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Key innovation indicators

Learning from principles and practices applied by professional industrial players and investors



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Leo A. Grünfeld
Erik W. Jakobsen
Aris Kaloudis
Erland Skogli
Dorothy S. Olsen

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Phone: (+47) 22 61 44 00. Fax: (+47) 22 55 65 56

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PREFACE

This report is the output of a project on developing and improving indicators for innovation policy programs in the Nordic countries. The project is funded by Nordic Innovation and has been managed by Senior partner Leo A. Grünfeld in Menon Business Economics. The report is written in close collaboration with NIFU and InFuture represented by Aris Kaloudis Dorothy S. Olsen and Erland Skogli. The report has also gained valuable insights from a close dialogue with Petra Nilsson-Andersen and Hans Christian Bjørne in Nordic Innovation. We are deeply grateful for all contributions.

It is by no means an easy task to provide widely applicable indicators for innovative activity spanning over a wide variety of sectors and economic activities. Nevertheless, we have observed that many innovation programs have put less emphasis on what many name “hard innovation indicators” than what we find among professional investors and industrial players. This report must be read as a response to this discrepancy. We claim that a return to more business focused indicators may improve the ability of innovation programs to actually support and propel new innovations.

The authors of this report are solely responsible for all views and contents in the report. The responsibility also covers all potential errors and inconsistencies.

16 September 2011

Oslo

Leo A. Grünfeld

Menon Business Economics

TABLE OF CONTENT

1	INTRODUCTION	9
	<i>Key performance indicator toolkit</i>	12
2	A SIMPLE MODEL FOR ORGANIZING INNOVATION INDICATORS	15
2.1	THE PHASE SPECIFIC INNOVATION APPROACH TO INDICATORS	15
2.2	INDICATORS THROUGH THE PROJECT CYCLE (BEFORE, IN ACTION AND AFTER).....	16
	<i>Before the innovation project is launched (ex ante indicators)</i>	17
	<i>While the innovation project is active (in medio indicators)</i>	17
	<i>After the innovation project is finished (ex post indicators)</i>	17
3	INDICATORS IN EXISTING NORDIC INNOVATION PROGRAMS	19
3.1	A BRIEF SURVEY OF INNOVATION INDICATORS FOR NORDIC INNOVATION PROGRAMS	20
3.2	THE NORWEGIAN FORNY PROGRAM.....	21
3.3	INDICATORS USED IN THE GAZELLE GROWTH PROGRAMME.....	24
3.4	INNOVATION NORWAY: COUNTRY WIDE ENTREPRENEURSHIP GRANTS (LANDSDEKKENDE ETABLERERSTIPEND)	27
3.5	INNOVATION NORWAY: INNOVATION LOANS.....	28
3.6	DYADIC PROGRAMS: IFU / OFU-PROGRAM OF INNOVATION NORWAY.....	29
3.7	SELECTIONS PROCESS IN THE CLUSTER DEVELOPMENT PROGRAM ARENA.....	31
3.8	NAVIGATOR PROGRAMME.....	32
3.9	EU ENTREPRENEURSHIP AND INNOVATION PROGRAMME (EIP).....	35
3.10	INDICATORS OF SERVICE SECTOR INNOVATION.....	40
	<i>A new typology of services designed for innovation indicator studies</i>	41
	<i>Innovation in services: A way to overcome market imperfections</i>	42
	<i>Five indicators of innovation in services</i>	44
4	INDICATORS AMONG PROFESSIONAL INDUSTRIAL PLAYERS AND INVESTORS	47
4.1	DO FIRMS USE INNOVATION INDICATORS?.....	47
	<i>The RINMA-strategy of innovative activity</i>	47
	<i>Mckinsey report on innovation metrics</i>	48
4.2	DEFINING PROFESSIONAL INDUSTRIAL PLAYERS AND INVESTORS.....	50
4.3	THE INNOVATION STRATEGIES AND PRACTICES OF PROFESSIONAL INDUSTRIAL PLAYERS AND INVESTORS.....	54
4.4	MAPPING INNOVATION PERSPECTIVE OF PROFESSIONAL INDUSTRIAL PLAYERS AND INVESTORS	58
	<i>Sarsia seed (seed fund – Norway)</i>	59
	<i>Viking venture (seed and venture fund – Norway)</i>	59
	<i>Verdane capital advisors (Venture fund – Sweden and Norway)</i>	60
	<i>Northzone Ventures (Venture and expansion fund – Denmark, Sweden and Norway)</i>	61
	<i>Statoil Technology Invest (corporate venture – Norway)</i>	61
	<i>Midvestfondene (venture/expansion fund – Norway)</i>	62
5	WHAT HAVE WE LEARNED? A KEY INNOVATION INDICATOR KIT FOR BETTER PUBLIC SECTOR PROGRAMS	65
5.1	INNOVATION IS MANAGEMENT FIRST, MANAGEMENT SECOND AND FINALLY MANAGEMENT.....	65
5.2	STRONG TIES TO ESTABLISHED INDUSTRIAL PLAYERS AND CO-INVESTORS IS A KEY TO SUCCESS.....	65
5.3	MORE FOCUS ON CORE PARAMETERS FOR PROFITABILITY.....	66
5.4	PROGRAMS MUST BE DESIGNED TO EASILY SCALE THE FINANCING OF PROJECTS.....	66
5.5	SOME REFLECTIONS ON LINKS TO THE INNOVATION RADAR APPROACH.....	67

1 INTRODUCTION

Is it possible to measure innovation? Clearly, this is a question that attracts a lot of attention among business experts, policy makers, academics and investors. Today, there exists a large set of innovation indicators that aim at measuring the output from innovative processes, the resources that are needed for innovating, and the processes that must be implemented in order to turn innovation inputs into innovative outputs. But before answering all these questions, it is detrimental to ask what the term innovation actually means. And furthermore, who and what the measurement instruments (read indicators) are aimed towards.

In this report, we have an ambitious goal. We ask whether it is possible for public sector programs to learn from the way private innovation entities think about innovation and innovation management. If this is possible, and we really believe so, one can provide a list of principles or indicators that professional private innovation entities use in their work with innovation processes that may enrich the indicator tools that many public innovation programs rest upon. Naturally, our efforts in this report are just one step of many on the road to constantly improving public innovation policy, yet we claim that there is more to learn from those who constantly focus on innovation as a means for improving firm productivity, profitability and eventually welfare. With professional private entities, we mean organizations that focus on portfolios of innovative projects in order to obtain long term financial gains. Venture capital funds and private equity funds often stand in the core of such activity, yet many larger corporations also think in this way (often phrased as corporate venture activities). Of course, innovative activity takes place in all kinds of companies, and there is probably even more to learn from the overall corporate innovative activity in the economy, yet it would be too large a task to approach such a wide innovative field. Our approach is more focused.

It has often been made the case that a large majority of innovation policy measures are conceptualized, designed and implemented based on abstract theoretical thinking on market and systemic failures, identified in the national innovation systems. This approach was obviously necessary in refocusing old-fashioned industrial policies towards new needs, in particular the need of recognizing R&D-based innovation as the key growth element in modern knowledge economies. It is now perhaps time to reconsider this approach, by going back to address the microeconomic foundation of innovation theory and by more carefully observing the needs of the businesses as they try to succeed and expand in new markets.

In particular, in the vast majority of existent sets of indicators 'measuring' innovation at a macro level (country or region or even economic sectors), and certainly in most approaches on which national policies are based, the company is treated as a black box and it is not recognized that a large part of economic growth in developed countries today is not related to R&D-activities, but to more complex processes within and between firms that are not captured by traditional R&D indicators. That does not mean that R&D-based innovation indicators are irrelevant, but that there is an increasing policy concern that we are measuring the wrong things and therefore, are not able to grasp the real forces of innovation as an engine of economic growth. All these macro-indicator sets consider inputs and outputs, such as expenditure on research or patenting as 'measures' for innovation, and largely neglect company indicators. It is *how* an organization spends money on research not how much it

spends that matters. It is not simply holding patents that matters but how relevant the patents are for the market.

Interestingly, several macro based indicator sets include the amount or intensity of venture capital investments in a country as a key indicator of innovative capability. This is based on the fact that countries that report high venture or private equity investments also normally report high innovation activity in the business sector¹. But why is it so? Is it merely due to stronger access to early stage capital or is it due to the way venture capital and private equity firms work in terms of supporting, designing and organizing innovative activity? Our main objective is to climb one step closer to the internal processes and strategies of these investment agents, to understand and learn from their behavior

Almost all innovation policy measures aim at (and are justified by) the ultimate goal of job creation and economic growth. This implies that in measuring success at a project, company or cluster levels, one must have an idea of how the intervention can in fact contribute to program goals in the selection of projects (ex ante) and in all implementation phases of the programs (interim). We claim that there is a lot to learn from professional investors both in terms of their selection processes (identifying projects with a high innovation potential) and in terms of how they work with the companies on the road to achieving commercial success and higher efficiency.

Venture capital firms, large corporations with portfolios of innovation projects, business angels, etc. have a long experience in selecting and terminating projects based on both qualitative and quantitative criteria. We are therefore suggesting a more careful study of KPIs used by a carefully selected group of such agents VCs in the Nordic countries. Based on their assessments we conclude whether measuring techniques applied by these agents are also relevant for Nordic Innovation Agencies and their programs. Our hypothesis is that the VC tool kit and evaluation logic may – with some modifications respecting the heterogeneity of measures, economic sectors and firm sizes – be applied in a vast majority of existent and future innovation policy measures.

Based on our review, we argue that good KPI indicators of innovation programs should address stronger the following problems with many existing innovation program indicators:

- They do not focus sufficiently on the essence of innovation management. Most importantly, indicators should capture a milestone strategy, where proofs of concept, proofs of technology, proofs of commercialization and proofs of profitability are in the center of managerial focus.
- They do not focus sufficiently on the three core aspects of earnings potential through three core elements of business innovation:
 - Appropriability: Will you be able to keep the gains from innovation to yourself
 - Absorptive capacity: Are you organized to improve your ability to learn effectively from the innovative environment surrounding you, including customers, competitors, suppliers and the knowledge institutions.

¹ van Pottelsberghe de la Potterie, Bruno & Romain, Astrid, 2004. "The Economic Impact of Venture Capital," Discussion Paper Series 1: Economic Studies 2004,18, Deutsche Bundesbank, Research Centre.

- Scale: Will you be able to apply the innovation to a large number of operations or customers with low marginal costs
- Organizational efficiency: Will you be able to develop and implement the innovation without affecting the existing organizational efficiency negatively?
- They do not focus sufficiently on innovation output, solely counting innovations, patents and alike. We need more focus on effects, like costs, revenues and profits. Innovation projects without costs are rarely productive. The innovation project normally ought to follow a J-curve, i.e. a time-line where costs exceed revenues in the first part, but positive returns in the second part. Many innovation programs are not designed to follow the projects or firms all the way down the j-curve and up again, lacking sufficient financial flexibility.

The three mentioned weaknesses are all focusing on core business parameters. They are truly focusing on **business needs**. They do however not stress the overall economic importance of innovation to society, yet innovation criteria that do not meet the business needs will only rarely contribute to improve overall social welfare, which is crucial for governmental funding. Many existing innovation indicators focus on the overall gains of innovation for society as a whole. In a context where you evaluate a public innovation program this is clearly important since public sector programs are to maximize wealth creation in society. Yet, unless firms find innovations profitable, the gains to society through knowledge diffusion, economic externalities, improved consumer surplus and access to shared resources rarely becomes significant.

Nordic Innovation Center is emphasizing that the indicators of innovation we need now must be *business needs driven*. We interpret *needs driven* as indicators that focus on business needs that must be satisfied in order to reach a higher likelihood of commercial success. If the program is able to identify these needs through a well-developed set of highly generic indicators, we have moved some steps forward.

The focus on business needs suppress to a certain extent the focus on overall economic effects. Yet, most often, a successful innovation in the business world generates revenues for the innovator and not solely for others. Moreover, if innovation programs tend to only support innovative activity where innovation appropriability and profitability is low, business incentives are slowly fading, which surely affects the willingness to innovate negatively. Furthermore, if innovation programs stimulate knowledge exchange and public goods production among firms (as is the case in cluster programs), private gains from participation should be positive for most of the program participants. Only then is the program needs driven.

Based on our review of innovation strategies and practices among professional investors, this report provides a kit containing four groups of innovation indicators that we believe will improve the performance of several innovation programs. The kit provides operational indicators within the fields of

1. Innovation management with a focus on identifying strengths and weaknesses in the management
2. The strength of ties to and cooperation with established industrial players and co-investors as a key to success

3. The need for more focus on core parameters for profitability like scale potential and market potential
4. The need for letting Programs be designed to easily scale the financing of projects, both up and down

Below, we summarize our indicator discussion in the form of a toolkit of innovation based key performance indicators.

Key performance indicator toolkit

Our review of selected innovation program indicators in the Nordic countries displays a clear lack of indicators focusing on innovation management. Operating such indicators requires a lot of resources because the quality of the management team is not always easy to reveal. Nevertheless, focusing stronger on the entrepreneurial team by mapping their experiences and their past successes will, according to the practices implemented by the professional players provide a better foundation for successful innovation projects supported by the programs. Notice also that management teams tend to change over time as central figures leave long lasting projects, and this may affect the likelihood of success. Hence, monitoring innovation management over time is also important, not only during the selection phase (ex ante indicator).

Innovation management

Key performance indicators

- 1 Project manager experience with innovation projects (number and size)
- 2 List of previous successful projects for all managers and entrepreneurs

The professional industrial players and investors are systematically searching for innovative cases that are strongly tied to larger industrial players through the value chain or through common goals. This indicator criterion is often viewed as a key parameter for obtaining commercial success. With strong interaction with industrial actors from early on, the potential for establishing profitable customer relations is enhanced severely. Innovation programs that are directed toward projects in the late prototype phase and the commercialization should consider excluding candidates that do not have established such relations. We believe that the success of the IFU/UFU-program hinges on this requirement, and more programs aiming at this phase should operate with similar conditions.

Innovation through industrial and investor network

Key performance indicators

- 1 Name of industrial partners that is involved or highly interested in the project
- 2 Name of industrial co-investors that holds a stake in the project
- 3 Name of representatives from potential user/customer of the product or service
- 4 Description of the relationship to this entities and their role in the project

The professional industrial players and investors rarely invest in innovation projects unless they have a clear potential for scaling. With scaling, we mean that you can produce a large volume of entities without significant cost increases. Consequently, average costs are falling sharply as volumes are increased. In some of the programs operating with more sophisticated innovation indicator parameters, this element is clearly taken care of. Yet, we have a clear impression that many

programs, e.g. focusing on the invention face, do not give sufficient attention to this aspect. Yet it is important for generating long term profitable innovations.

Innovation through focusing on profitability

Key performance indicators

- 1 A description of the technology or service focusing on scale potential compared to existing solutions on the market
- 2 A description of the business solution (model) that must be in place in order to reach the scale potential
- 3 Implement a shift in strategy towards more sector or industry focused programs that allow program managers to be more up to data on the technological and market related

The professional industrial players and investors are aware of their important role when it comes to controlling capital flows. This is especially important when innovation projects with a large potential becomes more expensive than first estimated. The structure of most innovation programs is tying the program managers with respect to allocating additional resources to good but expensive projects. Besides the limitations given by EU state aid policy, more flexible program structures may serve an important purpose in this sense.

Conversely, program managers should be more aware of the large number of innovation project failures. Such failures are not easily detected unless there is a strict milestone structure in the program. Based on the review of the program indicators, we suggest that more indicators are designed to follow up the projects on the road, increasing the potential for identifying innovation failures. This should be combined with increased attention on holding back grants and loans under such circumstances.

Innovation through financial management

Key performance indicators

- 1 Develop and apply more milestone based criteria for financing
- 2 Implement a program strategy where it is possible to scale the capital allocated to projects more freely. This includes allowing programs to finance innovation projects in tranches.
- 3 Based on the milestone indicators, utilize the potential for removing support to projects gone wild.

2 A SIMPLE MODEL FOR ORGANIZING INNOVATION INDICATORS

2.1 THE PHASE SPECIFIC INNOVATION APPROACH TO INDICATORS

Our analysis of key innovation indicators covers a wide range of innovation projects. Hence, it is required that we try to group innovation activities into groups of activities that innovation programs are focusing at. Simultaneously, the categorization should also capture the way professional industrial players and investors think of innovation. Below, we present a framework that we believe is applicable to solve these matters. The approach may appear as highly linear in terms of an innovation model, but it is not an innovation model, rather a grouping of projects according to their stages in terms of commercial development.

All kinds of innovations, whether they are new products, services, processes, business models, technologies or marketing, should from a business perspective be evaluated by their effect on performance – i.e. reduced costs or increased revenues. However, the problem is that the performance effect can only be evaluated ex post. Hence, there is need for a set of indicators that ex ante anticipates the ex post effects. Although innovation is not a singular process, it might be fruitful to connect the indicators to the steps that innovations go through – from the lenses of professional industrial players and investors. The main four steps are:

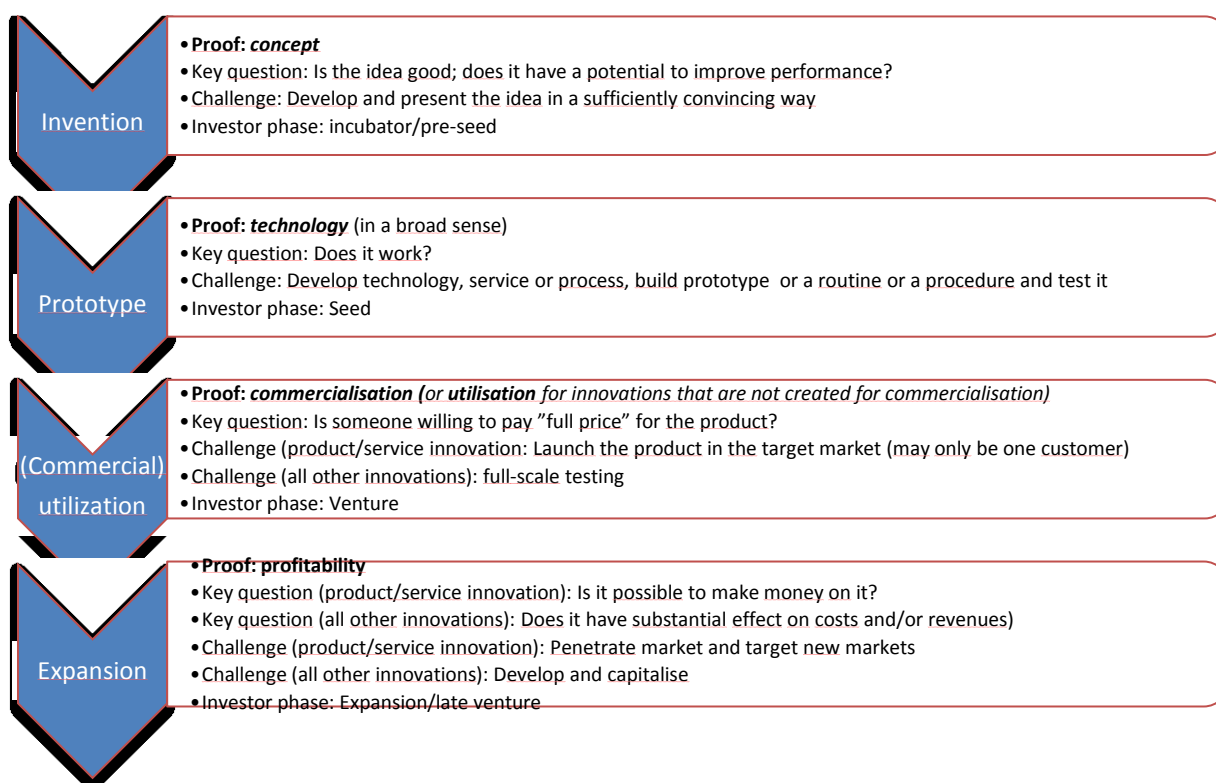
1. **Invention** – the creation and conceptualization of the idea
2. **Prototype**² – the development of the idea
3. (Commercial) **utilization** – the *commercialization* of new products/services, or the utilization of other innovations
4. **Expansion** – the process of transferring the innovation into new markets, or the process of implementing the innovation in the entire organization

In the figure below, key characteristics of these four steps are specified:

- the kind of **proofs** that investors or program managers need to ensure that innovation moves the right way on each step
- the **key question** that should be asked to evaluate the innovation at each step
- the main **challenges** that firms face on each step
- the type of **investor or program** that correspond with the step the innovation has reached

² A **prototype** is anything that helps communicate the idea: e.g. mock-ups, models, simulations, role playing, experiences (Clayton Christensen/Innosight). Prototyping early and often will save loads of time and effort. The goal is to get fast, insightful customer or end user feedback.

Innovation through phases of activity



These four steps are specified for commercial innovation tracks, but can easily be applied to other kinds of innovations, like new processes and new organizational forms. The third step, commercialization, can be translated to or understood as *full-scale utilization*, for example of a new technology or a new process. And the expansion step can be translated to further development and capitalization of a new process by implementing it in the entire organization. Thus, the model is highly flexible and open when it comes to interpreting different forms of innovation. The model is however less applicable to network innovations and systemic innovations where a large group of innovative players cooperate and develop innovations in networks.

2.2 INDICATORS THROUGH THE PROJECT CYCLE (BEFORE, IN ACTION AND AFTER)

What are innovation indicators supposed to tell us about innovation projects? Public sector innovation programs are designed to help innovative and economically viable projects that are in need of external resources that are not provided sufficiently by the market. Yet in order to help these projects in the right direction, program managers as well as professional industrial players and investors need tools along the whole cycle of the project. As we will describe in section 5, many program indicators are not explicit with respect to which part of the project they are aiming. In principle, the project and the program cycle can be split into three, along which separate indicators must be designed. Our tool kit containing key performance indicators for innovation programs state explicitly what part of the project the indicator is relevant for:

Before the innovation project is launched (ex ante indicators)

Indicators focusing on this part of the cycle should help the program manager to

- Search and select projects that fit the program
- Design an announcement strategy in order to communicate the program to the right group of projects
- Choose the right funding and resource fuelling strategy
- Build systematic experience on the success of the selection procedures
- Match the project with the right co-investors, industrial partners
- To Identify peers and mentors for the project

While the innovation project is active (in medio indicators)

Indicators focusing on this part of the cycle should help the program manager to

- Set up a necessary milestone strategy to measure innovation progress
- to ensure that all participants in the project are incentivized correctly
- continuously test the innovation project according to goals
- potentially contribute to redesign the management
- provide information that gives support stop the funding or eventually stop the project

After the innovation project is finished (ex post indicators)


Indicators focusing on this part of the cycle should help the program manager to

- Evaluate output from the project in terms of
 - value added and employment
 - Profitability and market capitalization of the project
- Identify the numbers and value of patent, licenses and alike (IPR)
- Evaluate the value of strategic alliances,
- Evaluate the long term firm internal and external effects (external to the firm)
- Evaluate Contribution to knowledge society
- Map the relevance of the program in the aftermath

3 INDICATORS IN EXISTING NORDIC INNOVATION PROGRAMS

In order to map and understand how public innovation programs may learn from the innovative strategies and processes that professional investors and industrial player apply, it is necessary to first dive into the present use of innovation indicators in existing innovation programs. Thus, in this chapter, we take a closer look at indicators that are used directly in the management of some selected innovation programs. In the Nordic countries there exist a large number of programs aimed at stimulating innovation. A recent survey conducted by Accenture for Nordic Innovation, identified the key characteristics of 120 innovation programs, with a wide variety of designs, objectives and types of resources available. Naturally, it is not possible, nor productive to discuss them all in depth. Consequently, we selected a set of programs that represent innovative activities at the different innovation phases described in the model above. To a large extent, we discuss the strengths and weaknesses of the indicators for each program.

In the figure below, we have sorted the programs according to their main focus area with respect to innovation phase:



	Type of program:	Programs covered by the study		
A	Entrepreneurship	Etablerer-stipend (Innovation Norway)	Forny-program (The research council og Norway et al.)	
B	venture and commercialization	Innovation loans (Innovation Norway)	Gazelle Growth programmet	
C	Dyadic relationship	IFU /OFU (Innovation Norway)		
D	Inter-nationalization	Navigator Program (Innovation Norway)	EIP/CIP program of the EU Commission	
E	Cluster building	Arena (Innovation Norway)		

Before we dive deeper into specific innovation programs, we give a brief review of the most commonly applied indicators based on an introductory survey of 120 programs in the Nordic region.

3.1 A BRIEF SURVEY OF INNOVATION INDICATORS FOR NORDIC INNOVATION PROGRAMS

As pointed out in several PRO INNO Trend Chart studies it is relatively rare that an innovation program is designed on the basis of a clear thinking of what is the intervention logic and what the result targets should be (ex ante targets). Most often the final shape of an innovation program is the result of compromises between several policy areas and domains.

We have made a brief survey of the different key performance indicators applied in approximately 120 Nordic innovation programs.³ The survey clearly identifies that the problem of intervention logics is present in many of these programs.

The most commonly applied indicators in Nordic innovation programs are based numbers of new products, patents, businesses or developments of new products and services. These are viewed as important output indicators because they measure the main result that can be reached in an innovation perspective and it is relatively easy to quantify these kinds of results.

Improved entrepreneurship capabilities, ability to attract private capital and project or firm survival rates are other goals that Nordic programs often apply as innovation indicators. Commercialization and breakthroughs in the market with new innovations or technology are other measures that clearly represent important goals and indicators for the different programs in Nordic countries.

In several programs, there is also a focus on internationalization. Commonly applied indicators are international breakthroughs and cooperation in international market.

Cooperation between enterprises and cooperation between research institutions and smaller enterprises in developing new products and services is often applied as indicators along the road in several programs. New partnerships between research institutions are also often treated as a measure or indicators of success.

In some programs, improvement in recruitment, attractiveness for the enterprise, increased job satisfactions of employees as well as higher salary for participating individuals are KPIs that is harder to measure but mentioned in programs from all the Nordic countries.

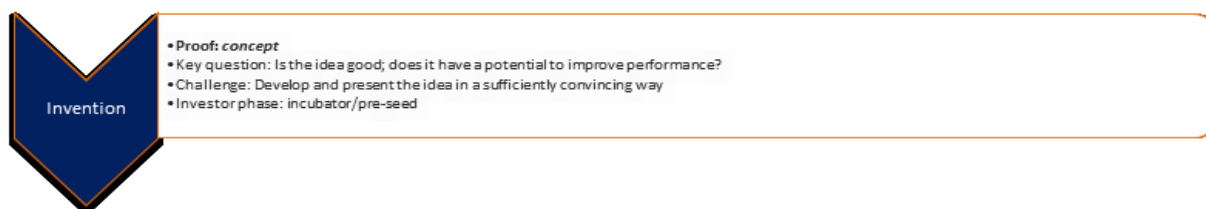
Among most cluster based innovation programs increased interaction between enterprises is a common although relatively unclear KPI for innovation. It is slightly unclear how this interaction is to be measured consistently.

From a country specific perspective, we like to highlight the following differences: The two largest in programs in Norway (user driven R&D grants, BIA and SFIs) apply more vague KPIs compared to the other Nordic countries. Where similar programs in other Nordic countries tend to focus on quantified results as number of patents, development of new products or services, these programs in Norway focus more on external effects and whether they have contributed to a systemic innovation process or innovation in a research network. R&D cooperation appears to be a type of central indicators in these programs. Sweden has one large program, ALMI foretagspartner, where one of three performance indicator is the number of new companies that started with ALMIs help and their

³ The survey briefly sums up the mapping of the Accenture study on innovation programs in the the Nordic countries, focusing on the use of innovation indicators

survival rates three years after the start. Several programs in Denmark focus on quantifiable results as new products, production processes, commercial success, increase profit and research and innovation of international standards (e.g. cited in acknowledged journals). Finland runs a large number of smaller programs which operate with more specific sector and technology development goals that consequently also dominates the innovation indicator sets.

3.2 THE NORWEGAIN FORNY PROGRAM



In terms of the indicators for Nordic innovation program evaluation, this innovation programme is within the invention phase, whereby ideas arising from research are assisted in the phase towards commercialisation.

This programme was established by the Norwegian Research Council (RCN) in 1995 to assist commercialization of good business ideas from academic or research environments. The funds available to the programme vary from year to year, but from its modest beginnings in 1995 with a budget of NOK 27mill it has developed steadily, and in 2009 the budget was NOK 127mill. The information presented here is based on interviews with three members of the programme management from RCN, various documents they provided and an evaluation report produced in 2009 (NIFU) when the whole FORNY programme was evaluated.

The way in which this programme supports commercialisation is by financing Technology Transfer Office (TTOs). These TTOs can apply to the FORNY programme for funding for up to 50% of their operating costs. These TTOs then find the promising ideas in their local research environments and support them until they are commercialised. Once a new company is established the people involved will no longer receive support from the TTO or the Forny programme, however the firm will still be monitored by the program. They have been monitoring growth and revenue of all the firms they have financed since 1995. The programme documentation states that in order to be successful, the programme should produce the potential for value creation and increased welfare for Norway.

The programme received some criticism in the evaluation carried out in 2009. The main criticism was that the broad aim of the programme was not being addressed sufficiently by limiting all activity to TTOs and ignoring other forms of technology transfer. The evaluation points out that that in relation to the sum invested few high growth firms were created.

The measurements carried out within the programme fall into three main groups:

1. Monitoring of performance of TTOs
2. Reporting on results of the entire programme
3. Estimating the potential of the “ideas” presented for commercialisation (Proof of concept)

Monitoring performance of TTOs

The program finances the basic costs of running the TTOs. This investment is followed up twice a year whereby the TTOs fill in a standard form. The data is mainly quantitative and most of it is independently verifiable. The data following data is registered:

- Number of courses and training of employees(in research institutes) on commercialisation
- Number of meetings with researchers
- Number of women involved
- No. of good ideas registered
- How many concepts in the pipeline
- No. of patents in Norway & abroad.
- No. of firms established
- No of licences

The TTOs also measure annual performance of projects (i.e. new firms created) after commercialisation:

- Income from sale of shares
- Income from licences
- Revenue
- Salary costs
- No. of employees
- Industrial partners or pilot customers
- Other forms of financing

In addition to the twice yearly report, the TTOs also send in more detailed data on each of their commercialisation projects. This is registered in the incentive form. This data is registered in a database and entitles the TTOs to a reward, in terms of extra funding. This data is not used directly to monitor the TTOs, but some of the data e.g. on industrial sectors are used to monitor the results of the programme.

Monitoring the results of the programme

The results of the whole programme are monitored by the management team at RCN. They take the data registered by the TTOs and the more detailed data registered in the incentive form.

- Number of new firms established
- Number of licenses registered
- Number of employees in the new firms
- Revenue growth in the new firms
- Number of patents

Perceived effect of the programme

Questionnaire sent to firms who have received funding asking how important the Forny programme was for their success. This is not measured regularly.

Verification or Proof of Concept

Projects already receiving support from the programme can apply for additional funding to cover the costs of a verification process often including testing and prototyping. The application process is competitive. Although most of the data registered is qualitative, it is based on standard set of guidelines and each project is given a ranking value for each section of the evaluation and each of these is weighted to give a final ranking. The data registered is:

- description of the technological concept
- commercial potential
- property rights
- competence of the applicants
- activity plan
- budget
- proposed sources of funding

Ranking (1 – 7)

Technology or idea (How innovative, patentable, research-based?)

Project plan (Quality of description, realistic budget, measurability of milestones)

Feasibility (technological and commercial competence, contact with industrial networks, own capital, probability of commercialisation within estimated timeframe)

New indicators under consideration

The programme management team have responded to the earlier evaluation and to feedback from firms, TTO and government. Based on this they are revising their use of indicators and have created a project group to look into this.

The work of the TTOs

The TTOs use their funding from RCN to actively search for promising groups of researchers and offer them courses in an attempt to make them aware of how research may be commercialised. The TTO follow-up course participants who are then encouraged to develop a concept for commercialisation. During this phase the TTO offer commercial expertise and a network. The most promising ideas receive funding for further work. During this phase the TTO continue to provide expertise on patenting, licensing and profiling, market analysis and business plans. The contract between RCN and the TTO includes certain quantifiable aims to be fulfilled during a one year period; these differ depending on which TTO, but follow the following format:

- Identify X potential new ideas
- Create X new firms
- Sign X license agreements

Challenges of measuring this programme

The management team in the programme are well aware of the importance of indicators. However they see their primary responsibility to report on how RCNs investment has been used and to follow up the more short term success criteria within the programme. Reporting of the impact of the programme on wealth creation and increased welfare in Norway appears to be a secondary concern. Part of this issues lies in the challenges of reporting the long term development of firms, long after they have left the FORNY programme. Not only is the time frame challenging here, but it is impossible for the programme management to know how much of the success of a high growth is firm attributable to the support is received from the FORNY programme.

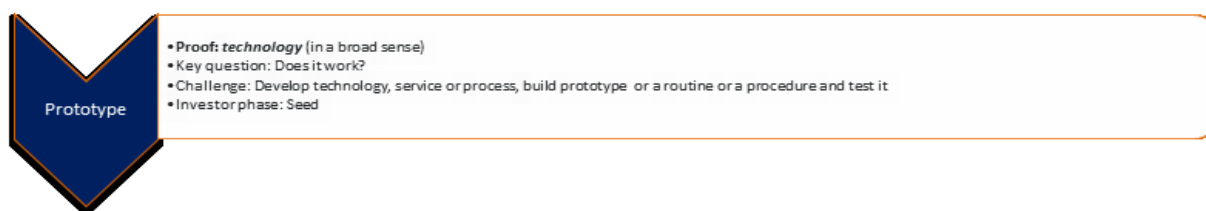
One of the weaknesses of the indicators in this program is that their main measure is the performance of the TTOs not primarily the performance of the new firms established. A TTO may be active and register many newly established firms and thus may perform well with regard to these criteria, but there may not be any growth or further development of these firms. Thus the programme may be efficiently managed and producing short-term effects, but not necessarily creating the values or increased welfare intended.

Another related weakness is that the TTOs are responsible for selecting, or finding potential ideas for commercialisation. RCN is not involved in this process and there are no central criteria for selecting ideas or for estimating the business potential of an idea. The initial potential is not registered in any quantifiable way, or in any way that could be easily aggregated to give a picture of the innovation pipeline.

Other limitations are that the value derived from licensing is not estimated pr. firm or pr. product. They only measure the total sum for all the firms. Often there are many licences pr. firm or pr. Product. The value of individual innovations is not measured, i.e. it is not possible to see how much of a firms revenue came from the one innovation.

The verification process provides quantitative data which is compiled according to standardised criteria and provides potentially interesting data measuring number of innovations in the pipeline, number of innovations rated as 1 or 2 etc. in terms of potential. Unfortunately this data is not registered for all projects in Forny, only those who apply for verification and it is thus of more limited value as an indicator.

3.3 INDICATORS USED IN THE GAZELLE GROWTH PROGRAMME



This program was initiated in 2007 by the Danish Ministry of Science, Technology and Innovation. It ran until 2010 and was then adapted into the Accelerace program. The main difference between the

two phases is the Accelerace phase is targeted at younger firms. The same indicators are used in both programs. The aim of the program is to “offer start-up assistance to innovative and science-based small and medium sized companies, who can realize their growth-potential in the US –market” (Mid-term evaluation, 2009:3). The overall budget was €4,3 million and 40 Danish SMEs have received assistance from the program. In this respect, the program sorts under the prototype phase.

This text is based on information from an interview with program manager Petter Torstensen, the Mid-term evaluation and the presentation of the program overview.

How the program works

The Gazelle program is aimed at selecting knowledge-intensive SMEs with growth potential in the global market. About 10 – 15 firms are recruited in each six month period. These firms are chosen from about 50 – 70 applicants. The program consists of 5 workshops totaling 48 hours and the program management team function as facilitators. They give presentations on tools and methods; invite relevant investors and experts on international markets and other relevant themes.

When asked about indicators the program management provided a few, however when questioned about the process, it became evident that a lot of data about the firms, products, growth potential and results is measured and logged in a systematic way throughout the program.

Initial indicators:

Growth potential – ranking 1 – 5 (based on investor and program management evaluation)

Proof of concept – based on the evaluation of investors and the program management team. This stage includes an assessment of the firms’ ability to replicate the current business model in the proposed new market.

Proof of technology – based on interviews with customers, not quantified (usually registered in terms of issues to be resolved or suggestions for improvement).

Monitoring during the program:

During the program the management team checks that various outputs are produced:

- Validated international value proposition pr. project – document, which must be approved by investors
- International growth plan pr. project- document, which must be approved by investors
- Accomplishment of milestones pr. project

At program completion

Various checks are carried out for all firms completing the program and the following is registered:

- The market plan is evaluated by investors. (Based on the question “if this firm did what they are suggesting, would it be a good investment”).
- Final report - During the last camp each firm works with the experts to come up with an estimate for their growth potential in terms of DKK and number of employees.
- New ranking of growth potential 1 – 5 (Carried out by management team & investors)

- New insights developed during the course of the program – based on reflecting over changes in business plan presentation (video). Qualitative.
- New insights developed based on systematic analysis carried out by PhD students. (using video, slide show, progress reports and interviews). Qualitative.

Medium term measurements:

12 – 18 months after completion of the program. The management team analyses the financial reports from the firms and interview them to check the following:

- Nr. of firms which have raised funding in form of venture capital or other forms of finance
- Amount of funding raised

This is based on the idea that long term growth is dependent on mid-term investment and feedback is given to the firms. This medium term measurement is also used to measure the success of the program.

Long term measurements:

From 2 to 5 years after completion of the program, the following quantitative data is registered. It is based on financial reports from the firms and on interviews:

- Growth in no. of employees
- Growth in revenue
- Changes in export portfolio

In addition to these measurements a questionnaire is sent out to the SMEs 4 times during the program asking them to rate the program in terms of usefulness. How does the program provide business success for your firm?

The mid-term evaluation of the program (Rambøll, 2009) highlighted the issue of embedded knowledge and suggested that the program consider a way of measuring knowledge acquisition. The program management team responded to this by making videos of the presentation of the business plans at the beginning, middle and end of the program. The SMEs are then asked to reflect on the changes and try to classify their learning in terms of:

- Technology
- Customer
- Market
- Organisation

In addition to this, two PhD students joined the program to analyze all reports, presentations and annual reports for each firm and write a report on their development.

Based on this the management team try to assess knowledge development during the course of the program.

Reflections on indicators in the Gazelle program

It is not possible to link growth in revenue or growth in export to one particular innovation, at the moment this is only measured at the level of the firm. There seems to be no consideration of appropriability and if this might be affected by venturing into a new market, however issues of this kind may be included in the individual growth plans and market plans and are not quantified. The program has reacted quickly to the suggestions of the mid-term evaluation and has found a novel solution in their attempt to measure the development of embedded knowledge. The program relies heavily on the knowledge and experience of investors as well as business consultants. This may have given the program some valuable external knowledge which has been used to develop the standard measurement of proof of concept.

How the indicator data is gathered during the program

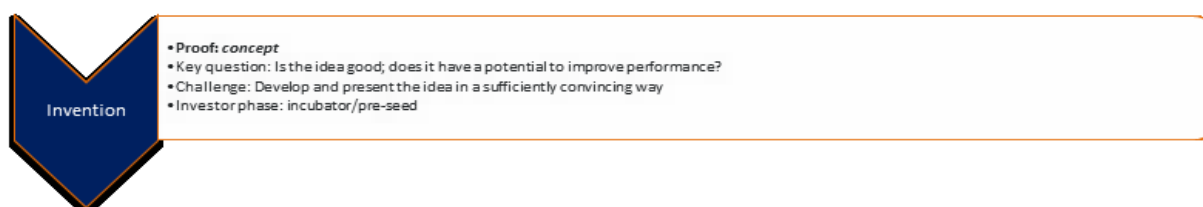
After successful completion of the screening process the 10 qualified SMEs go on to the strategic planning phase. During this phase they attend a “camp” where they present their business idea. This presentation is videoed. The presentations are evaluated by a group of investors and they are given a ranking on their potential for growth in the global market “Proof of concept”. The main criterion used by the investors is “will this firm be a potentially interesting investment?” This phase results in a document called the value proposition where the value of the current value of the product is described and quantified.

The next stage is the market analysis, where the ideal customer is identified and this is followed by the go-to-market phase when the operational strategy is decided. During this phase the program management is contacted with the firms on an almost daily basis. Coaches and various experts are brought in during this phase and their involvement is adjusted to the needs of each SME.

The discussion with the investors is documented and partners approve the content before going to the next stage.

Embedded knowledge – based on a qualitative evaluation by the SMEs and the PhD students working with the program management.

3.4 INNOVATION NORWAY: COUNTRY WIDE ENTREPRENEURSHIP GRANTS (LANDSDEKKENDE ETABLERERSTIPEND)



The country wide firm entry grant is a program dedicated for start-up firms or even development of ideas for a firm. Hence, it sorts primarily under the invention phase but may also touch the prototype phase. The grant can cover as much as 50 percent of the costs related to the start-up phase, such as

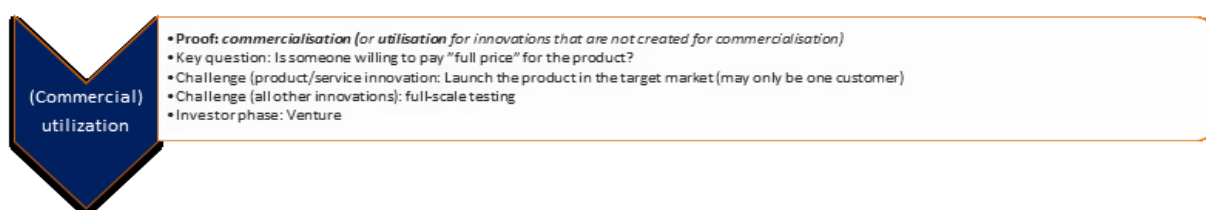
wage costs, consultancy, smaller physical investments etc. Innovative firms with significant growth potential are a prioritized group. In 2011, 20 MNOK was dedicated to this program.

One specific prerequisite is that the firm as a legal entity can be no more than five years old. Similar to the innovation loans the application for the firm entry grant must contain a description of the business plan. Furthermore the project is assessed by Innovation Norway, and rated on a 1-6 scale along parameters such as:

1. Ability to go through with the project (human resources)
2. Potential profitability (Quality of business idea, Market potential, Competitiveness)
3. Corporate social responsibility
4. Operational risk
5. Ability to attract additional private capital

The firm entry grant is the only program for firms in the very early stages. It can be a valuable help for many entrepreneurs with good ideas and lack of capital. Taking into account that there are thousands of startups each year facing the same startup problems, makes it however hard for such a financially limited program to target firms which are potential champions. On the other hand do you not need many successes to make up for the money invested in the program.

3.5 INNOVATION NORWAY: INNOVATION LOANS



One of Innovation Norway's largest applied and most successful programs for giving financial support to innovative commercial projects is the "innovation loans". In 2011 the program was given a total of 500 MNOK for lending out to innovative projects. The innovation loans are so called top-up loans, which means that they have lower priority than other loans provided by private banks. The innovation loan functions as a risk buffer and makes it easier for the firm to attract additional loan capital from private capital markets.

The innovation loans can amount to as much as 50 percent of the capital needed in the project, and loans are not given for the purpose of financing the firm's operating costs. The repayment period is normally not more than 10 years although both interest-only and no interest periods can be arranged. If the loan is linked to a specific project as much as 50 percent of the loan can be forgivable.

The applications for innovation loans must contain a detailed description of the project's business plan, including market position of the firm, explicit ambitions for growth and internationalization, cost structure, product development and financial situation. Based on the information from the

application the project is assessed on a wide set of parameters to which Innovation Norway assign a score from 1-6. The projects are categorized according to its overall aim, which can be:

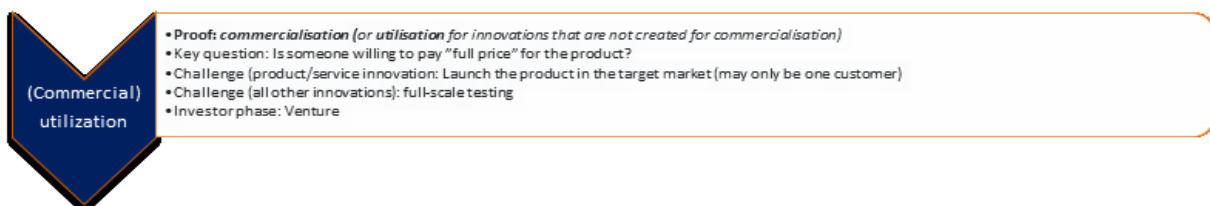
- Innovation (international level, national level, industry level, firm level)
- Increased capacity
- Structural adjustment
- Environmental improvement
- Strengthening financial position
- Improving competence
- Increasing efficiency/rationalization

The most common for the loan application being refused is, according to Innovation Norway, that the overall project risk is assessed to be too high. This may be due to unrealistic budgets or project plans, lack of competency with management or board members, unfavorable market conditions or lack of equity. The most important parameters here are Innovation Norway's assessment on the firm's

1. Capability to implement
2. Operational risk (e.g. liquidity risk)
3. Expected profitability of the project
4. Extent of guarantees for loan capital

The Innovation loan is suitable for firms which are already past the first commercialization stage and can handle loan payments through cash flow through running operations, but which have an innovative project which is perceived as to risky by the private capital markets. The fact that the loan mitigates risk and the same time as it only provides the top-financing of the capital needed is a good way to attract private capital to the project, which in turn is the acid test of whether the project is believed to turn out profitable.

3.6 DYADIC PROGRAMS: IFU / OFU-PROGRAM OF INNOVATION NORWAY



The Industrial Research and development Program is a strategic grant scheme offered to the industry and the public sector. The objective is to promote the development of new products, services and solutions for both the national and international market. The programs are dyadic, which means cooperation between developer/ supplier and customer/commercial partner explicitly required. This is highly important, since it requires a form of commercial proof in terms of a willingness of a customer to engage in an innovative project with the supplier. The commercial proof is something we return to in chapter five.

These programs were unique in a Nordic context up until recently. They have a long track record and were established already in 1993. In the period between 1995 and 2010 two billion NOK have been granted different dyadic partners. The results of the projects have displayed overall high additionality and a commercial success rate of 44 percent, which is no less than impressive. In additions, has there been a high success rate for early phase projects. The program has attracted several private sector innovation agents that invest in innovative companies. An example is Viking Venture, a venture capital fund which has backed and owned several IFU/OFU-projects. They have participated in several investments project and have very good experience with it as a means of promoting innovative projects with a successful outcome.

Indicator data and case studies available

There are a lot of indicators which can be used to evaluate programs like IFU/OFU. In the last evaluation conducted by ECON (2008), the following indicators were applied to map the results of the projects:

New product or service in existing market, entering new market or entering international market, new internal knowledge, increased R&D or sales ratio, cooperation (with commercial and knowledge partners), increased sales or export, project effect on R&D or Innovation, project success overall, newsworthiness of product/service, patenting of product/service, revenue growth versus grant, contribution to knowledge growth, value creation versus industry peers, contribution to network development or collaborative relationships, contribution to strategic focus on innovation, collaboration and knowledge growth, and last contribution to the company's position as an innovative and attractive business.

Indicator weaknesses

In every evaluation there will be some weaknesses, and there will always be something else that could have been measured.

The large weakness in Econ (2008) is that the evaluation does not include measurement of profitability. One of important point in making programs like IFO/OFU is to create new opportunities for new business in the future, and not including profitability makes the indication of success of a project less valid.

Today most indicators are questionnaire-based. Some are performed as qualitative or semi quantitative interviews. One of the challenges with these kinds of interviews is that they are not independently measurable. Another challenge is that the respondents may also have vested interest in the outcome of evaluation, and this is especially hard to catch when the evaluation is performed only with interviews.

Other types of indicators can be based on financial analysis. This gives a quick answer, but do not always give the full picture of the situation. Some project will have a lag before the revenue on an investment or innovation comes, and this kind of information will not a financial analysis include.

The last more generally challenge is that there is not much focus on matching *program* evolution indicators with *project* management indicators on firm level. These are indicators such as proof of concept or business model, proof of technology and commercial potential. And indicators used in the

evolution are not necessarily applied in the operation of the program and continuous assessments of the project portfolio. This makes the results from the different sources less comparable.

3.7 SELECTIONS PROCESS IN THE CLUSTER DEVELOPMENT PROGRAM ARENA

This program is relevant for all innovation phases.

Arena is a Norwegian national program for long term development of regional business clusters. The objective is to strengthen the clusters innovative ability through a stronger and more dynamic interaction between the industry, R&D institutions, universities and the public sector. The interaction is to be long-term, goal-oriented and focused on innovative collaboration, international awareness, access to knowledge and new business.

There has been some development in the criteria for different projects. In 2003 the applications process emphasized that each project had an interesting approach, a wide combination of enterprises and an innovation environments with a large innovation and growth potential. The different project in the Arena program should have processes going on with different maturity levels and the committee had a focus on dispersion on region and industry. However, spread according to regional and industry should not control the search for new projects.

The main criteria in 2003 were that projects had to have cluster or innovation system characteristics. The projects should also be based on interaction between industry, R&D and public actors and on a regional partnership. The projects were based on the assumption that a public interest (the Arena) may reduce barriers and stimulate the processes.

In 2007 some of the selection criteria changed and became more specific. Each project had to have a resource foundation. There had to be a certain amount and concentration of businesses within an industry or value chain, relevant R&D activities and education, relevant government development agencies and a labor market with relevant/specialized expertise within the field.

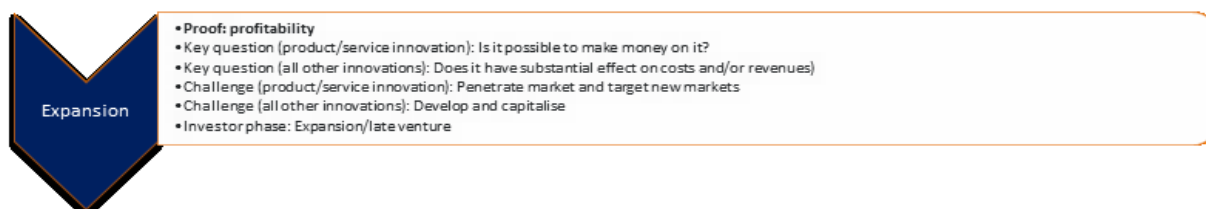
The relationships and foundation between the participants in a project would preferable have identified common interests between the participants, co-relations between firms, co-relations between companies and expertise and development actors, a foundation in regional development strategies and partnerships and have a plan for collaboration with other programs and funding.

If a project is to pass the selection process there has to be a willingness and ability to binding participation, realistic and ambitious goals and a budget and financial plan. There must also be a relevant strategy and activities based on cooperation and interaction between actors. The project management must be of high legitimacy and good qualifications and the project must have the ability to trigger, enhance or accelerate the development processes.

In the application the applicant must show that the project has development potential such as growth potential for the cluster within a specific market or area of expertise and the project's contribution to realizing such growth.

Applicants which fulfill the addition criteria such as projects based on collaboration between actors from different sectors or areas of expertise, within new industries or sectors in an early development stage and based on industries or areas of expertise with high female participation are given a positive assessment

3.8 NAVIGATOR PROGRAMME



In terms of the needs driven indications for Nordic innovation program evaluation, this innovation programme is within the expansion phase, where SMEs want to expand into a new market.

This Navigator programme was established in 2009 and is managed by Innovation Norway (IN). The aim of the programme is to improve the internationalization process of Norwegian SMEs and help them to achieve success in new markets. The way this is done is by helping the firms to develop the necessary competence, working with them to help them set realistic goals, helping them to access appropriate market information and by helping them to develop an international network. The firms do not received direct economic support from the programme. They benefit from the services of experienced consultants, participation in workshops and visits abroad. The firms have to commit themselves to a certain number of days dedicated to the project and pay a fee to participate in the workshops.

The programme is organised in groups and a group of ten firms comprise one project. Each project runs for a year and includes 4 to 5 workshops, one of which is abroad. The intention is that the groups should come from the same geographic area in Norway or from the same industrial sector and that preferably they should all want to break into the same new market (these are not absolute rules). At time of writing there are 100 firms registered within the programme, but only one project (10 firms) has been completed so far.

Example of programmes: Navigate to Asia – this project was recently completed. It consisted of 10 firms from the around the Oslo Fjord, all were SMEs and were within the ICT, micro/nano sector. Other programmes starting up are related to seafood and green technologies.

The measurements of this programme are divided into three main categories:

1. Potential for international growth
2. Results of programme
3. Perceived effects of the program

Potential for international growth

The potential for international growth is assessed during the first selection phase. Potential participants are usually selected by the regional offices of Innovation Norway. All firms go through a short evaluation process before they can participate in any of Innovation Norway's programmes. Various checks are done for example that the firm has a strategy and their participation is approved by the relevant stakeholders. These are registered in terms of Y/N answers and are grouped under the following headings:

Is the firm willing?

Is the firm able?

Is the firm ready?

The next stage of the evaluation of potential is carried out during the first workshop where a "situation analysis" is produced. This initial evaluation is normally carried out with a local consultant, with business expertise. The document should contain measurable targets, such as:

"Improve sales margin by X% within the next two years"

"Secure sales of about X tonnes of X per week"

A profile of the company's strengths and weaknesses is normally developed during this process. The document produced at this stage is particular to the firm and there is no ranking of potential.

Results of the programme

Indicators developed during the programme:

- Expected % growth in revenue pr. firm
- Number of contracts achieved in a new market
- Number of firms established in new markets

Results measured after completion of the programme

- Actual growth in revenue pr. firm
- Growth in export pr. Firm (not yet sure how exactly how they will measure this)
- Firm survival over time compared to other firms in the same sector

Perceived effects of the programme (qualitative data, based on questionnaire sent to participants)

- Satisfaction with program
- Growth of network
- Evaluation of the importance of contacts
- Firm's investment in research initiatives
- Evaluation of own competence development

Challenges with indicators from the Navigator Programme

The programme managers were aware of the need for indicators, particularly for innovation. However they were grappling with more fundamental problems such as trying to get the firms to embrace a common view of what innovation actually is.

Another obvious weakness with this programme is that it has only existed one year and it is therefore too early to be able to say how successful the firms have been in expanding their markets.

Based on this brief analysis it would appear that the internationalisation phase is embarked upon without any kind of rigorous testing or any attempt to quantify “proof of technology” or similar kind of measure relating to the product or service being marketed internationally. Some quite detailed information relating to the product or service is sometimes included in the situation report, but this would be more useful as an indicator if it were quantified.

There does not appear to be any focus on appropriability (will the firm be able to keep the gains of the innovation) nor is there any obvious focus on the consequences of up-scaling although the Situation Analysis does include a brief analysis of consequences for the organisation.

There is no focus on measuring innovation output or the growth resulting from these particular innovations in the international market.

A lot of potentially useful data is registered in the situation report, but mostly this is qualitative. Although the report follows a standard format, it is up to the consultant how he/she uses the form, making it very subjective. The advisors assisting firms in compiling the situation analysis all have business experience, but this responsibility is regionally distributed and it is uncertain if these advisors are a homogeneous group.

The statistical department in IN have reported that programs giving grants or loans to firms have a much more detailed system of reporting results (see our reporting on start-up grants and innovation loans). It is normal that they report expectations in terms of potential growth (graded 1 – 5) and later that effects of the programme are measured by external consultants using a questionnaire including measuring revenue growth and export revenue growth.

Background information about the stages within the programme

After acceptance in the programme the firm may need to wait some time before there are enough other firms to start the project. At the first workshop the participants work on developing a common understanding of the term “innovation”. They also develop a “Situation analysis” of their own business. This analysis is done in writing and registered electronically. A local consultant assists the firms in developing their situation analysis. This document contains information on the firm including turnover and market share in the countries where they are currently represented as well as future plans for internationalisation.

At the end of each workshop each firm has to suggest a realistic aim for revenue growth. This is updated after each workshop, but this is not measured until more than one year after the project is completed.

At the end of the programme the project manager completes a project report where the aim is to report the number of companies who have established themselves in a new market and the number of contracts achieved. The growth in the revenue of the firms will also be measured and reported. A couple of years later IN will invite external consultants to carry out an analysis of these firms including their survival and growth rate in relation to other firms in the same sector. They also intend to follow up the presence of these firms in new markets by checking the registers of INs offices abroad. They intend to use Questback for a period after the programme. There is no measurement of growth related to a specific innovation. There is currently no measurement of the programmes contribution to export revenue, but IN would like to measure this in the future.

The companies participating in the programme have full access to all reports and documentation, but no reports are developed specifically for them.

3.9 EU ENTREPRENEURSHIP AND INNOVATION PROGRAMME (EIP)

This program is one of three programs under the EU Competitiveness and Innovation Framework Program (CIP). It has a wide mandate and thus covers all innovation phases, yet with less focus on the invention and expansion phase and more focus on the mid-phases.

The main aim of the CIP is to “contribute to the enhancement of competitiveness and innovation capacity in the Community, the advancement of the knowledge society, and sustainable development based on balanced economic growth”. The EIP program has a budget of €2.17 billion for the period from 2007 to 2013. The main objectives of the EIP program are:

- To facilitate access to finance for the start-up and growth of SMEs and encourage investment in innovation activities.
- To create an environment favourable to SME cooperation, particularly in the field of cross-border cooperation.
- To support eco-innovation
- To promote an entrepreneurship and innovation culture
- To promote enterprise and innovation-related economic and administrative reform.

For the purpose of analyzing the use of indicators we have concentrated on the eco-innovation initiative. The ECO-Innovation initiative cuts across industrial sectors and offers funding to turn early stage ideas into commercially viable products. These can be products, processes or services which are expected to boost economic growth and protect the environment. Funding is available in the form of grants of up to 50% of project costs and applications from SMEs are given priority. Support is given to projects on their first application to market or market replication projects. Projects are expected to last around 36 months. The technology should already be demonstrated, but due to risk, not yet penetrated the market. “Projects must be environmentally beneficial, innovative and economically viable in the medium to long-term”. The other requirements to secure funding are based upon technological requirements related to the eco-effects of the product or service. The first projects started in 2008 and the first one will be finished in 2011. The total budget for ECO-innovations for 2010 was € 32 million.

In the eco-innovation initiative, the gathering of data for monitoring purposes is done by financial intermediaries. The indicators for eco-innovation differ from the other EIP indicators, in that they are broken down by industrial sector. Program management is very aware of the need to produce useful indicators for all parties including the firms participating. However they are also aware of the administrative burden for the SMEs. The challenges mentioned by program management were:

- Measuring long term impact (contracts with firms ensure that they continue to report results for two years after completion of the program)
- Aggregating indicators of environmental innovation. The reason this is so difficult is because of the different types of innovation. In some cases it might be relevant to measure CO² reduction in terms of number of tons, but for manufacturers of recyclable plastic packaging other measurement might be more applicable. The management teams are currently considering different ways of weighting this type of measurement in order to be able to give a meaningful indicator of the societal impact of the program.

Regular surveys of the participating firms are carried out and these have shown that in spite of the administrative burden, the firms find the requirements placed upon them actually help them to make better business decisions. For example they are asked to quantify market potential, expected benefits or the direct benefits related to a project.

Some of the existing measurements (monitoring indicators):

- Share of venture capital (VC) funds dedicated to eco-innovation (output)
- Number of SMEs in the clean technology sector that received new financing (result)
- Take-up of environmental technologies and eco-innovative activities (impact)

	Indicator	Nature QNT/QL	Type	Evaluation question	Data available
	Measure: Eco-innovation: first application and market replication projects				
1	Number of the eco-innovation pilot and market replication Projects	QNT	Output	Efficiency Effectiveness	Y
2	Number of the proposals received	QNT	Output	Efficiency Effectiveness	Y
3	Percentage of the projects for which, direct or indirect, the beneficiaries are SMEs	QL	Output	Efficiency Effectiveness	Y
4	Proposals covering at least two major economic sectors having high environmental impact and innovation potential	QL	Output Target	Efficiency Effectiveness	N
5	Attract around 150 proposals and select about 40 highly innovative and replicable projects	QNT	Output Target	Efficiency Effectiveness	N
6	At least 60% of beneficiaries are SMEs	QNT	Output Target	Efficiency Effectiveness	N
7	Environmental benefits linked to projects financed: e.g., achieving measurable reduction in the greenhouse gas emissions (e.g. CO2 in tonnes, waste in tonnes) and in the resource efficiency (e.g. raw material in tonnes reduced, water in litters, energy in kW/h)	QNT	Result Impact	Efficiency Effectiveness Added value	N
8	Economic benefits linked to projects financed: e.g. increased number of customers of the participating beneficiary, entering transnational markets (e.g. number of new countries in which solution is offered)	QNT	Result Impact	Efficiency Effectiveness Added value	N
9	Contribution of projects to innovation, e.g. increased spectrum of eco-innovative products, services and technologies on the market (e.g. existence of a new construction material offered through retailers), new clusters or joint ventures based on eco-innovations (e.g. number of companies involved)	QNT	Result Impact	Relevance Efficiency Effectiveness Added value	N
	Measure: Enterprise Europe Network - Environmental Services for SMEs				
10	Number of Network staff and environment consultants who followed the training (2009/2010)	QNT	Output	Efficiency Effectiveness	N
11	Number of local organisations with whom cooperation agreements are signed (2009/2010)	QNT	Output	Effectiveness	N
12	Number of SMEs participating in workshops (2009/2010)	QNT	Results	Efficiency Effectiveness	N
13	Number of SMEs receiving environment-related on-site services (2009/2010)	QNT	Result	Efficiency Effectiveness	N
14	Number of SMEs whose business has benefited from these services (2009/2010)	QNT	Impact	Efficiency Effectiveness Added-value	N
15	Documentation of good practices for 3 sectors of activity showing the potential advantages and improvements for all SMEs in these sectors (2010)	QNT	Output	Effectiveness	N

Source: Evaluation of indicators of the EIP Programme 2010:23

In addition to the above indicators the program management would like to include the following indicators in the future:

- Market share
- IPR per firm

An evaluation of the program was carried out in 2010 by the Centre for Strategy & Evaluation Services, in Kent, UK. In order to analyze indicators they developed the Intervention Logic of the EIP

program. Firstly problems and needs that are addressed by policy were defined; operational objectives for the program were agreed upon as well as global objectives. The ways of which various program initiatives would be expected to generate certain outcomes in the short and longer term were considered in relation to policy objectives. Based on the results of this process an analysis of existing indicators was carried out. They found that there were too many indicators, giving a confusing picture and many appeared to be ad-hoc, based on short-term management needs. The indicators changed frequently and the information needs seem to accumulate i.e. old indicators are not removed. They also mention the challenge identified in other programs, which is the short term nature of operational indicators and less regard for the long term policy aims of the program. They found that there were no common principles for the use of indicators and that the evaluation and impact assessment were based on general framework documents. They suggest a standard framework for indicators for the whole EIP program and in particular that indicators should “contribute to an assessment of the relevance, efficiency, effectiveness, utility, sustainability and European added value of the EIP.” They divide their suggested indicators into outputs, results and longer-term outcomes/impacts.

They found that some indicators were redundant and suggested the inclusion of many others as shown in the table below:

	Indicator	QNT/QL	Type	Evaluation question	Data source	Time Frequency
	Measure: Eco-innovation: first application					
1	Number of the eco-innovation first application and market	QNT	Output	Efficiency Effectiveness Relevance	EACI	Annual
2a	Number of SMEs participating in the	QNT	Output Result	Efficiency Effectiveness	EACI	Annual
2b	- % of which are start-ups		Output Result	Efficiency Effectiveness	EACI	Annual
3	Leverage effect of funding (Total value of projects supported/EC)	QNT	Output Result	Efficiency Effectiveness Added-value	EACI	Annual
4	Number of new and improved eco-innovative products,	QNT	Result	Effectiveness Added-value	EACI based on reports of beneficiaries	End of measure
5	New clusters or joint ventures created based on eco-	QNT	Result	Effectiveness Added value	Report of beneficiaries	End of measure
5	Total expected environmental benefits from the financed projects as reported by project beneficiaries (reductions)	QNT/QL	Impact	Efficiency Effectiveness Added value	Report of beneficiaries	End of measure
6	Economic benefits for project beneficiaries (increased number of customers of the participating beneficiary)	QNT	Impact	Efficiency Effectiveness Added value	Report of Beneficiaries or EIP evaluation	End of measure/ End of EIP
7	Feedback of beneficiaries of contribution of funding (added-value, additionality, relevance)	QL	Output	Relevance Effectiveness Added-value	Survey of Beneficiaries or EIP evaluation	End of measure/ End of EIP
	Measure: Enterprise Europe Network -					
8	Number of local organisations with whom	QNT	Output	Effectiveness	EACI	Annually
9	Number of SMEs participating in workshops	QNT	Results	Efficiency Effectiveness	EACI	Annually
10	Number of SMEs that received environment-related	QNT	Result	Efficiency Effectiveness	EACI	Annually
11	Feedback on provided service by SMEs benefiting (quality of service, contribution to performance)	QL	Impact	Efficiency Effectiveness Added-value Utility	Feedback survey through Network	End of measure
12	Documentation of good practices for 3 sectors of activity showing the potential	QL	Output	Efficiency Effectiveness	EACI	End of measure

Source: Evaluation of indicators of the EIP Programme 2010:50

The new indicators suggest the removal of some redundant indicators (4 – 6) relating to targets for indicators 1 and 2. They also suggest that the number of applications received should also be reported. They suggest more information on gearing including the ratio of the total value of the projects to total EU-funding committed. Program management supports the changes of indicators and already implementing them.

Indicators of the actual number of new technologies and products developed and the environmental benefits are suggested measured, not annually, but at the end of each evaluation period (2 to 3 years). Some are suggested to be collected from the projects receiving funding or in the case of nr. of products from the EACI database.

3.10 INDICATORS OF SERVICE SECTOR INNOVATION

The Nordic economies are dominated by services. Yet, so far, innovation programs have not explicitly focused on the specific challenges that service sector firms face in their innovation processes. And clearly, many service providers follow innovation paths and apply innovation strategies that differ widely from what is common among firms in the manufacturing sector. Thus, there is a need for understanding how such firms innovate and how one may measure their innovative activity through indicators. When you design a policy that stimulates innovation, it is important to know what innovation in service sectors is all about. And not at least, what are the most important drivers and obstacles to innovation in this sector of the economy.

Innovation in services is notoriously complicated to measure. In this section, we refer to a project that launched five central indicators resting on a new way of looking at service sector innovation. It has gained solid attention throughout Europe since it is the only attempt to identify fully operational innovation indicators for comparable groups of service providers.

In order to grasp the heterogeneity and specific characteristics of innovation in services, Menon (2010) has regrouped the standard industrial classification. Our five service groups: Problem solvers, assisting services, digital and manual distributive services and leisure services are consistently different with respect to how they create value for their customers as well as what and how they innovate. Among providers of distributive services, process innovations have generated strong productivity growth and thus lower transaction costs for the whole economy. Among problem solvers and providers of leisure services, product innovations have raised quality and enlarged product diversity, which contributes to larger consumer surplus and welfare.

We have developed five indicators of innovation in services which are designed to help monitoring the innovative patterns over time and across sectors. The share of firms that report innovations is probably the most relevant one. The amount of financial resources devoted to innovative activities is also important. The share of new services in total turnover indicates to what degree the innovators are able to commercialize their innovations. We are specifically focusing on market dynamics in the service sector as an indicator of innovative activity, and believe that this indicator says a lot about the innovative climate. A mobility index indicating how market shares shift between competitors says something about the industry dynamics driven by innovation.

A new typology of services designed for innovation indicator studies

When you provide a list of all types of services, from cleaning to telecom, and from dental services to shipping, you get struck by the heterogeneity. Our study shows a close resemblance between the heterogeneity of services and the heterogeneity of innovations in this sector. The innovations are driven by widely different motives, they are directed towards a variety of purposes, and they are affected by policy measures in different ways. We find that the way a service provider creates value for its customers, is highly relevant when you want to identify why firms engage in certain forms of innovation, as well as how policy measures affect the innovative activity. Thus, we construct a service categorisation based on the logics of value creation in this vast sector.

In the report, we define innovation as any activity that contributes to higher value added through renewal and improvements. Consequently, innovation in services basically covers all measures that contribute to higher firm profitability. To get a grip on how such measures contribute, you first have to understand what is special about services.

The logic of value creation in the service sector is linked to how different service producers create customer value. Keeping this in mind, we generate a simple typology based on services that display a large degree of similarity along the dimensions/characteristics listed above. Such a typology is helpful in understanding why and how firms innovate and how policy affects the innovative activity of firms. Our typology is based on the nace 5 digit nomenclature. Thus it is fully compatible with the existing industrial statistics.

The typology contains the following service groups:

Problem solvers create value by solving specific and unique problems for their customers. There is a low degree of standardization among these services. To a large degree such suppliers provide services that the clients are not able to produce themselves. Law firms, medical doctors, engineers, architects, and researchers represent typical examples of problem solvers.

Producers of **assisting services** generate customer value by taking over time consuming activities for firms and households that are easy to standardize. Security services and cleaning services are typical examples of such activities.

Producers of **distributive services** generate value through the facilitation of interaction between customers, for instance by selling goods and transporting commodities, passengers and information. A large sub-group of distributive service providers operate predominantly through digital channels, like providers of telecom services and financial services. Due to the large scale and productivity effects of operating in such channels, we split the distributive service providers into **digital** and **manual** distributive service providers.

Producers of **leisure services** generate values by stimulating the emotions, perceptions and spiritual experience of customers. Leisure services are highly heterogeneous and represent activities like sports, arts, entertainment, restaurant services and media services.

A comparison of the size of these five service groups in Norway shows that *manual distributive services* is the largest, employing approximately half a million workers in 2004. Problem solvers represent the second largest group, employing approximately 220.000. Growth wise, the problem

solvers have more than doubled the number of employees since 1980. Producers of assisting services and leisure services have also experienced strong growth; however the growth rates are slightly lower.

Producers of distributive services, on the other hand, have faced decreasing or stagnating employment. Yet, due to large productivity growth, the climb in value added has been pronounced. There is good reason to claim that the remarkable productivity growth among these producers has strongly contributed to bring the Norwegian economy into a more efficient state, and the absolutely highest productivity growth is found among the digital distributive service providers.

The differences between the five service groups can also be illustrated by firm size. Digital distributive service providers and assisting service producers are overrepresented among the largest firms. This is clearly due to the scale advantages driven by standardization. The presence of strong heterogeneity among problem solvers and leisure service suppliers curbs their scale advantages. Thus a smaller proportion of these firms become really large.

Innovation in services: A way to overcome market imperfections

Most producers of services have a pronounced incentive to overcome market related obstacles to trade which are especially relevant for the service markets. One way to overcome these market imperfections is to innovate. Yet, producers of services differ in many respects. Consequently, their commercial challenges and innovative strategies also vary substantially from sector to sector.

The search for a unique and highly demanded service is the main driver for innovation among service suppliers. More specifically, service firms cluster into two groups with distinctly different innovation strategies: 1) When services are neither separable nor possible to standardize, there exists a fundamental problem of information asymmetry. Customers will not be able to evaluate the quality of a potential supplier up front as well as ex post, since alternative solutions are hard to compare. This problem contributes to narrow the markets by cutting demand. Innovation among firms in this group will tend to focus on building reputation through e.g. total customer solutions that reduces the risk for clients. 2) When services are characterized by a stronger degree of separability and standardization, innovations are more geared towards process improvements. The innovation strategy among such firms will often focus on industrializing the services in order to gain from scale effects. A closer look at our service typology reveals a highly differentiated pattern of innovation among the 5 groups:

For the **problem solvers**, innovation is often the core activity. This is due to the strong focus on customer adaptation and tailor made solutions. Innovation surveys also indicate that problem solvers invest a relatively large share of their innovative activity on product innovations as opposed to process innovations. They focus on new solution, new diagnosis tools, analytical concepts and differentiating brands. We also find a stronger presence of organizational innovations in this group, where firms to a larger extent are concerned with skill development and optimal incentive schemes.

Firms that produce **assisting services** will aim their innovations towards process improvements. Such services have a lot in common with traditional commodity production, but have to a lesser extent been able to improve their processes through digitalization and industrial processing. To a larger

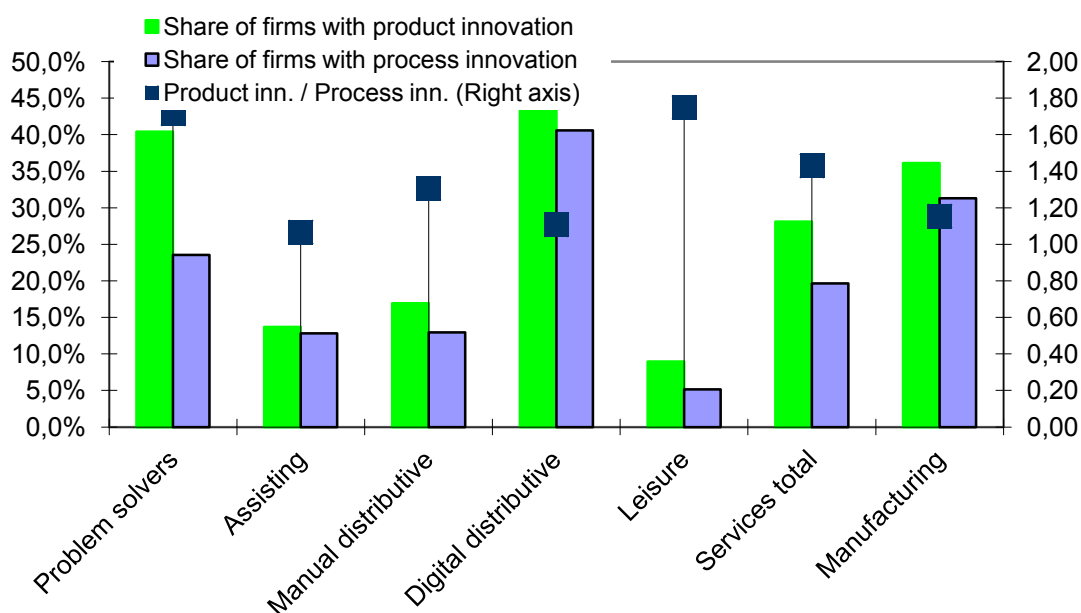
extent, process innovations in this group are linked to improved worker efficiency through standardization, quality control and scale effects.

Innovation among providers of **distributive services** is to a larger extent a question of how to reduce transaction costs between customers. This can be obtained through process innovations as well as new forms of distributive services, both in terms of new ways of distributing and in terms of what is distributed. Process innovations are often linked to digitalization and automation and are often focusing on a more efficient user producer interface. Integration of logistic systems is a typical example of important process innovations among transporters. When distributive services are attached with network externalities (the value of a service increases with the number using it), customer segmentation represents an important form of organizational innovation.

While consumers normally prefer that services are predictable and of a stable quality, they are actually often searching for the opposite when they consume **leisure services**. The aspect of surprise is what many producers of leisure services search for when they invest in innovation. New experiences (product innovations) are thus the most important form of innovation in this group. Leisure service providers are now increasingly focusing on the use and development of new technology, both in order to improve products and in order to reach out to a larger group of customers. New technology enables such firm to multiply their services, improve their storage capacity and simplify distribution. This is particularly relevant for providers of art, entertainment and sports services. Tourism services also tend to focus on organizational innovations that link several providers together in a network. This is due to the strong complementarity between leisure services and tourism services, which generates large challenges relating to how you coordinate tourism related services.

There is reason to believe that innovations and innovation processes differ between manufacturing and service firms, but more interestingly, they also vary substantially between the five services groups defined in our service typology. Figure 8 shows the propensity to conduct product and process innovations among the five service groups in the Norwegian economy. The green bars show that share of the firms with product innovations, while blue bars illustrates the share of firms with process innovations, and finally the dark blue dots show product innovations divided by process innovations. The figure confirms our discussion above. Among problem solvers and leisure service providers, product innovations dominate, while the opposite is true for producers of assisting services. The highest shares of innovations are, however, found in digital mediation. This explains the rapid productivity growth in this sector.

Share of firms with product and process innovation specified for the five service groups and manufacturing



Source: Statistics Norway, CIS3 and own calculations

We have conducted an empirical analysis of the innovative activities of firms, using the Community Innovation Survey (CIS3). The analysis shows that there are large differences between the five groups when it comes to innovation. On the aggregate level, service firms invest less in innovation as compared to manufacturing firms. However, this result must be handled with due care, since the differences between our service groups are large. For instance, the share of firms that innovate among problem solvers and digital distributive service producers is larger than the share of innovating manufacturing firms. On the other hand, the share of innovating firms sorting under assisting services and manual distributive services is significantly smaller. Leisure service providers are not often innovators, yet if they innovate, they spend relatively large resources on this activity.

Five indicators of innovation in services

In order to monitor how the innovation activity in the service sector develops over time, access to information on central patterns of innovative activity is of vital importance. An appropriate set of innovation indicators will help the planner in choosing the right measures to promote innovation. We have developed five indicators that utilize available statistics to map the most important features of innovation among service producers based on the following simplified model of innovation where the purpose of the indicators can be identified:

The indicators should be produced for each of our five service categories, but it is fully possible to provide indicators on a significantly more detailed aggregation level (five digit nace-level). We suggest the following five indicators as proper means to follow the development of innovative success in the Norwegian service sectors.

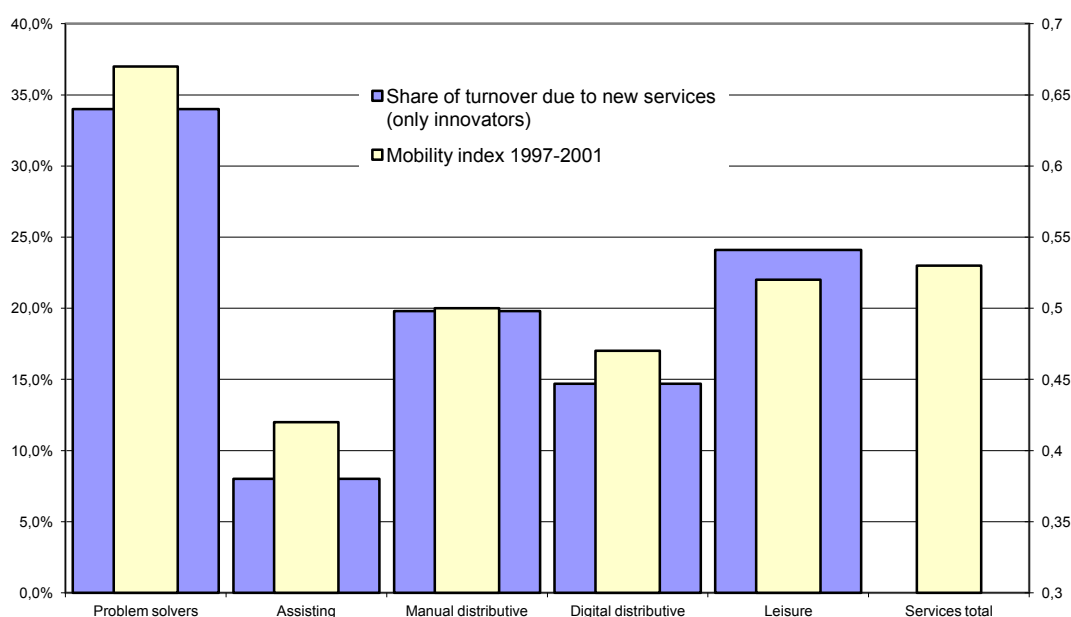
- 1) **The share of firms that invest in innovation activities (input indicator).** The ability to produce innovations is utterly dependent on the firms' willingness to invest in innovative activities. There is a strong positive correlation between the share of firms in a market or an industry that invests in innovation and the share of firms that actually innovate. The indicator should be based on statistics from the CIS which is provided every fourth year.
- 2) **Total innovation expenditure measured in NOK (input indicator).** The amount of innovation investments or the size of the involvement is of vital importance for whether a firm obtains an innovation or not. It is also important with respect to whether the innovation will provide higher productivity and profitability. The indicator should be based on available statistics, either from the CIS or from the bi-annual R&D statistics provided by Statistics Norway.
- 3) **The share of new services in total turnover (output indicator).** This indicator is closest to what most policy makers are concerned about. It is a clear advantage that this indicator also explicitly focuses on the commercial aspects of the innovative activity.
- 4) **Mobility indicator (environment and output indicator).** The degree of mobility within a specific market, measured in terms of changes in market shares between firms that compete in the same market, taking explicitly into account the entry and exit of firms, is strongly correlated to the amount of new services in total turnover, see Figure 10.

The mobility index is given by:

$$M_K = \frac{\sum_{i \in K} |m_{i,t} - m_{i,t-s}|}{2}$$

where M_K is the mobility index for industry K , and $m_{i,t}$ is firm i 's market share at time t . Thus the mobility indicator is a good output indicator. But it also says something about the pressure for innovation in a market, which is captured by the environmental factors in the model. The fact that this indicator can be provided on a yearly basis is a clear advantage.

Sales of new services and the mobility index



Source: Statistics Norway, CIS3, the MENON firm database and own calculations

- 5) **Growth in value added per employee (output indicator).** Productivity growth is one of the most important measures of how innovation contributes to economic wealth in the long run. Thus, this indicator is a highly important output indicator. However, the indicator is attached with a significant potential for measurement error, since some groups of services register high productivity growth (process innovators) while others contribute to economic welfare through large consumer surplus (product innovators). An optimal design of this indicator requires the implementation of a well suited quality adjustment measure.

4 INDICATORS AMONG PROFESSIONAL INDUSTRIAL PLAYERS AND INVESTORS

4.1 DO FIRMS USE INNOVATION INDICATORS?

The use of explicit and well defined indicators for innovation among companies that engage in innovation processes is probably not highly common. Many firms, especially the larger ones, operate with separate R&D, innovation or business development departments, yet that does not imply that they have formulated an explicit set of indicators that they use in advance of and during the innovation process. A large proportion of the more knowledge intensive companies also involve in constant innovation in close collaboration with customers, suppliers and possibly business allies. In these firms, the innovation process is a fully integrated part of their core activity (see for instance the problem solvers in the section on service sector innovation). If you ask them whether they operate with innovation indicators, many of them will not grasp the perspective underlying the question. It is like asking if they use indicators for their business.

Nevertheless, many companies make strategic considerations whenever they consider changing their strategy, by for instance moving into new markets, or introducing new services and products. Such strategic considerations are normally structured in some more or less systematic form and resemble to a large degree sets of indicators for innovation. In the business strategy literature, some strategic models are more commonly applied than others. Below, we briefly review the RINMA-strategy, which is widely dissipated among business strategist, and which is commonly believed to have been implemented in the mindset of a large number of firms worldwide. We also review a seminal article on the use of indicators among large firms written by McKinsey.

The RINMA-strategy of innovative activity

A company is likely to obtain superior returns in a new market if it possesses resources that can create a sustainable competitive advantage. Several criteria need to be fulfilled before the resources can actually generate a competitive advantage for an innovative firm. They need to be rare and critical in the new market as well as difficult to imitate or substitute. Furthermore, the company needs to be able to retain any value created. These criteria are conceptualized in the RINMA framework (Jakobsen & Lien 2001), inspired by and closely related to the VRIO framework developed by Barney (1991). This framework taught in many business schools around the world and is applied by a large number of companies in their aim towards successful innovation.

The RINMA abbreviation covers the following set of indicators:

Rare: The innovation (resources or capabilities) has to differentiate the firm from its competitors, preferably be unique to the firm.

Important: The innovation has to create a significant contribution to the firm's performance, either as reduced costs or as increased customer value and hence higher prices.

Non-imitable: Some innovations may be easy to imitate by the competitors. Even though they are rare and important, their strategic value is limited, since imitation quickly will rule out the performance effect. Hence, the innovation ought to be difficult, time consuming or costly to imitate.

Mobilized: For an innovation to create competitive advantage it has to be fully utilized.

Appropriable: Finally, the firm has to be able to retain the gains created by the four preceding criteria. This is threatened if other stakeholders, suppliers, employees or others, control the innovation.

If these five conditions are fulfilled, the innovation creates a sustainable competitive advantage for the firm that possesses the innovation.

Mckinsey report on innovation metrics

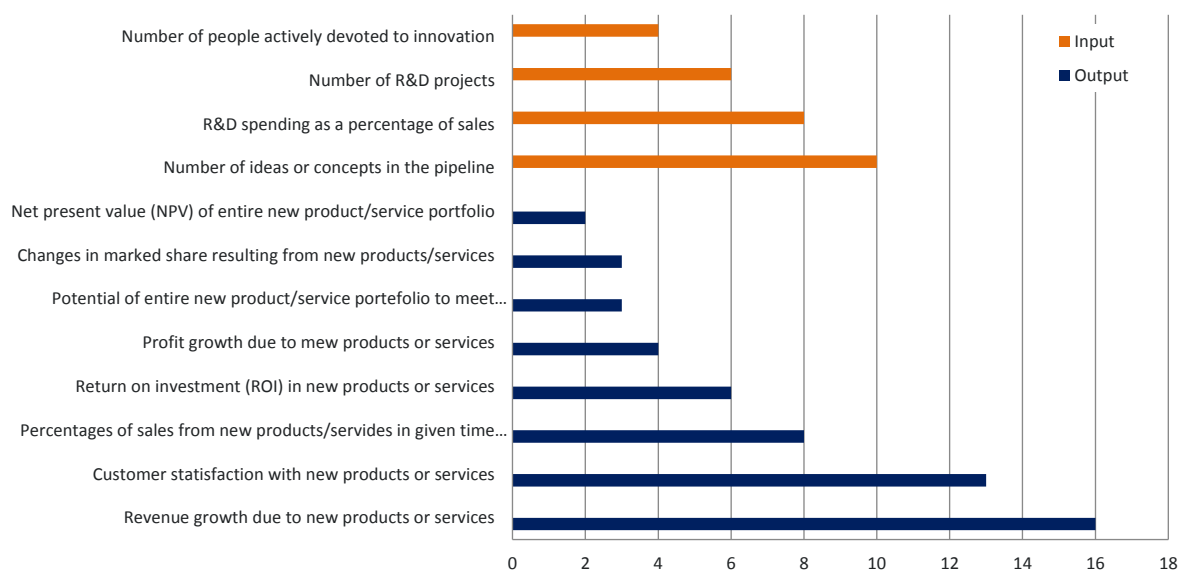
A survey conducted by McKinsey & Company from 2008 shows that “Companies reporting the highest contribution to growth from their innovation projects tend to be more interested in pursuing and measuring their innovations as a portfolio and therefore use metrics across the whole innovation process.” (McKinsey & Company, 2008)

McKinsey identifies many different kinds of metrics, but companies tend to use more than one metric if they use them. A guideline is that companies use about eight metrics, on average, to assess innovation. There are several reasons for this. In general metrics provide strategic direction for innovation activities, they guide the allocation of resources to innovation projects and make it easier to diagnose and improve overall innovation performance. Figure 1 below shows a range of metrics that many companies find useful.

The survey shows that companies are much likelier to rely on metrics for innovation outputs than for innovation inputs. The figure below shows these findings. The figure also shows that the metrics used to measure input and output are fairly different. While the input metrics are countable numbers, the output metrics are based on the financial outcome of companies.

Metrics ranked

Metric ranked no. 1 in terms of importance in respondents' organizations
 (% of respondents who use more than 3 innovation metrics) Source: McKinsey 2008



The strategic goal of the company determines the application of different metrics. For companies that are engaged in tracking the relationship between shareholder value and spending on innovation, the three most important metrics are all externally focused (not on the internal innovation process). However the survey revealed that many companies did not track the relationship between spending on innovation and shareholder value. The three metrics are:

- ✓ Revenue growth
- ✓ Consumer satisfaction
- ✓ Percentage of sales from new products or services

This stands in contrast to the metrics used by companies where innovation is the most important strategic priority, where the three top metrics were:

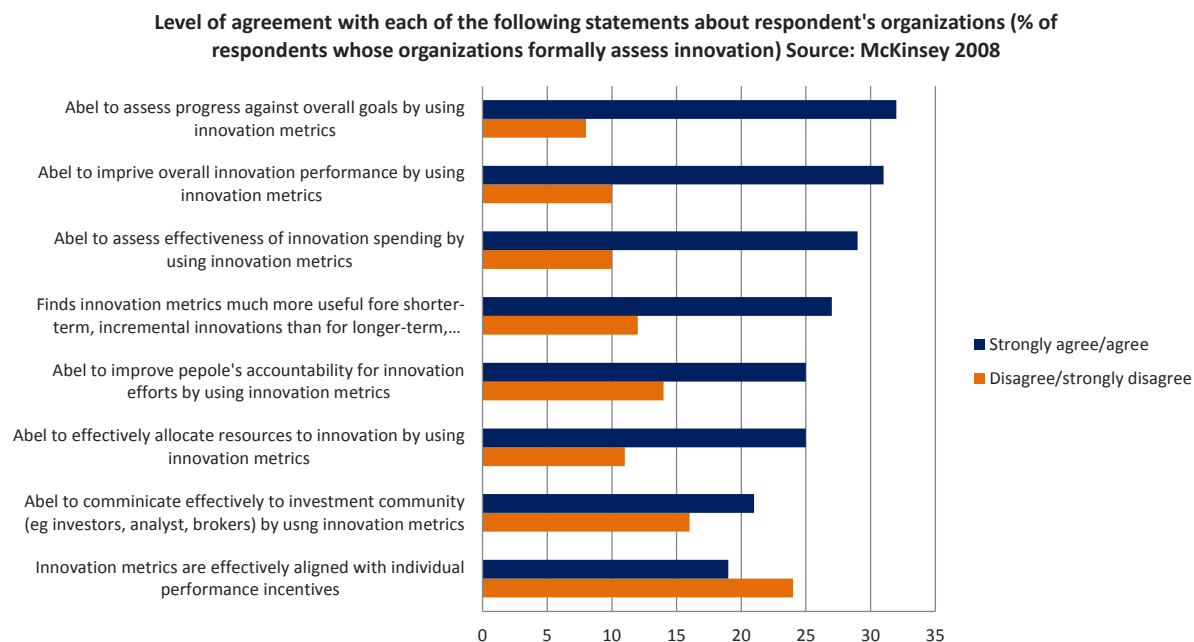
- ✓ Customer satisfaction
- ✓ The number of ideas in the pipeline
- ✓ R&D spending as a percentage of sales

The survey showed that these companies obtained higher organic growth rates than their competitors. They had over 31 percent of their organic growth from ongoing innovation. In general the report states that these companies have a greater interest in pursuing and measuring their innovations as a portfolio. They are more likely than other respondents to pursue and measure all types of innovations. 25 percent say that creating a balanced portfolio of innovations is one reason they use metrics. They also use metrics across the whole innovation process, such as assessing:

- The number of people actively devoted to innovation
- The number of ideas sourced from outside the organization
- The percentage of innovations that meet their development schedules

The figure below shows an overall satisfaction with use of innovation metrics. Many companies are satisfied with their use of innovation metrics in general; far fewer are satisfied with specific uses, such as aligning individual performance incentives. (McKinsey & Company, 2008)

Level of agreement with statements regarding innovation metrics



Companies that use innovation metrics are, on the whole, satisfied with their use. The many companies that do not track their innovations can probably gain a better understanding of their innovation performance just by introducing some of these metrics.

Many companies would gain a deeper understanding of their innovation performance if they paid more attention to input metrics as well as output metrics, benchmarked themselves against their competitors, and dug into the relationship between innovation spending and shareholder value.

Although executives are on the whole satisfied with the way their companies use innovation metrics, the findings indicate significant room for improvement in many individual applications – most notably, aligning metrics with individual performance incentives and using them to communicate effectively with investors.

4.2 DEFINING PROFESSIONAL INDUSTRIAL PLAYERS AND INVESTORS

How do professional industrial players and investors operate when it comes to innovation processes? Naturally, their practices vary widely from player to player, yet there are some common features that both the literature and our interviews display. But before describing these practices and the use of what one may call innovation indicators it is necessary to describe the nature and roles of these firms.

What we term professional industrial players and investors distinguish themselves from other companies in several manners: Below follows a list of key properties that defines the group. Naturally, these definitions are not clear cut as many larger companies have structures that are relatively similar to the group. Among the most relevant players we find venture fund management teams and so called corporate venture teams (separate parts of larger corporations that have the role of managing portfolios of investments in innovative companies owned the large corporation).

Indirect management through active ownership

This group of firms or investors is involved in innovative activities through their ownership in companies. They usually hold a large share of the company stocks, normally above 15 percent. They predominantly use their influence through board positions, but relatively often, they also take positions in the company management for a period of time. In order to run an active ownership strategy, these entities establish a permanent management team that is devoted to following the portfolio companies tightly.

Portfolios of companies

The professional industrial players and investors are owners of a portfolio of several companies. Consequently, the managers are often represented in several boards and may utilize their experience across firms. In venture funds and private equity, all portfolio companies are selected externally, while corporate venture often draws from a pool of innovative projects in the mother company, forming spin offs that are better taken care of outside the mother company. Those running a corporate venture activity often use the management pool across portfolio companies, enabling them to replace a portfolio company management with an internally recruited management team. In venture funds, this strategy is less likely as there is no common pool of management to pull from. The portfolio of companies is usually not completely related in their activities, representing a certain variety of business activities. A portfolio of only fully related activities is rather defined as a chain store concept.

Explicit focus on investment phase

Most of these players specialize in portfolio companies that are operating in the same phase, although this is more common among venture and private equity funds than among corporate venture players. The traditional split between different phases follows closely our model outlined in chapter two. Incubators and seed funds focus on the invention phase and prototype phase. Venture funds focus on commercialization often demanding a proof of commercialization before investing. Expansion and growth funds focus on the most mature phase expanding into new markets.

Strong focus on financial gains

The professional industrial players and investors are focusing more tightly on financial gains than other innovation actors. The funds operate with an explicit exit strategy and are expected to terminate all investments within a given time period (normally around 10 years). Corporate venture players do not necessarily have to exit and may also return the innovative technology or services to the mother company in the case where this is conceived as profitable.

Use of formal term sheets

As owners most of these agents operate with relatively strict term sheets defining the rights as owners. These rights often imply that they control operational matters, including detailed matters of innovation strategy, in the firm that exceed the right according to their ownership shares. The use of significant term sheets is more common among funds than among corporate venture players as these also more often hold a majority share of the company.

Below, we present a list of selected professional industrial players and investors, distinguishing between funds and corporate venture players:

Selected venture funds in the Nordic countries with focus on innovative venture cases

HQ country	Management company	HQ country	Management company
Nordic	Via Venture Partners Nordic Venture Partners Eqvitec Partners Northzone Ventures Verdane Capital Advisors	Sweden	Scope Capital Advisory Innovations Kapital BrainHeart Capital Creandum II Advisor Ålands Investering Pod Venture Partners PNP Venture Capital Rite Ventures Sustainable Technology Partners
Denmark	Novo Nordic Growth North Cap Partners Nordic Biotech Advisors Sunstone Capital	Norway	Agder Energi Venture Alliance Venture Convexa Ferd Venture Kistefos Venture Capital Teknoinvest AS Telenor Venture Viking Venture
Finland	Inventure CapMan Life Science Conor Venture Partner Nexit Ventures		

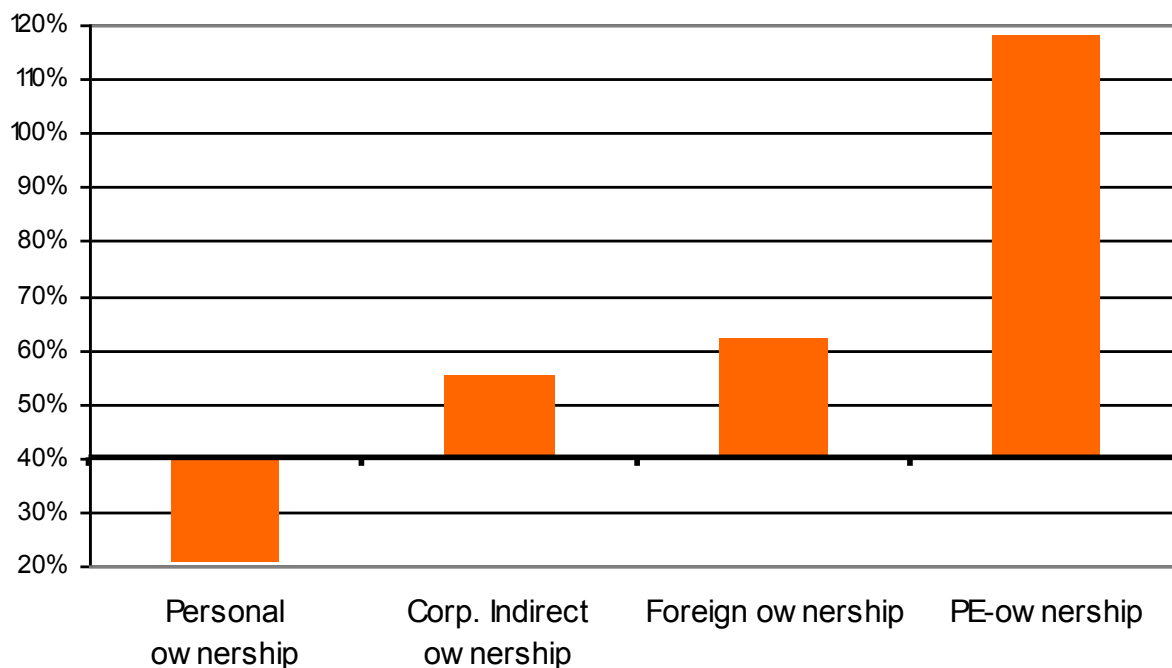
Corporate venture players in the Nordic countries

HQ country	Corporate venture	HQ country	Corporate venture
Denmark	Novo Nordisk Maersk Holding	Sweden	Saab Venture Industrivärden
Finland	Nokia Venture Kone	Norway	Hafslund Venture Canica Braganza IKM Invest Glastad Invest Statoil Tecnology Invest Scatec

The main reason why we are interested in this of innovation agents is that business innovation is in the core of the investment model. They focus on structuring all kinds of innovation that improves long term performance, from highly specific technological innovation in the ICT industry (e.g. MySQL) to improved procedures for user producer driver innovation in firms providing tailor-made services (e.g. Nordic Vision Clinics). Highly advanced models are also developed for organizational innovations (e.g. in RenoNorden) and open innovation (e.g. Trolltech).

We are also interested in this group of innovation agents since they appear to outperform other owner types in terms of generating value added in their portfolio companies (see figure below). One reason for this may be found in the way they manage the innovation process in these firms. We look closer at their practices below.

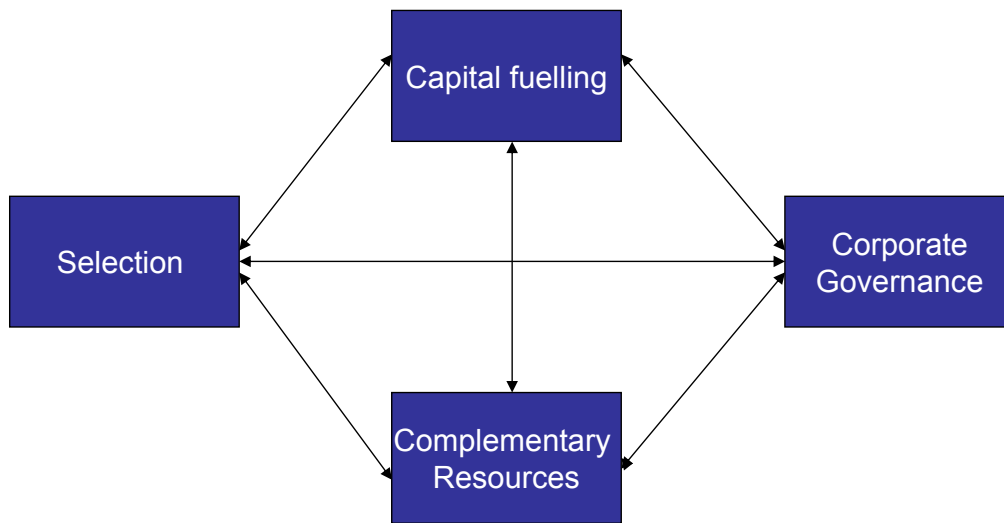
Value added growth in firms in Norway with alternative owners (2000-2004). Deviation from the median firm in the industry



4.3 THE INNOVATION STRATEGIES AND PRACTICES OF PROFESSIONAL INDUSTRIAL PLAYERS AND INVESTORS

From the defining characteristics of these players it is clear that they interact with the innovative firm in a highly active manner, often keeping both hands on the wheel. To better understand their innovation strategies, it is helpful to distinguish between the roles that are played by them as active owners in businesses. Grünfeld and Jacobsen (2006) have developed a model that introduces the four roles of active ownership. They claim that such ownership can only be successful if all roles are filled, either by the owner alone or by a group of owners.

The four roles of active ownership relevant for innovation management



The selection role of innovative cases

The selection role of innovative cases is a core activity of these units. The selection role involves identifying an innovation project that has the right potential and that fits the competencies of the active owner. The selection role covers both search and selection. Most of the professional industrial players and investors are concerned with a relatively standardized set of indicators that must have a sufficiently high score before investing. Below, we list and group these selection criteria:

Criteria applied among most professional industrial innovation teams and investment groups

Indicators	Ex Ante	Ex medio
Team / Management		
Experience and competence	X	X
Network	X	X
Resource capacity	X	X
Product / Process		
Uniqueness	X	
IPR strength	X	X
Scalability	X	
Business Plan		
Value proposal	X	
Value model	X	
Plan	X	X
Market		
Size	X	
Growth	X	X
Maturity	X	
Expansion into related markets	X	X

The selection indicators (which are equivalent to so called ex ante indicators) are in many instances just as important as indicators after the selection phase. Since many of the investments are made in early stages of the innovation process, it is central to use indicators to also further develop the innovative activity over time. Ex post evaluations and indicators by investors are straightforward: They are mostly concerned about returns on investment.

It is important to notice that the role of a well-functioning management team in the portfolio company is evaluated as the most important group of indicators for many of these players. It is clear that such innovation agents put a larger emphasis on this dimension of indicators than what is found in most innovation programs. If the project is highly immature and in a very early stage, the management issue is usually not given such a high weight since the development of the innovation project often will involve the establishment of an operational management team.

Professional industrial players and investors also focus extensively on the property of the product, process or service that is expected to be derived from the innovation activity. Here, uniqueness, IPR strength and scalability play a central role. Without these components in place, the earnings prospects are really not in place. Among some of the innovation program indicator sets, these are also given substantial emphasis (e.g. innovation loans from Innovation Norway), yet in most innovation programs in the Nordic countries, the emphasis on e.g. scalability is not well pronounced.

The selection role also involves serious considerations around the subject of business matching. These players are often not investing unless they are able to identify:

- Relevant co-investors that can also contribute with relevant resources and competencies for the firm
- Industrial partners that may engage in the innovation process as potential customers or suppliers.

Finally, the selection process usually also involves a thorough mapping and design of a financial plan all the way from entry to exit. These financial plans are usually significantly more rigorous than what is applied in program ex ante evaluations of innovation projects.

There is an important distinction between funds and corporate venture players in that their selection process often also involves projects that are derived from the mother company (spinouts). In this case, questions of price for entry become less relevant, affecting the financial planning strategy.

Innovation and the role of corporate governance and milestone strategies

This role is central for following up the innovation processes over time. In order to maintain focus on the indicators mentioned above, the corporate governance role normally comes to expression in the form of the following strategic plans:

Milestone strategies: These agents normally formulate thorough milestone plans that enable them to follow the management closely over time. The milestone strategies often involve reporting as often as every quarter, and when entering the firm as an owner, the milestone plans are defined down to rather explicit goals on the road according to the reporting scheme. Milestones are usually related to technological progress and commercial goals. They also normally include a plan for what to do if the scheduled progress is hampered significantly. For innovation projects that last over long periods of time (typically observed in the life science sector), the milestone structure is often less rigid. Yet in these cases the option of ending the project is usually stronger expressed in the plan.

Incentivation: Professional industrial players and investors normally run prefer to enter into prosperous incentive schemes with the management allowing them large gains from successful outcomes. These schemes involve shared ownership and option based programs. Such instruments are hard to install through public innovation programs in most Nordic countries, yet innovation programs do rarely prohibit such arrangements between owners and managers. The strong incentivization model is preferred based on previous investment experience and alignment of interests.

Redesigning management: An important part of the corporate governance role is to select the right management for the company through its different phases. This role is often troublesome because active owners often get strong ties to the management. This is especially so if the company is young and the management consist of entrepreneurs who have strong ties to their company. Nevertheless, the option of changing the management through the innovation process, for instance moving from the prototype phase to the commercialization phase is a strong and potent tool that is not eligible for innovation program managers.

The role of providing relevant complementary resources to the firm,

Many of the professional industrial players and investors posit competencies that are complementary to the firm. This may involve knowledge about markets, financial and industrial networks, strategic partners, entrepreneurial skills etc. For active owners to be able to profit on their ownership advantages, the complementarity factor is vital. Hence, many of these players tend to focus on investments in firms that cluster around a specific sector (e.g. clean tech or life science). Hence, these agents tend to specialize in some sectors. From an innovation program perspective, one may learn that such specialization of programs also may serve the purpose of increasing the success rate in the program.

Corporate venture players are not equally dependent on such complementary factors placed in the management team since they may draw from such factors in the whole corporate entity, including the mother company.

The role of capital fuelling

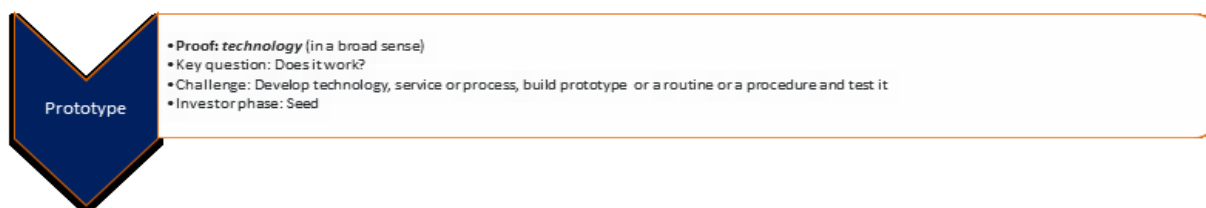
Most professional industrial players and investors are strongly aware of an explicit financial strategy, where capital is allocated in tranches. This way, they maintain control over spending and are able to cut funding sufficiently early to avoid large losses if the innovation project gets off track. Moreover, many players experience that innovation processes are more capital demanding than initially expected. In that case, the owners may fuel the company with necessary capital to continue the innovation project. Corporate venture players often have an advantage in this sense since they may tap the mother company for capital, using it as a milking cow. Funds are often more limited when it comes to expensive innovation projects that still have a large earnings potential.

4.4 MAPPING INNOVATION PERSPECTIVE OF PROFESSIONAL INDUSTRIAL PLAYERS AND INVESTORS

In order to give the more general picture of innovation practices more empirical substance, we have conducted a series of interviews with central figures representing professional industrial players and investors.

A key challenge when interviewing the representatives is that they find it hard to provide good answers to what kind of indicators they apply. Their investment and innovation strategies are systematically complex and heterogeneous, and the players tend to be focusing on each case rather than in tool kits of innovation indicators. Nevertheless, we have identified some central innovation and investment strategies that support the patterns described above, although with varying nuances.

Sarsia seed (seed fund – Norway)



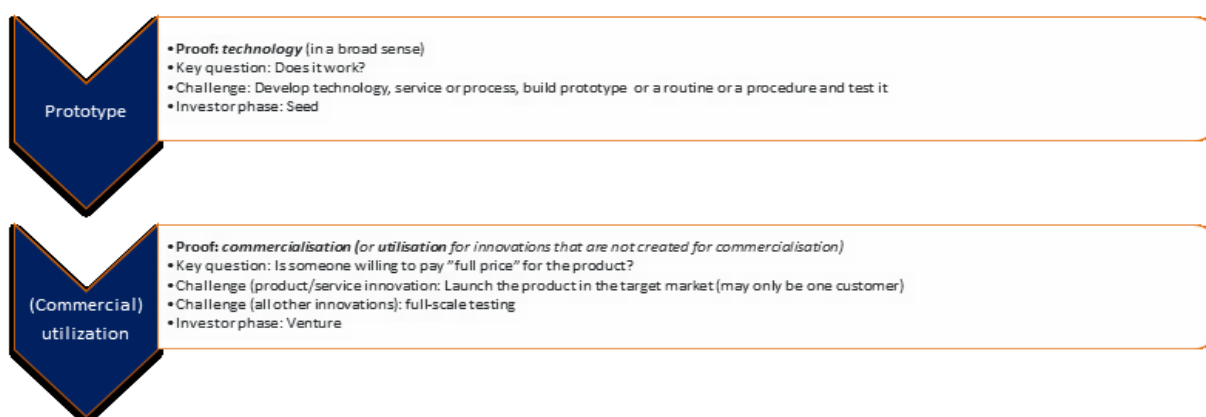
Sarsia Seed is a seed fund located in Norway with a capital base of 300 million NOK. Only a few of their portfolio companies had revenues when the initial investment was made (app. 25%). Sarsia Seed use the following properties as main indicators for innovation success.

- The potential revenue related to the innovation project. This must be proven high in order to catch interest. In other words, the value added for the buyer of the product or services must be large.
- Sarsia seed will only involve in projects that operate in a field where there is a potent exit market. In other words, there must be high industrial activity with a sufficiently large number of endowed firms that are interested in taking over the venture, either through internalizing the technology or through introduction on the stock markets.
- Being an early stage investor, the fund focuses less intensively on the management team, but during the road to exit, this subject becomes increasingly important.

Sarsia Seed follows a strict policy when it comes to using milestones. The most important milestones that must be met by the portfolio company before further involvement is decided is

- The establishment of a concrete financial plan all the way to exit
- Proof of concept, predominantly through an operative demo
- First sales to a real customer

Viking venture (seed and venture fund – Norway)

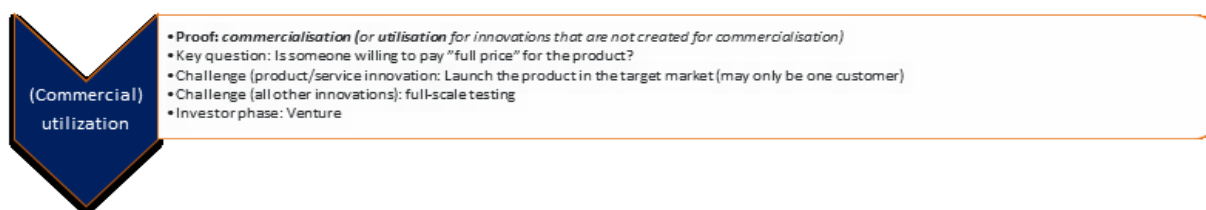


Viking venture is a highly successful venture fund managing company located in Trondheim Norway. They are currently managing 1.1 billion NOK of investments in firms that operate in the prototype

and commercialization phase and have invested in more than 30 highly innovative cases. Input indicators. Viking reports that they are particularly focused on cases that fulfil the following requirements (indicators):

- World class cluster (“the resource base surroundings”). In other words, the firm must be a part of a business environment that is highly competitive in international terms. Such clusters are normally providing sound exit opportunities, and rich potential for resourceful co-investors and industrial partners
- A clear commercial strategy: This should be lined out at the selection phase.
- Scalable technology or service and international potential
- A sufficiently large market need and a clear customer approval of this demand
- The most important output indicator is return on equity

Verdane capital advisors (Venture fund – Sweden and Norway)



Verdane Capital Advisors is a highly successful venture company located in Stockholm and Oslo. They predominantly purchase portfolios of firms from other professional investors. The investment group is strongly focused on innovation cases that provide

- (1) Uniqueness of technology
- (2) Scalability and resulting revenue potential
- (3) An opening for Verdane to influence the development and add value

Moreover, Verdane is continuously working to develop a

- go to market strategy and sales organization
- management team drive and expertise
- potential for strategic acquisitions /and or organic growth

Verdane is focusing on the following milestone characteristics:

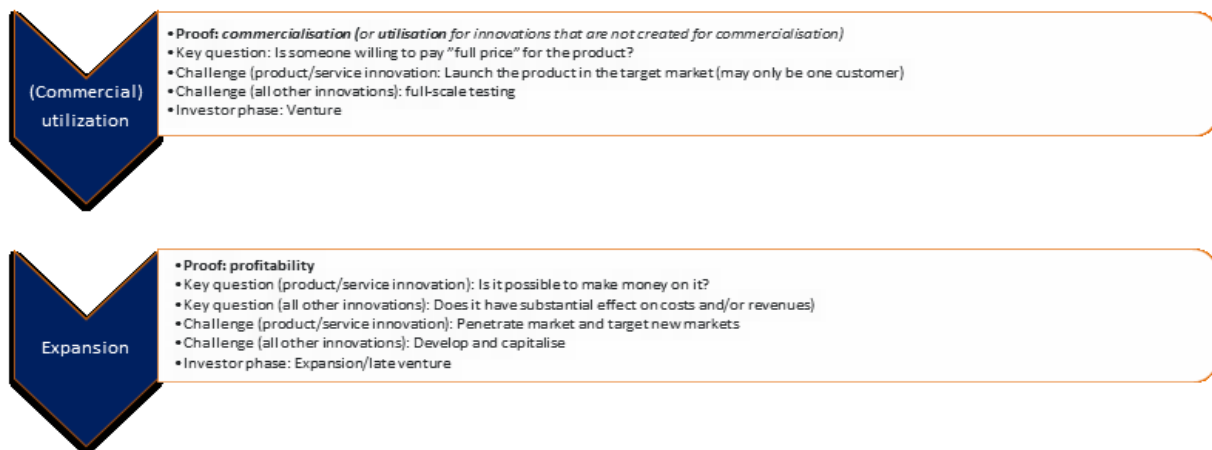
- EBITDA or if early stage revenues of critical size to enable EV/EBITDA or EV/Sales valuation
- A well-functioning organization (a need for establishing CFOs, CTOs etc.)
- Strategic alignment between owner groups

They look for excellent management teams that are able to balance attention to detail and hard analytics with strategic vision and relentless execution. But even excellent teams can be made better. The teams they like to work with must strive for continual improvement and welcome active owners.

Management teams should be able to develop and implement a disciplined and structured growth plan. They must understand that optimizing the underlying profitability of the business model is an integral part of a well thought out and well executed growth strategy. Verdane require that management teams implement periodic and transparent reporting systems and leave no part of the organization untouched in their search for value creation.

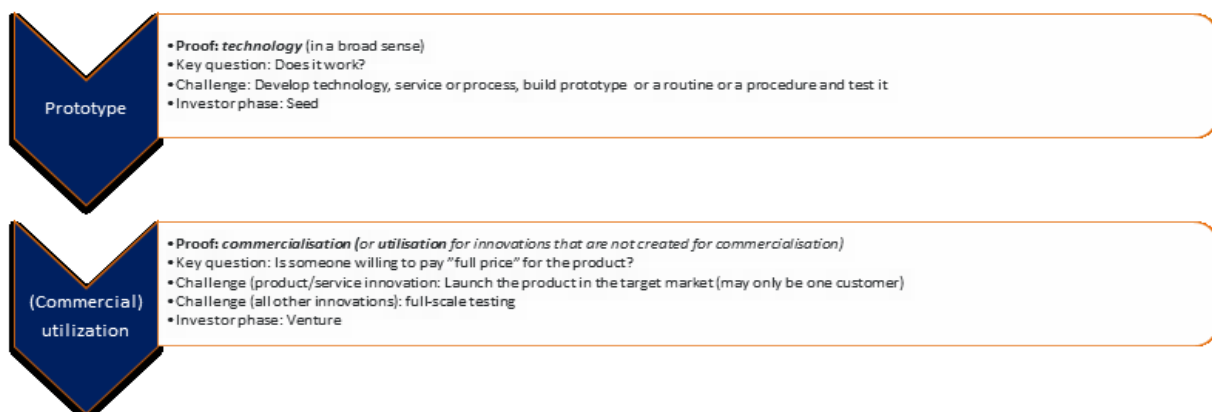
Furthermore, they require that the management is flexible, dynamic and capable of adjusting quickly to market changes and capitalizing on the opportunities that emerge.

Northzone Ventures (Venture and expansion fund – Denmark, Sweden and Norway)



Northzone is focusing on early stage firms and firms in the expansion phase with

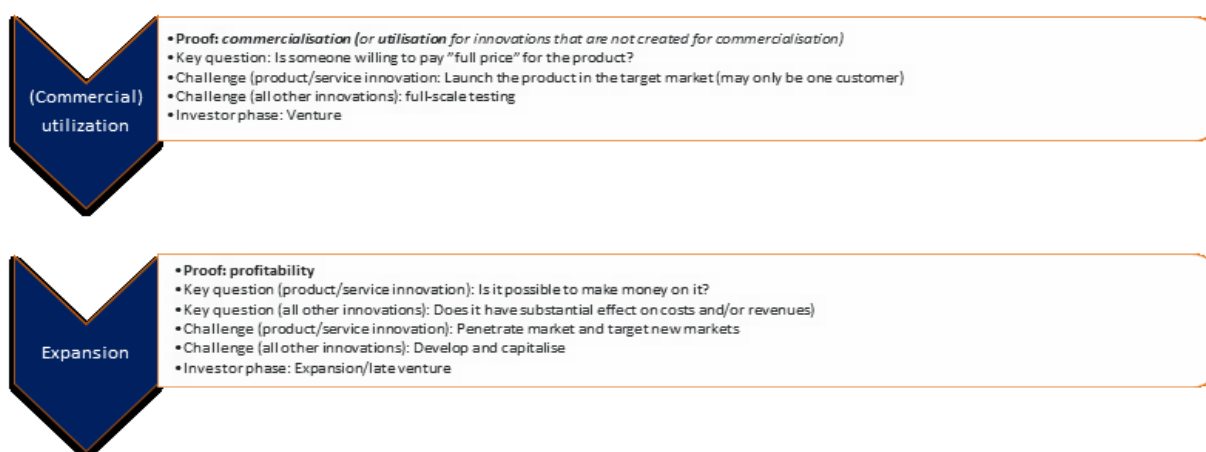
Statoil Technology Invest (corporate venture – Norway)



Statoil Technology Invest (STI) is a seed branch under Statoil, following up on projects that are not directly in the core of the Statoil exploration activity. STI is highly technology focused and most of their resources are put into following up the technological progress of the projects they invest in. In addition, they apply the following indicators:

- Close cooperation with suppliers and industrial partners. They often co-invest with such partners in order to increase the likelihood of a commercial solution. It is a central element that they also search for solutions that can be applied by Statoil in their future exploration activity.
- Exit focus: They think exit from day one, identifying potential buyers of the company.
- There is a wide variety of innovation strategies for the firms they are involved in, but they always follow the innovation process closely from a financial perspective. This is an area where they have significant competence.

Midvestfondene (venture/expansion fund – Norway)



The Midvest funds are located in Norway focusing on venture cases (commercialization), and more mature expansion cases as well small cap buyout cases. The fund managers focus in company properties that work as indicators of investment opportunities. The most important indicators are:

- The management team in the company. This plays a central role, not at least in the more mature cases.
- Scale potential – It is important that it is possible to transform ideas to a commercial concept that has a fast growth potential. Alternatively, one may invest in a project that can easily be sold to a company that is able to materialize scale effects (so called high strategic value). Technological uniqueness is viewed as a core property.
- We are also highly focused on the market knowledge and competencies of the management team. Many teams experience that they have misinterpreted the signs from the market. In other words, they do not have sufficient market competence. This is important.
- When the investment decision is made, we are focusing strongly on the technological breakthrough. Our experience is that you need to push on this matter in order to reach milestone and obtain necessary progress.

- In our more mature cases we are constantly focusing on cash flow matters, improving cost efficiency and profitability
- Finally, it is a pressing need to establish all forms of IPR before an eventual exit.

5 WHAT HAVE WE LEARNED? A KEY INNOVATION INDICATOR KIT FOR BETTER PUBLIC SECTOR PROGRAMS

Apparently, there is a significant learning potential from the insights derived in the previous chapter describing the practices, way of organizing innovative activity and use of indicators among professional industrial players and investors. Some of these insights are highly relevant for the management of innovation programs. Below, we present a kit that may serve to improve the performance of innovation programs in the Nordic countries. It consists of four explicit recommendations based on core lessons learned.

5.1 INNOVATION IS MANAGEMENT FIRST, MANAGEMENT SECOND AND FINALLY MANAGEMENT

Our review of selected innovation program indicators in the Nordic countries displays a clear lack of indicators focusing on innovation management. Operating such indicators requires a lot of resources because the quality of the management team is not always easy to reveal. Nevertheless, focusing stronger on the entrepreneurial team by mapping their experiences and their past successes will, according to the practices implemented by the professional players provide a better foundation for successful innovation projects supported by the programs. Notice also that management teams tend to change over time as central figures leave long lasting projects, and this may affect the likelihood of success. Hence, monitoring innovation management over time is also important, not only during the selection phase (ex ante indicator).

Innovation management

Key performance indicators

- 1 Project manager experience with innovation projects (number and size)
- 2 List of previous successful projects for all managers and entrepreneurs

5.2 STRONG TIES TO ESTABLISHED INDUSTRIAL PLAYERS AND CO-INVESTORS IS A KEY TO SUCCESS

The professional industrial players and investors are systematically searching for innovative cases that are strongly tied to larger industrial players through the value chain or through common goals. This indicator criterion is often viewed as a key parameter for obtaining commercial success. With strong interaction with industrial actors from early on, the potential for establishing profitable customer relations is enhanced severely. Innovation programs that are directed toward projects in the late prototype phase and the commercialization should consider excluding candidates that do not have established such relations. We believe that the success of the IFU/UFU-program hinges on this requirement, and more programs aiming at this phase should operate with similar conditions.

Innovation through industrial and investor network	
Key performance indicators	
1	Name of industrial partners that is involved or highly interested in the project
2	Name of industrial co-investors that holds a stake in the project
3	Name of representatives from potential user/customer of the product or service
4	Description of the relationship to this entities and their role in the project

5.3 MORE FOCUS ON CORE PARAMETERS FOR PROFITABILITY

The professional industrial players and investors rarely invest in innovation projects unless they have a clear potential for scaling. With scaling, we mean that you can produce a large volume of entities without significant cost increases. Consequently, average costs are falling sharply as volumes are increased. In some of the programs operating with more sophisticated innovation indicator parameters, this element is clearly taken care of. Yet, we have a clear impression that many programs, e.g. focusing the invention face, do not give sufficient attention to this aspect. Yet it is important for generating long term profitable innovations. This comment must though be moderated slightly when it comes to e.g. innovation in knowledge intensive services, where scale effects are often not achievable. We comment on this aspect in the final part of this chapter focusing on whether the innovation indicator kit fits the needs of service sector companies.

Another key indicator of profitability is potential demand or market size. Without a large market size, scale effects serve no purpose. Similar to the problems of identifying good innovation management teams, it is often hard to evaluate the quality of the market size assessments made by the applicant to a program. This suggests that programs could be more sector focused, allowing program managers to obtain better knowledge about market potential.

Innovation through focusing on profitability	
Key performance indicators	
1	A description of the technology or service focusing on scale potential compared to existing solutions on the market
2	A description of the business solution (model) that must be in place in order to reach the scale potential
3	Implement a shift in strategy towards more sector or industry focused programs that allow program managers to be more up to data on the technological and market related

5.4 PROGRAMS MUST BE DESIGNED TO EASILY SCALE THE FINANCING OF PROJECTS

As discussed in the section on the capital fuelling role, the professional industrial players and investors are aware of their important role when it comes to controlling capital flows. This is especially important when innovation projects with a large potential becomes more expensive than first estimated. The structure of most innovation programs is tying the program managers with respect to allocating additional resources to good but expensive projects. Besides the limitations

given by EU state aid policy, more flexible program structures may serve an important purpose in this sense.

Conversely, program managers should be more aware of the large number of innovation project failures. Such failures are not easily detected unless there is a strict milestone structure in the program. Based on the review of the program indicators, we suggest that more indicators are designed to follow up the projects on the road, increasing the potential for identifying innovation failures. This should be combined with increased attention on holding back grants and loans under such circumstances.

Innovation through financial management

Key performance indicators

- 1 Develop and apply more milestone based criteria for financing
- 2 Implement a program strategy where it is possible to scale the capital allocated to projects more freely. This includes allowing programs to finance innovation projects in tranches.
- 3 Based on the milestone indicators, utilize the potential for removing support to projects gone wild.

5.5 SOME REFLECTIONS ON LINKS TO THE INNOVATION RADAR APPROACH

In a central Nordic program on business driven innovation, Nordic Innovation is presently developing a set of indicators designed to measure and manage innovation in a wide variety of firms. The project is strongly linked to the innovation radar approach developed by Mohanbir Sawhney, Robert C. Wolcott and Inigo Arroniz at Kellogg School of Management, Northwestern University. The innovation radar is focusing strongly in innovation as a process that is strongly driven by customer needs and market interaction. The radar is more of a managerial tool than a classical innovation approach as described by innovation science academics. Below, we briefly describe the radar and its 12 dimensions.

The innovation radar



The radar is organized according to four central dimensions in the innovation process. The dimensions are presented in terms of four questions: What do you offer, how do produce it, who is buying the product or service and what market do you focus at? The framework is relatively generic but is, as mentioned strongly focused on the demand side. Less attention is devoted to technological aspects. Elements in the innovation strategy that are given strong emphasis are: Solutions and platforms for customer interaction, branding and networking, supply chain solutions and development of customer experience. It is apparent that the innovation radar has its main focus on more mature firms where the road to commercialization and expansion is given more attention than proof of invention and technology.

Professional investors work to a larger extent with innovations in terms of organizing the innovation process internally and capturing the value through IPR-structures. Hence their innovation activity is focusing on the dimensions in the lower part of the radar. However, professional investors also tend to emphasize innovation scalability through the development of platforms and solutions for customers that provide cost efficient production.

It is thus reasonable to claim that the toolkit provided in this report predominantly covers a subset of the innovation dimensions described by the radar. As pointed out by the developers of the innovation radar, innovators are normally not able to fill all the dimensions to the full extent and should specialize in those dimensions where they are strong. Here, the professional investors and industrial players are clearly specializing in the areas we have outlined above, and should thus try to cooperate with other innovation agents in order to serve all the needs required to fulfil the aspects needed for successful innovation.



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Nordic Innovation

Nordic Innovation

Nordic Innovation is an institution under the Nordic Council of Ministers facilitating sustainable growth in the Nordic economies.

Our mission is to stimulate innovation, remove barriers and build relations through Nordic cooperation. We encourage innovation in all sectors, build transnational relationships, and contribute to a borderless Nordic business region.

We work with private and public stakeholders to create and coordinate initiatives which help Nordic businesses become more innovative and competitive.

Nordic Innovation Centre is located in Oslo, but has projects and partners in all the Nordic countries.

For more information: www.nordicinnovation.org