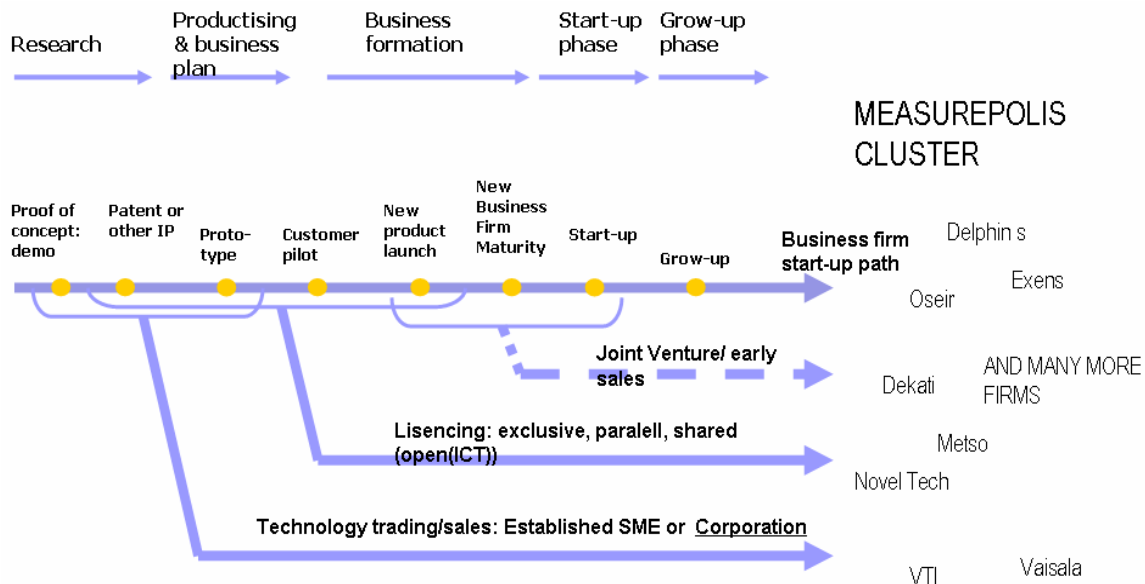


Fig. 1, The Measurepolis cluster

When bridging these two worlds, one finds oneself trying to determine where the fuzzy dividing-line passes. In terms of the venture growth process illustrated in Fig. 1 below, one may suggest the point where patenting costs begin to accumulate or the first demos are built up as the other locates the dividing-line at the point of the growth process where the first formal funding takes place, i.e. the start-up phase. Should the framework comprise a third zone between these two worlds or just clear up

the bridging mechanisms from one to the other? The question is a fundamental one and the suggested mechanism, the framework, implies that the concept of ownership management is related not only to tangible assets but to intangible assets as well, located in a ‘gray zone’.

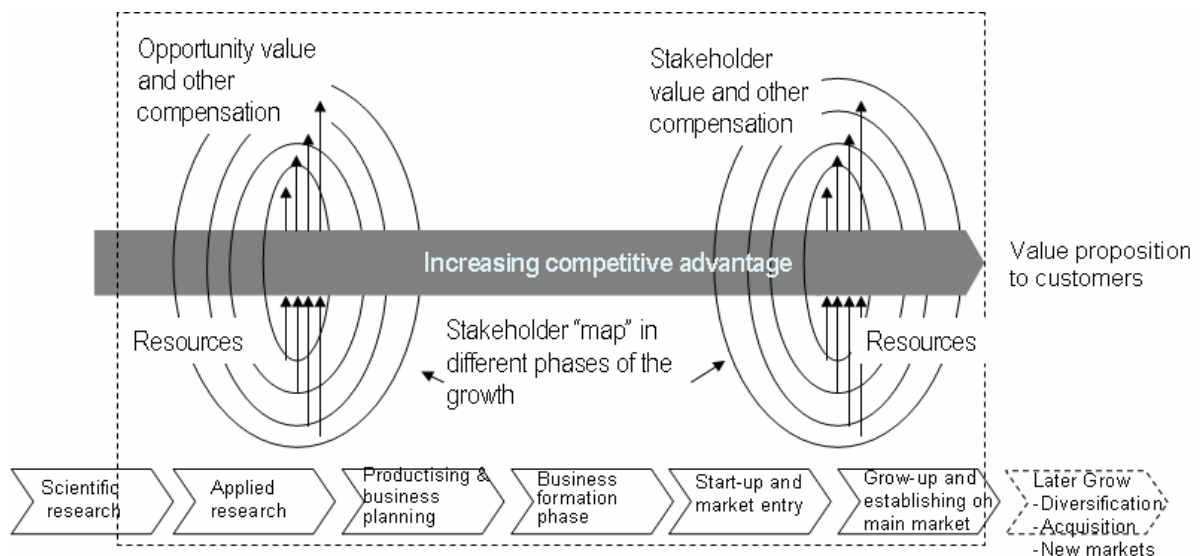
The current situation regarding the commercialization process at universities is illustrated above. All three ramification paths exist, but they could be supported even better. Especially the early phases (applied research and productizing&business plan creation) regarding the commercialization activities are resourced and coordinated inadequately. This is mainly because of insufficient market transparency and lack of business skills at universities. This could be called the ‘blind phase’ requiring a sound screening process. The productizing phase is mostly at the end-point of the universities’ commercialization process where the lead is handed over to business enterprises. From this point on, co-operation between a university’s research team and the business firm’s R&D representatives continues. The suggested vision here is to migrate from this relay mode to parallel mode allowing researchers to operate longer and get more commercialization experience and market reflection or even get a change to participate in some role of business operation.

The vision of the new forum implies a new layer on the top of the measurement-technology-related research carried out at Finnish universities, which is the business-orientated forum for connecting universities’ commercialization efforts. Based on interviews, the determinants for the commercialisation layer are the availability of the following:

- “friendly and wise” money in the pre-seed phase (productizing and piloting),
- seasoned business consultants and high-grade leadership experience
- partnering opportunities with small and medium sized enterprises, SMEs
- smooth ownership transition and fair exit schemes between investors and founder-owners
- top-class contacts within corporations
- distribution channels and shared sales activities or reasonable joint venture opportunities
- professionally operated ownership management and intellectual and financial capital investment process, which is the main focus of this study
- common conferences and networking opportunities for researchers and marketing experts

### Research objectives and questions

Although the cluster view is a concentric one and building a new forum suggests focusing on networking and relationship issues, the study, however, focuses on investigating social-level and individual-level economic factors such as team building and organizational role matching as well incentive and rewarding and risk taking reasoning and ownership management as is discussed later in more detail.



**Fig.2. Research-to-capital framework**

Actually the commercialization framework, as is shown above, considers two major approaches. The first is a vertical one and it determines stakeholder categories positioning on diverse levels from the firm's core, which is the value of the firm. This approach is called the intrinsic approach as the view is from the core of the business growth and its value to the outer 'spheres' as is illustrated in Fig. 2 below. The farther away the circle's perimeter is from the arrow, the looser the relationship of the stakeholder in question is considering contributing to the enterprise's growth process and creation of competitive advantages and ultimately the enterprise's growth and increase in the enterprise's value. The second dimension is a horizontal, timely basic view that drills down to characterize the dynamism of the enterprise's growth, which is discussed in the theory part later on.

### **Research questions**

The area of main interest in this study is the ownership management of an emerging business enterprise from research to viable business and the search for an optimised model for change management that is outlined by risk taking and rewarding mechanism, social issues, and the investment of both capital and immaterial intellectual properties as sourced by the founder team, other key persons, and investors. Further, this model is characterized by four determinants and it denotes the dynamism of the entire framework.

Ownership is in proportion to the shareholder value of the enterprise and other enterprise-related non-contractual property. An emerging business enterprise is mainly dominated by skills, experience, and business knowledge. Thus, the role of capital investment money can be even secondary although its role becomes more and more important when seeking new markets and growth. Accordingly, this study claims that managing and giving value to immaterial property, not only to patents, is crucial in creating inspired team spirit and a launch pad for successful business growth. Therefore, diverse knowledge qualities together with IPR (e.g. customer relationship contacts, business intelligence and strategic management experience) are crucial forms of knowledge and competence for any emerging new business. Further, as intellectual property is always human-related, the human-related aspects become even more important in the launching phase than in an established company.

Nevertheless, the present study results argue that the value of a business embryo before the start-up is based on the enterprise's opportunity value of promising product(s), patents and committed research team. However, in reality, valuation at this phase is complex, and intangible assets seldom stand for non-current assets in the balance sheet nor do they represent so called apport equity. In turn, the valuation practises of a mature enterprise follow business trading schemes and the situation is more straightforward as the object of the trade, a firm, can be considered rather liquid.

Finally, the study seeks to answer for the questions of dominance and power setting dynamism involved in the growth process. Nowadays, there are plenty of capital investors offering funding either on a participatory basis together with skills and business knowledge or passively as an institutional funding organizations demanding perhaps board membership. Loosing contact with the enterprise's steering wheel is a tough question for the founder team. The research questions focus on the area of managing ownership and key human resources and competences required for fuelling growth at the individual level and also looking at the university and network level.

### **Research method**

The empirical part of the study was carried out following the principles of multiple case study research logic (Yin 2003), which implies using multiple data sources, not only multiple cases. Accordingly, observations, interviews, narratives, and literature were collected, and thereby the triangulation requirement of case study research study logic was met.

The preparation for research and the pre-study phase was started in the autumn of 2005. Experimental case data collection was launched in January of 2006 to be concluded in August of 2007, with interim results being used in to outline this paper. As was mentioned, the data consist of two sample sets. The first set comprises ten early-phase university-backed research-to-capital cases, which mainly represent the late applied research phase or early productizing phase. In practise, the cases involve a clear vision of a business opportunity and almost everything has been patented or the patenting process is on-

going, and two were in the pilot project phase. The second sample set included six established international measurement technology firms. One of these six cases represents an in-depth case while five other cases attended to the overall picture of the growth process, typically 4 - 6 years after patenting in the late applied research phase up to the current situation as is shown in Fig. 2. The data were mainly captured by means of interviews, financial reporting, and by studying contracts and memos that provided the basis for a picture of the growth path of each of the cases and shed light on the research questions.

In addition to these samples, observations were executed via the Finnish measurement technology cluster of enterprises. Twenty interviews of experts holding leading positions in universities, industry, financing, and Government were carried out in April-May of 2006. The researcher authoring this paper study also acted as a consultant with the ten cases that is in line with the requirements of case study logic, and presented observations as a participant (Yin 2003).

Further, certain metrics were required for consultancy purposes of the first set. A synthesis of ten or so models of state-of-the-art corporate venturing and built-in venture models of leading-edge Finnish corporations was accomplished at beginning of the project. The metrics system was fulfilled following the gate-to-gate approach such that at the end of each of the growth process phases there was a decision point for acceptance of either to proceed to the next phase, reject, or return back to the case of an earlier phase. In practise, the emerging business case unavoidable proceeds through all of the phases regardless of ramifications as stated earlier in Fig. 1. Accordingly, the ownership management framework shall be not affected by the chosen commercialisation line. The metrics part is not reported here due to its limited size and only the main characteristics of each of the growth phases are presented in Appendix 1.

When selecting the case studies it was considered important for versatile approaches to be present. These varied by growth phase, ownership structure, business experience of the teams, and the anticipated commercialization paths. The cases form the second sample area, i.e. established enterprises, involved companies growing with diverse strategies and sourcing schemes.

Finally, the purpose in data collection was to produce conclusions of maximum practicability tied to companies' real-life situation.

#### **4. Theoretical approach – venture growth and relationship governance**

Considering the theoretic approach selection, the technology management discipline could be one promising theory for the purposes of this study. However, it does not explain the characteristics of risk of capital investment and the reasoning of intellectual capital sourcing. Therefore, a more robust theory of venture growth theory was selected supplemented by relationship governance.

##### **Venture growth**

The concept of venture growth is relatively young. Among the basic theories paving the path to understanding the challenges of emerging new business is the resource dependency theory (Penrose 1958). An enterprise's successful growth is dependent on the availability of resources from its environment. The resource-based view depicts companies as a collection of resources and capabilities. Capabilities reflect the ability to combine resources in a meaningful way to promote the company's performance. Getting a resource, e.g. funding or business advisory, depends on the founder team's credibility and their personal ability as well the team's attitude regarding accepting new stakeholders. Entrepreneurial activity is the human asset and driving force in carrying out new ideas in business (Erikson 2000). In the corporate strategy context, the nature of entrepreneurship is recognized to be a renewing force although it is complex to maintain and meets resistance from existing businesses and their business area owners (Ansoff 1987). Especially managerial forces committed to serve key customers, which bring major revenue to the company, are representatives of enterprise stagnation (Christensen 1997). Attempts by universities to commercialize innovations often meet resistance in big corporations as their strategy and market positioning do not match the new business ideas.

The recent venture growth research carried out highlights the nature of the funding gap that comprises both capital and knowledge funding, and it is this gap that young ventures have to overcome to gain access to the capital market. Therefore, the theory is called venture-to-capital (Alamutka 2005, Harrison et al 2004, Rasila 2004, Seppä 2000). The equity gap is obvious and problematic for new ventures seeking small-sized initial investments lacking interest for institutional investors (Rasila 2004, Seppä 2000). New business ventures also need diverse skills and competences, which are translated more generally as managerial skills and business knowledge or intelligence; in this study we used the first one. The equity gap can also be seen as the distance between the venture and the capital market (in terms of both knowledge and money). Reaching the capital market requires a professionally organized ownership management. The following venture-to-capital process was found to be useful for the purposes of this study:

Phases in venture growth: Idea > Concept -> Seed -> Start-up -> Growth -> Maturity  
Determinants of venture-to-capital discipline: Ownership, Management, Financing,  
Entrepreneurship

As is already illustrated in Fig. 2, the phases are the same as suggested in the venture-to-capital theory. However, a couple of names were replaced with the typical expressions used in technology management literature. A venture in the measurement technology industry is always based on a patentable “hard” innovation that can be bundled with a service model.

### **The intellectual asset investment view in the venture growth process**

Management and entrepreneurship, in addition to their other characteristics, involve the human aspect since they are based on individual persons’ experience and the business knowledge they have accumulated during their career. Business knowledge and experience is crucial for fueling the growth process and for creating competitive advantage. Depending on the growth phase, diverse qualities of knowledge and experiences are required, which implies changes in dominance at the personal level. Based on observations made of start-ups in Silicon Valley, Komisar (2001) described “three CEO’s” reflecting the different challenges of the leader of a young venture. The first CEO puts together the team and manages the early growth, next paves the way to the main market and finally, the third CEO brings strategic wisdom actualizing the later growth. In other words, first the technology team is build up it needs business manager skills added to it, next it is complemented by sales and marketing excellence, and finally strengthened by strategic wisdom.

Evaluating personal knowledge and experience is a tricky issue for any intellectual property until it is realized at customer value and income cash flow for the enterprise in question. Thierauf suggests a ranking for valuating knowledge and experience. From top to down, the categories are truth, wisdom, business intelligence, knowledge, information and data (Thierauf 2002). Truth is universal and cannot be utilised for business purposes. “Wisdom is ability to judge soundly over the time, intelligence is a keen insight into understanding important relationships, knowledge is obtained from experts based on actual experience” (Thierauf 2002, p.8).

The study claims that categorizing knowledge and experience makes sense, but it has to be considered by type of business. Further, the type of business, which in this study is the measurement technology industry, is characterised by competitive advantage that is the cornerstone of company growth (Porter 1980). To quote Gideon et al., “Innovation is most critical to achieving a competitive advantage if the entrepreneurship is developing a high technology product or service”. This statement emphasize the key role of innovation (Gideon D et al. 2001). The competitive advantages of a growing firm form a complex set of interacting factors comprising implicitly expressed elements that play a focal role in the success of the enterprise. Dehning et al. claim six outstanding determinants of sustainable competitive advantage for emerging IT firms (Dehning et al, 2002) and these are contributed to remarkably by the experience and knowledge of the enterprise’s key personnel as well by external contributors.

### **Core element of the framework: Ownership management**

The framework diagram in Fig. 2 is characterized by four circles with each of them representing the intensity of interaction and the impact of the stakeholders. For the sake of convenience, the stakeholder categories are not identified here in detailed.

The transaction cost economics theory (Williamson 1973) suggests four key nominators for explaining the governance of non-contract-based business relations, and these are: 1) The specific characteristics of the asset and incompatibility with the need, 2) The self-seeking benefit or opportunism tied with knowledge asymmetry between parties 3) The bounded rationality strengthening unwillingness for relationship, and 4) The risk-taking propensity outlined in terms of safeguards and incentives.

Recent network and sourcing theories suggest a fifth element, namely the trust and accumulated social equity proportional with the reputation and trustworthiness of the contracting body in question (Kern et al., 2000, Willcocks et al. 1999). Especially research looking into contemporary IT-outsourcing cases has produced significant contributions to the transaction cost and relationship theories. Sourcing cases involve transactions not only connected with tangible technology assets but also with intangible knowledge assets (Willcocks et al. 1999). From point of view of the this study, research focusing on outsourcing theory will shed light on relationship formation and produce appropriate hints for building up the suggested ownership management core of the whole framework.

The proposed determinants for governance of non-contractual ownership and relationship dimensions presented especially along the way from applied research phase to investable venture are as follows:

1. Role matching, team forming ability threatened by opportunistic behaviour characteristics
2. Bounded rationality: Limited experience and information of executing business reflected as risk aversion (or tolerance) and required safeguard mechanism for mitigating risk
3. Rewarding: Strong incentives as motivators for aiming on start-up a new firm
4. Intellectual asset specificity: Personal skills and knowledge areas of key business areas (asset specificity) that are aligned with business growth

One should note that these elements prevail strongest of all in the key stakeholders that are team founders; later key persons bring in management experience and board members. In turn, the upper levels (see the circles in Fig. 2) of stakeholders do not imply that these determinants as strong as the key stakeholders, but they do not entirely disappear either.

Managing determinants in the above is crucial for fuelling venture growth or any commercialization efforts that of a necessity require a highly motivated team and other contributors to promote the growth process.

## **5. Results and conclusions**

The results were approached from three angles here. The first was assessment at the general level, and major problems and contributors for commercializing research were identified. The second approach was to evaluate the four determinants of the intrinsic view of the growth process phase-by-phase. Thirdly, the stakeholder map was described at two points of the growth process as shown in Fig. 2. It should be noted that the borders between the phases and stakeholder levels are in a state of flux and change from one case situation to the next. The purpose is to illustrate the growth process as an average process and the above division should not be understood in absolute terms.

In general, there are three main options for the commercialization of patentable innovations as suggested in fig.1.:

1. Trading: Immaterial rights are sold to an established company that offers a global sales channel and distribution for the innovation as well substantial market intelligence
2. Licensing: Immaterial rights are licensed exclusively or in parallel
3. Enterprise case: The research team launches a new business enterprise

Following central observations of the second sample set (established enterprises) there are some suggestions for the paths of creating new business described below:



- Most measurement technology cases offer too thin a base for launching a new business enterprise. Alternative ways to circumvent this problem include bundling up two or more patents as was done in the established new enterprises representing the second sample set.
- The second limitation of these business embryos was the anticipated “tech-orientated” customer segment representing early adopters in the market, e.g. laboratories. In order to gain a broader customer base, the planned technology roadmap must involve second generation products also fitting on-line measurement requirements or other usage cases.
- The third barrier for a research team aiming to launch a new enterprise was simply the lack of excellence of productizing. In practise, several competencies and information sources are needed for the successful launch of new products. Semi-industrial partners were used here in meeting the need for productizing knowledge.

### **Assessment of the applicability of the four intrinsic determinants**

Role matching, team building ability threatened by opportunism: Unwillingness to take capital investor money was evident in some cases (second sample set) and it was expressed by the term “slavery money”, which indicated a potential change in ownership and power situation in the enterprise from the founders to the investor(s). In other words, the founder team preferred to continue on their own, even if it meant slower growth and slower increase in the value of the enterprise. This reflected high team spirit and fear of power shifting elsewhere, which could be explained by determinant #1 (of intrinsic determinants) where opportunism stands for threat on part of the investor to capture the enterprise. Opportunistic behaviour among university people was not significant when considering business issues. Respectively, the team building capability related with business objectives was rather high. This could be explained by the reason that teams had existed previously as research project teams then continuing smoothly as business founder team.

One noteworthy characteristic of the team building process was the high number of owners at the start-up phase of the enterprise. Not only was the researcher team, but also the other minor technology-orientated contributors were granted with slight shareholder status (1-2% of the shares).

Bounded rationality reflected as risk aversion: Most researchers are eager to stay on as researchers if the business risk of starting a new enterprise is too ambiguous (sample set #1). This finding is in line with the concept of bounded rationality, which limits any long-distance thoughts about entrepreneurship. Without previous experience or strong mentoring support, new entrepreneur candidates felt insecure or even incompetent. This can partly be explained by the recognized background factor reasoning of entrepreneurship. However, it is also due to the researcher mindset, which requires continuous problem solving before taking on new challenges and it is controversial for business-minded persons to tolerate unknown situations. Even when safeguards existed, the entrepreneur role was not felt to be of interest. However, roles such as technical advisor or board member were of more interest compared to the role of a workhorse.

Rewarding: High incentives such as enterprise’s value growth and exit opportunities did not play key roles when engaging closely with the founder role. A good salary and interesting job were usual motivation explanations

Asset-specificity: Emerging new business requires two remarkably human capital based assets that are the creation of the innovation itself and business knowledge and skills or even business wisdom. The materialised growth path of new business embryo then implies the need of diverse business skills that need to be insourced to the firm. Partially the requirements of the intellectual assets can be anticipated beforehand by the type of the innovation and the chosen protection strategy of the immaterial property rights, either patenting or applying weaker measures such as trademark of copyright or not protecting at all.

The experiences of the established firms representing the sample set 2 match with theoretical findings of characterisation of CEO. In some cases the business minded leader was found from the researcher

team if the need for a high grade marketing expert doesn't exist due to the competition strategy in question.

However, acquiring needed intellectual assets proper for growing the business was reasonable easy after the business was successfully started. Then, the changes considering leading role of the firm wasn't that easy as the owner-leaders tend to remain in power longer than dictated by the requirements of the business growth. One noteworthy sourcing gap existed in the beginning of the growth process connected with the phases of the late applied research phase and productizing phase that called for the managerial skills. This problem, in Measurespolis network environment, was solved in terms of a case manager who was actually an experienced business consultant directing 5-10 cases ahead to the business formation phase where the first actual CEO took the lead.

Appendix 1. Typical actions involved in the growth process of a measurement-technology-related business enterprise or of a business line in a big corporation

PHASES ->					
FUNCTION I v	<u>applied research</u>	<u>productising&amp; business planning</u>	<u>business formation</u>	<u>start-up and market-entry</u>	<u>grow-up and establishing on main market</u>
Technology mgmt	-Patent(s) - prod. roadmap - demo/concept	-proto&piloting -productising plan	building first products	prepare for next generation products and new products	new products/ patents. (depending on type of business)
Strategic planning	Business concept	-business plan	Bus.plan for investors	sales operation dominates	strategy for expanding the firm
Funding	patenting costs	Preseed: '-patenting, '-proto+pilot	Preseed: product samples, proj.leader salary	Seed (if not earlier) or first round investment	First round capital investment
HR-related issues	tech team formation	-case manager/ business project leader	search for first CEO	CEO and core team	New key persons, a strategist CEO
Business control and finance admin	none	none (incl in Bus plan)	establishment of firm FA and control systems	emphasis on cash-flow and sales statistics follow-up	financial plans for further growth
Market communication	none	market test	start of the marketing	Product(s) launching	New products launch, new channels
Sales and distribution	none	first sales contacts+ prel."deals"	first closed cases, the main sales channels ready	building own distr network or co-operating with "big"	management of sales and distribution is stabilised
Customer management	none	-> sales	incl. In sales	incl.in sales	after sales and customer follow-up begins
Manufacturing and logistics	none	developing product characteristics	manufacturing trials and readiness to start product making	start of manufacturing	increase of capacity, second suppliers
Administration	patent ownership contract	ownership discussions for creating a firm	firm established as a legal entity, sales and distribution contracts, DD-process	investor related contracts+ others	risk monitoring more important
PROOFs /objectives of each of the phases	proof of business concept	proof of proto and customer pilot	credible business firm plan and proof of sales	proof of growing sales	proof of viable business

**Table 1. Typical actions involved in the growth process**

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