

## **A conceptual framework for the measurement of innovation capability and its effects**

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## **A CONCEPTUAL FRAMEWORK FOR THE MEASUREMENT OF INNOVATION CAPABILITY AND ITS EFFECTS**

### **Structured Abstract**

**Purpose** – The purpose of this paper is to clarify the concept of innovation capability and to show how the linkage between innovation capability and performance measurement can be formed.

**Design/methodology/approach** – The study is based on current literature of innovation capability and performance measurement and matching these two to find out how the measurement of innovation capability should be organized.

**Findings** – The paper describes the concept of innovation capability and presents a performance measurement framework for the measurement of innovation capability and its effects. As a result, a conceptual framework with five perspectives for measuring the relationship between innovation capability and business performance is presented. Also, the link between innovation capability and an organization's business performance is disclosed.

**Originality/value** – The paper shows a way forward of how to define measures of business performance in such a way that they are led from the development of innovation capability.

**Keywords** Innovation capability, Innovation, Performance, Performance measurement, Performance measurement framework

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## **1 Introduction**

To become innovative, an organization has to develop its innovation capability. Managing creativity and capabilities, like innovation capability, is one of the basic elements of an innovative organization. Nowadays, when organizations operate in very challenging environments, developing their innovation capability is vital. Organizations devoting themselves to the development of their innovation capability have better prospects to succeed in the future. According to Alasoini et al. (2007), an organization's competitiveness will be even more dependent on its ability to produce innovations in the future. Thus, it can be assumed that an organization's performance is more and more dependent on its innovation capability (Alasoini et al., 2007). To be conscious about the current state and development of innovation capability, organizations need to measure it. However, the measurement of innovation capability is challenging, because it is intangible by nature (Albaladejo and Romijn, 2000). Measuring is important for the development of innovation capability, and thus important for the future success of the organization. The current literature does not provide comprehensive frameworks for the measurement of innovation capability and its effects. Previous models (for example the strategy map presented by Kaplan and Norton (2004)) either consider the innovation process as a linear and separately identifiable construct or are not purely targeted to innovation capability measurement (for example Epstein (2007)). In this paper, innovation capability is seen in a more holistic way, and thus the study contributes to current understanding by taking the research issue one step further.

This study presents a performance measurement framework for the measurement of innovation capability and its effects. It is also clarified how measures of innovation capability should be linked to measures of the organization's overall performance. The conceptual framework of innovation capability measurement is based on a review of the innovation capability and performance measurement literature. Before the framework is presented, the concept of innovation capability is defined, based on previous definitions in the literature. The framework has been formed by studying the existing literature on performance measurement frameworks and current assessment models related to innovation capability or certain components of it.

## **2 Performance measurement**

### **2.1 Designing performance measurement**

Neely et al. (2005, p. 1229) define performance measurement as "the process of quantifying the efficiency and effectiveness of action". Performance measurement can also be defined quantifying the input, output or level of activity of an event or process (Radnor and Barnes, 2007). Performance management is action based on performance measurement, which results in improvements in behavior, motivation and processes. Further, Radnor and Barnes (2007) consider that performance measurement is about efficiency, productivity and utilization,

whereas performance management builds on performance measurement and is concerned with effectiveness and a broader, more holistic, even qualitative view of operations and the organization.

Performance measurement can be divided into four phases: design, implementation, use, and maintenance of a performance measurement system (Neely et al., 2000). There are many different process models for the design of performance measurement systems in current literature. Kaplan and Norton (1996) have presented a four-phase process of how to construct a Balanced Scorecard for an organization. Laitinen's (2003) process model includes 14 phases and is designed for the design and implementation of a dynamic performance measurement system. The methods used for the design and the number of phases vary, but the processes are very similar: first, the use is clarified and measurement objectives defined, and then measures are defined for the objectives.

The measures can be divided into direct and indirect, objective and subjective, and financial and non-financial ones. Indirect measures are used, when something cannot be measured directly. Objective measures are based on quantitative information. Subjective measures are usually based on people's opinions (Lönnqvist et al., 2006). Performance measurement is traditionally concentrated on financial measures (Yliherva, 2004; Bourne et al., 2005). Performance measurement is today seen as a comprehensive process. It means that all things happening in the organization are considered to have an impact on the performance of the organization. These things include leadership and management, employees' task motivation, the quality of operations, and the ability of products to fulfill customers' needs (Franco and Bourne, 2003; Laitinen, 2003; Bourne et al., 2005; Ukko et al., 2008). Also the purposes of using performance measurement vary. Performance measurement can be used, for example, for motivating the employees, communicating information, and leading actions (Franco and Bourne, 2003; Lönnqvist et al., 2006; Türk, 2008).

## **2.2 Performance measurement frameworks**

Comprehensive performance measurement frameworks sum all essential information to a concise set of measures based on one framework (Laitinen, 2003). No single measure can provide a clear target or focus the attention on the right business areas (Kaplan and Norton, 2005). According to Neely et al. (2000), performance measurement frameworks are useful, but they only provide guidelines for how measures should be identified, introduced and used for management purposes. The strength of a performance measurement framework lies in the way it pays attention to different measures of business performance - financial and non-financial, internal and external (Neely et al., 2000; Franco and Bourne, 2003).

Laitinen (2003) suggests the following requirements for performance measurement frameworks:

- All essential perspectives have to be encompassed.
- The measures have to compose a logical collection.
- The framework has to be useful for decision-making.
- The framework has to make performance improvement possible.
- Short-term measures have to predict long-term measures.

The literature provides several frameworks for performance measurement. These include for example the Balanced Scorecard, Performance Prism and Performance Pyramid. The Navigator and Intangible Asset Monitor are especially designed for the measurement of intangible assets. For example, the Performance Prism includes five perspectives: stakeholder satisfaction, strategies, processes, capabilities, and stakeholder contribution. The Performance Prism helps leaders to concentrate on the key issues they want to address when managing the organization (Neely et al., 2001a). The Balanced Scorecard includes four perspectives: financial, customer, internal processes, and innovation and learning. The Balanced Scorecard is based on the organization's vision and strategy. It forces the organization to focus on measures that are the most important, aiming to avoid overload of information (Kaplan and Norton, 2005). The Navigator has five perspectives: financial, customer, process, renewal and development, and human capital. One aim is to uncover and visualize the organizations intangible assets. The Navigator contains both financial and non-financial measures, which estimate the organization's market value (Bontis, 2001; Lönnqvist et al., 2006). The Intangible Asset Monitor is based on three classes of intangible assets: external structure (stakeholder relations etc.), internal structure (management, attitudes etc.), and individual competence (education, experience etc.). Each class of intangible assets is measured via three indicators: growth and renewal (i.e. change), efficiency and stability (Bontis, 2001).

### **3 Nature of innovation capability**

Innovation can only occur if a firm has the capability to innovate (Laforet, 2011). Innovation capability is composed of the main processes within the firm (Lawson and Samson, 2001). It cannot be separated from other practices. According to Neely et al. (2001b), an organization's innovation capability can be thought of as the potential to generate innovative outputs. Yliherva (2004) defines innovation capability as follows: innovation capability consists of an organization's intangible property and the ability to exploit this property in such way that the organization is able to produce new innovations perpetually. Lawson and Samson (2001) define innovation capability as "the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders". Rangone (1999) defines innovation capability as an organization's ability to develop new products and processes, and to achieve superior technological and management performance. According to Assink (2006), disruptive innovation capability is a driving energy to generate and explore radical new ideas and concepts, to develop them into marketable and effective innovations,

leveraging internal and external resources and competencies. Branzei and Vertinsky (2006) define product innovation capability as the ability to acquire and assimilate external knowledge, transform it into novel, unique competencies and ideas, and then harvest these ideas by first generating and then effectively commercializing new or improved products.

In light of the earlier literature, innovation capability can be defined as follows. In this study, innovation capability is defined to consist of the elements influencing an organization's capability to manage innovation. The concept of innovation capability includes three elements:

- Innovation potential consists of factors that affect the present state of innovation capability. The factors reflect the potential that organizations have to produce innovations.
- Innovation processes are systems and activities that assist organizations to utilize their innovation potential and therefore enable innovations. They are the way systems and activities are carried out.
- The results of innovation activities are e.g. product/service innovations, and process innovations.

A majority of the previous definitions determine innovation capability as a potential. This extended definition is presented to show the various elements of innovation capability that can have an effect on performance. Innovation capability can also appear as a capability that has already been realized. Thus, limiting the measurement of innovation capability only to the potential gives a very limited view of the effects. All three elements of innovation capability can contribute to the different areas of business performance, alone or through other elements.

### **3.1 Innovation potential**

A body of literature has identified the potential shared by innovative organizations (e.g. Lawson and Samson, 2001; Skarzynski and Gibson, 2008; Tura et al., 2008; Paalanen et al., 2009; Saunila and Ukko, 2012). For example, Skarzynski and Gibson (2008) divide innovation capability into four categories: leadership and organization, people and skills, process and tools, and culture and values. Ståhle et al. (2004) list four elements which can become either promoters or obstacles of innovation: people and the atmosphere, the physical environment, mental models, and decision-making and power structures. Another definition presented by Paalanen et al. (2009) sees innovation capability through a practice-based innovation activities approach. According to their view, the subcategories of innovation capability are absorptive capacity and external knowledge, organizational structures and culture, leadership and communication, and individual creativity and innovativeness. Similarly, Lawson and Samson (2001) see that the subcategories of innovation capability are vision and strategy, harnessing the competence base, organizational intelligence, creativity and idea management, organizational structure and systems, culture and climate, and management of technology. Tura

et al. (2008) define innovative capability via three subcategories: openness/creativity, knowledge/expertise, and operationalization capability. The first subcategory comprises the capabilities needed to exceed the existing solutions and search for new possibilities. The second subcategory covers the capabilities to acquire the knowledge needed to build innovation. The third subcategory describes the capabilities to find and introduce applications, so that the organization exploits the achievable knowledge base.

The concept of innovation capability can be considered more widely than presented above, however. In this study, innovation potential refers to the factors that make it possible for the firm to create innovations. The term innovation potential is used to represent the subcategories of innovation capability. According to earlier literature, factors that form the innovation potential of an organization can be divided into five categories:

- Leadership and decision-making processes
- Organizational structures and communication
- Collaboration and external links
- Organizational culture and climate
- Individual creativity and know-how.

### **3.2 Innovation processes**

According to Skarzynski and Gibson (2008), besides innovation inputs and outputs, it is important to evaluate the activities related to innovation processes. In this study, the innovation processes of the firm help the innovation potential to become a firm asset. For the innovation processes to be successful, the exploitation of innovation potential has to be successful. Therefore, the subcategories of innovation capability can be either enablers or obstacles of innovation processes. There exist many views in the current literature on how to define innovation process-related activities.

Koen et al. (2001) divide the innovation process into three main phases: front end, new product development and commercialization. Herstatt et al. (2004) suggest five phases: idea generation and assessment, concept development, development, prototype development and testing, and production, market introduction and diffusion. The first two phases form the front end phase. The innovation process-related activities discussed in this paper are placed in the front end phase. Koen et al. (2001) divide the front end into five elements: opportunity identification, opportunity analysis, idea genesis, idea selection, and concept and technology development (see also Reid and de Brentani, 2004). They are elements of the innovation process activities rather than phases, because the front end is not a structured process. The elements are performed concurrently and ideas circulate and are iterated between the phases. Koen et al. (2001) also define factors that drive the front end elements. These factors, which include

leadership and the culture of the organization, overlap with the innovation potential categories presented above.

### **3.3 Results of innovation activities**

Successful innovation process activities are expected to have some outcomes, innovations. Ståhle et al. (2004) define innovation as an improvement, which can be used as an advantage in competition in the market. Amabile et al. (1996) explain innovation as successful implementation of creative ideas within an organization. Innovation can be classified as products and services, or as changes in the way the organization creates and delivers products and services (Assink, 2006). In this study, innovation is defined as a new issue that creates value to the firm or its stakeholders. The basis of innovation does not have to be a completely new idea. It has to be new for the organization applying it. The value of innovation does not have to be economic value. It can be an improvement of the working climate or way of life (Ståhle et al., 2004). Finally, innovations can be divided into several categories: technical and organizational innovations, product and process innovations, and radical and incremental innovations (Wan et al., 2005; Kirner et al., 2009).

## **4 Measurement of innovation capability**

### **4.1 Current measures**

Appropriate measures of performance can contribute to a significantly better understanding of innovation. The most appropriate are those measures that enable focusing the innovation (Birchall et al., 2011). There are some common characteristics in the current innovation capability measures. They are focused on industrial and technology innovations. Service innovations have no proper measures (Tura et al., 2008). Current measures do not recognize, either, that organizations have different sizes and they operate in very different business areas (Carayannis and Provan, 2008). The best ones of the current measures are the ones which pay attention to both inputs and outputs of innovation (Albaladejo and Romijn, 2000). Few studies have proposed measures for innovation capability measurement. Cavusgil et al. (2003) have measured innovation capability by five items: the frequency of innovations, order of market entry, simultaneous entry in multiple markets, and the ability to penetrate new markets to tap the various facets of innovation capability. Albaladejo and Romijn (2000) limit innovation capability measurement to product innovations. They use three measures. The first one measures whether or not the organization has had at least one product innovation in a three-year period. The second one is the number of patents. The third one is an index which shows the significance of the organization's innovative outputs in a three-year period. The current measures of innovation capability can be divided roughly into two categories: input measures and output measures (e.g. Albaladejo and Romijn, 2000).

Input measures evaluate how the innovation activities have been arranged and how resources are allocated to them. Input measures include the funds used in R&D activities and education (Tura et al., 2008). Input measurement is problematic, because it tells how much is devoted, not if anything has been accomplished. Input measures also underestimate smaller innovation activities. Smaller organizations do not have opportunities to invest in R&D. That is why input measures do not reflect the actual innovation capability (Albaladejo and Romijn, 2000). Output measures evaluate the effects of innovation capability. It is hard to express all kinds of innovations quantitatively, and output measures usually measure the results of successful innovations (Tura et al., 2008). Output measures mainly include the organization's patents and licenses. The problem of output measures is that they are only suitable for certain types of innovations and organizations. They are not suitable for small or service organizations (Albaladejo and Romijn, 2000). Output measures do not measure the economic value of all kinds of innovations, either (Tura et al., 2008). Intangible measures are much undeveloped compared to financial measures. Numerical value is not always the best or the most important benefit attained through measurement. It is more important to notice the change in the measurement results (Yliherva, 2004). A comparison and summary of the current measures are presented in Table 1.

Table 1. Comparison and analysis of the measures and measurement of innovation capability

Type of measure	Description	Subjective/objective	Focus		Limitations
			Industrial/Service firms	Large/ Small innovations	
Input	Evaluate how the innovation activities have been arranged	Objective	Industrial (Service)	Large	Does not show what has been accomplished with the investments Concentrates on larger innovations
Output/ Outcome	Evaluate the effects of successful innovations	Objective	Industrial	Large	Not suitable for small or service organizations Does not usually take into account the economic value of innovations

## 4.2 Current measurement models

In light of earlier literature, it can be noticed that innovation capability has traditionally been measured via questionnaires or other subjective assessment models. There are various models for the measurement of innovation capability or factors closely related to innovation capability (see e.g. Prajogo and Ahmed, 2006; Panayides, 2006; Bass and Riggio, 2006; Dobni, 2008; Kivipõld and Vadi, 2010). The measurement of innovation capability from the perspective of performance management has been less studied. The current literature lacks models for the measurement on innovation capability and its effects in organizations. As presented above, single measures have been suggested, but comprehensive measurement frameworks have not

been developed. Therefore, the performance management perspective is not well embodied in the current literature.

The innovation perspective is in a small part in some current well known performance measurement models. For example, Kaplan and Norton (2004) have presented a strategy map which represents how an organization can create value. In this approach, the innovation process is considered one of the important internal processes. There are only a few models that are especially targeted to the measurement of innovation. One of the few models is presented by Capaldo et al. (2003), who propose an innovation capability evaluating method with four resource sets: entrepreneurial resources, human resources, resources arising from external linkages, and economic resources. Each set contains several measures to evaluate both the degree of market innovation capability and the degree of technological innovation capability. Also several models for the measurement of innovation have been developed. These models include some elements of innovation capability presented above. Muller, Välikangas and Merlyn (2005) have presented a matrix for the measurement of innovation. The matrix has been divided into three categories: resources, capabilities and leadership. These categories are measured in three perspectives: inputs, processes and outputs. Adams, Bessant and Phelps (2006) have designed a framework for the measurement of innovation management. The framework has been divided into seven categories: inputs, knowledge management, innovation strategy, organization and culture, portfolio management, project management, and commercialization. In total there are 19 measurement areas in the framework. Epstein (2007) has constructed an innovation contribution model, which includes input, process, output and outcome measures. It concentrates on the antecedents and consequences of investment in innovation. Carayannis and Provan (2008) have suggested a 3P- framework for the measurement of innovation processes. The framework contains three categories, which are posture, propensity and performance. These categories include measures on innovation inputs, process capabilities and performance. The measures are used to form an index, which shows the present state of the innovation processes in the organization.

## **5 Linking innovation capability and performance**

According to Calantone et al. (2002) innovativeness is the most important determinant of an organization's performance. Tidd (2001) divides measures that are used to prove the relationship between innovation and business performance, into two categories. The first group concerns accounting and financial performance. These measures include profitability, return on investment and share price. The second group concerns market performance, for example the share or growth (Tidd, 2001). Many earlier studies have confirmed the positive relationship between innovativeness and an organization's business performance (e.g. Lawless and Anderson, 1996; Subramanian and Nilakanta, 1996; Gopalakrishnan, 2000; Klomp and Van Leeuwen, 2001; Cho and Pucik, 2005; Chapman, 2006; Armbruster et al., 2008).

According to Chapman (2006), innovations have a strong effect on financial success. The study found a strong link between collaboration and financial performance - organizations using external sources achieve higher revenue growth than others. Klomp and Van Leeuwen (2001) discovered that innovations and innovativeness have an impact on sales performance and productivity (measured sales/employee). Subramanian and Nilakanta (1996) found that different kind of innovations have an impact on different fields of performance. Organizational innovations improve coordination and co-operation in the organization, and they have been indicated also as better results in efficiency measures. Technical innovations improve the organization's competitiveness, and they have been shown to have a positive impact on the results of effectiveness measures (Subramanian and Nilakanta, 1996). Armbruster et al. (2008) have shown that organizational innovations act as prerequisites and facilitators of an efficient use of technical product and process innovations, and therefore they are sources of competitive advantage. Organizational innovations themselves have impact on business performance with regard to productivity, lead times, quality and flexibility (Armbruster et al., 2008). Cho and Pucik (2005) have studied how an organization's innovativeness and quality affects performance. They discovered that innovativeness is a driver of growth, quality is a driver of profit, and both are drivers of market value. Innovativeness also affects profitability indirectly through quality (Cho and Pucik, 2005). According to Gopalakrishnan (2000), the speed and innovation magnitude are linked to the results of different measures of performance. Innovation speed has a strong impact on financial performance, measured by the average return on assets. However, innovation speed is not associated with executives' perceptions of overall performance. Innovation magnitude is associated with executives' positive perceptions of overall performance even though it does not have a significant impact on financial performance (Gopalakrishnan, 2000). The study of Palaima and Skaržauskienė (2010) revealed that systems thinking is associated with higher leadership performance. These results indicate that the relationship between innovations and performance is still challenging, and the studies have focused on certain elements of innovations and performance. Although there is a variety of studies concerning innovations and performance, there is a lack of studies concerning the measurement of innovation capability. Hence, there is still a need to develop more comprehensive measurement frameworks for the measurement of the effects innovation capability.

## **6 A framework for measuring the effects of innovation capability**

### **6.1 Research method**

The aim was to develop a general procedure to clarify, how the different aspects of performance can be linked to the measurement of the effects of innovation capability in organizations. The measurement framework was developed by examining and matching the existing literature of innovation capability and performance measurement.

The first research phase was forming an understanding of the concept of innovation capability to define what exactly is being measured. According to Olkkonen (1994), a concept is an abstract, general and compact definition of a phenomenon. Precisely defined concepts are essential for scientific research, especially when the measurement of a phenomenon is carried out (Olkkonen, 1994). Previous literature was searched earlier used approaches and to form a definition of the concept of innovation capability and related concepts. The second phase was examining current measurement frameworks, and further how the measurement of innovation capability has been noticed in the current literature of performance measurement. The phase was conducted by analyzing earlier innovation measurement literature and forming an understanding of which of the previously constructed performance measurement frameworks would be the most suitable to be adapted to the measurement of innovation capability and its effects.

In the third phase, a conceptual framework for the measurement of innovation capability was formed on the basis of the previous phases. Jabareen (2009) has defined a conceptual framework as a network of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena. The concepts that constitute a conceptual framework support one another, articulate their respective phenomena, and establish a framework-specific philosophy. The features of conceptual frameworks can be defined as follows (Levering, 2002; Jabareen, 2009):

1. A conceptual framework is a construct in which each concept plays an integral role.
2. A conceptual framework provides an interpretative approach to social reality.
3. Conceptual frameworks provide understanding.
4. A conceptual framework provides “soft interpretation of intentions”.
5. Conceptual frameworks do not enable predicting an outcome.
6. Conceptual frameworks can be developed and constructed through a process of qualitative analysis.
7. The sources of data consist of many discipline-oriented theories that become empirical data of conceptual framework analysis.

In this phase, the process and basis for the measurement of innovation capability are presented and the measurement process connected to the Balanced Scorecard. The Balanced Scorecard was chosen because it is the most common and frequently used performance measurement framework. Organizations using the Balanced Scorecard can use the framework presented in this study to connect the innovation capability and its effect measures to the Balanced Scorecard measures already exploited in the organization. It also represents all the significant perspectives of performance and therefore gives a balanced view of the organization's performance. The second reason that justifies connecting innovation capability measurement with the current performance measurement framework is based on the study of Kujansivu (2008). Kujansivu suggests that the balanced performance measurement system may be appropriate to support intellectual capital management. It can be assumed that the same

principles can be applied to the measurement of innovation capability, which is mainly intangible. Third, Epstein (2007) has used the Balanced Scorecard for an innovation contribution model, suggesting that it is useful as a performance evaluation system and it can also be useful when used to evaluate an organization's innovation efforts in particular. Balanced Scorecard focuses on better understanding on the causal relationships and linkages within the organization and the levers that can be pulled to improve corporate performance (Epstein, 2007). Thus, the Balanced Scorecard can be useful also when measuring the organization's capability to produce innovations and its effects.

## 6.2 Principles for the measurement of innovation capability

When developing innovation capability, innovation outputs are expected (Lawson and Samson, 2001). In this situation innovation outputs are the results of practice-based innovation activities. It is also expected that continuous successful results of innovation activities will make the organization more innovative. Many studies have indicated a positive relationship between an organization's innovativeness and overall performance (see the previous section). The innovation capability measurement framework is based on this assumption.

As presented above, innovation capability cannot usually be measured directly. The measures have to be designed so that they measure things closely related to innovation capability. Hence, when measuring innovation capability, three elements have to be considered: potential, processes and results. These elements can be measured by objective or subjective measures or both.

The measurement of innovation capability and its effects is based on four components. The basic principles of the measurement of innovation capability are presented in Figure 1. The factors of innovation potential can be either promoters or obstacles of innovation. Exploitation of innovation potential is needed for successful innovation process-related activities. When the innovation activities are successful, their results are also better. Successful innovation activities have a positive effect on the organization's business. These four phases have to be considered when designing the framework for the measurement of innovation capability and its effects.

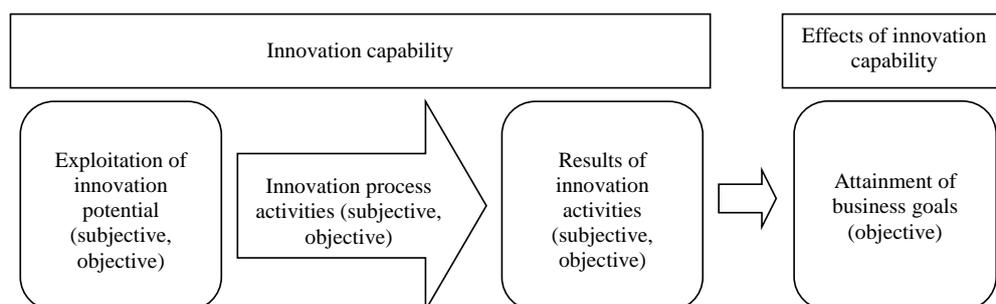


Figure 1. Basis for the measurement of innovation capability and its effects

### **6.3 The measurement framework**

Previous models and frameworks dealing with innovation performance measurement have concentrated on for example resources dedicated to innovation (e.g. Capaldo et al., 2003; Muller et al., 2005), innovation processes (e.g. Carayannis and Provan, 2008), innovation leadership and management (e.g. Muller et al., 2005; Adams et al., 2006), and capabilities (e.g. Muller et al., 2005; Adams et al., 2006). However, the capabilities view is a very small part of the models. There have been only a few attempts to create a framework for the measurement of innovation capability especially. Comprehensive innovation capability measurement frameworks have not been presented in the previous literature.

The result of the study is a conceptual framework for the measurement of the effects of innovation capability in organizations. The framework is based on the Balanced Scorecard. When the framework was designed, special attention was paid to the concept of innovation capability. Thus, the four Balanced Scorecard perspectives were renamed to match the principles of the measurement of the effects of innovation capability. For example, innovation capability associates better with the wider focus on personnel than just the perspective of learning and growth. Another purpose was to achieve a balanced view of the development of innovation capability through innovation performance measurement. The innovation performance perspective was used to capture the objectives and measures related to the three innovation capability elements. One basis for the framework was making it possible to consider the relationship between innovation capability and business performance in assisting the measurement of innovation capability. Thus, the main question is: how to define the cause-effect relationship between innovation capability measures and business performance measures? The constructed framework provides guidelines for which perspectives should be catered when measuring the effects of innovation capability. Five perspectives were chosen to the framework: financial, customer, processes, personnel, and innovation performance. The innovation performance perspective includes measures related to innovation capability, both potential, concrete activities and their results. The perspectives of financial, customer, internal processes and personnel performance measure the effects of innovation capability in the organization's business goals. These perspectives are presented in Figure 2. The framework represents the principles for the measurement of innovation capability presented in Figure 1 in the following way: the innovation performance perspective is used for measuring the three elements of innovation capability, and the effects are measured via the rest four perspectives (customers, processes, personnel and financial).

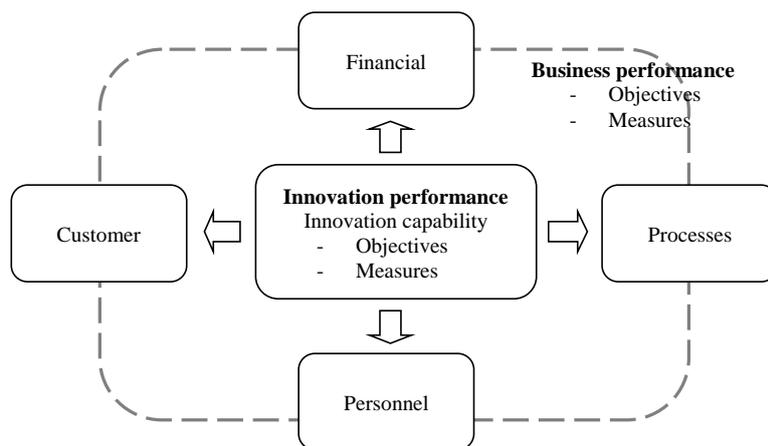


Figure 2. Framework for the measurement of innovation capability and its effects

The innovation performance perspective may include various kinds of measures. The objectives and their measures are case-specific, and goals are set considering the organization's starting points and characteristics. However, the main point is to measure things related to innovation capability or some of its elements (namely potential, processes and results). Hence, the innovation performance perspective can include measures related to the elements of innovation capability (innovation potential, innovation processes and results of innovation activities). These include for example:

- Creativity
- Motivation
- Leadership
- Communication channels
- Idea creation and assessment
- New products or services
- New procedures or ways of action

The basis of the innovation capability framework is presented in Figure 3. Innovation performance consists of the three elements of innovation capability, namely potential, process and results. The measures of the innovation performance perspective concentrate on evaluating the elements of innovation capability. These measures are linked to the business performance measures divided into four perspectives, namely financial, customer, processes and personnel. As a summary, one factor is chosen from one of the elements of innovation capability and the measure to the factor is defined. Then the measure is linked to the business performance measure. If the state of the innovation capability measure changes, changes are also expected in the business performance measure. This cause-effect relationship can be either direct or indirect, meaning that improvement in the innovation capability measure can show directly in the personnel perspective measure, or indirectly through processes perspective measure.

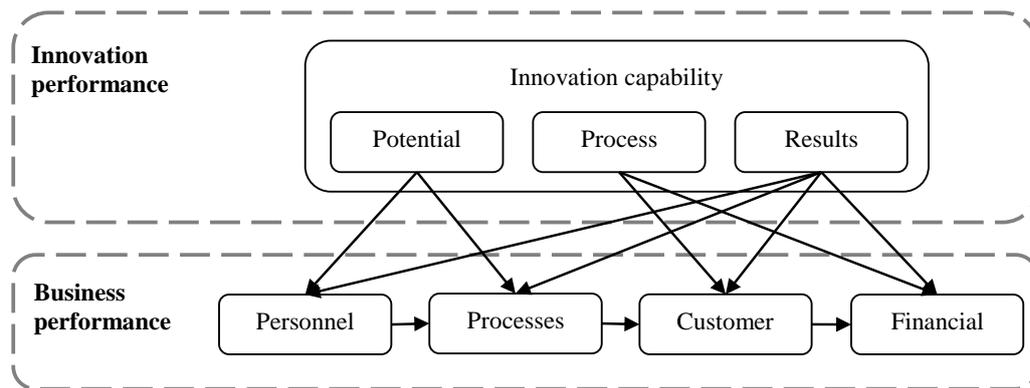


Figure 3. Different stages of measurement and cause-effect linkages

The effects of the exploitation of innovation capability are discussed next. The innovation capability elements are modified into objectives of innovation performance, as described in the previous section. What can the exploitation of innovation capability mean in each perspective of business performance? The basic idea of the framework is that the objectives of the innovation performance perspective are linked into business objectives, because it is not enough to get the output of innovation, but also the outcome of innovation. In this case, concrete objectives or measures are not provided, but directions and guidelines are presented. The following four questions and their answers reflect how the link between innovation capability and the four business performance perspectives can be formed. It is also discussed how the development of innovation capability can occur in business performance measures. Thus, the presented measures are examples of the measures that can be utilized in innovation capability effect measurement. The measures cannot be the same in every case, because innovation capability also varies between different types of organizations.

When the framework is utilized, the following issues should be acknowledged:

- Defining objects of innovation capability
- Defining measures to the objects of innovation capability
- Defining the linkage of what improvements of business performance are expected when developing the innovation capability objects
- Defining the objects of business performance perspectives
- Defining measures of business performance
- Defining cause-effect relationships of business performance measures

1. How does the development of innovation capability affect the behavior of our *customers*?

When developing innovation capability, the benefits to customers should be taken into consideration. Customer satisfaction tells how well the organization is doing. Things that affect customer satisfaction include time, quality, service and cost. However, it is not enough to have

satisfied customers, the customers should also be profitable. Measures related to markets reveal how well an organization is doing in a desired market. Besides trying to get new customers, it is important to retain the existing customers. Hence, the customer perspective can include measures related to:

- Customer profitability
- Customer retention
- Customer satisfaction
- Market share

Next, some examples of the linkage between innovation performance and customer perspective are given. Improvements in production processes may increase customer profitability, if the products are made with lower costs than earlier. Thus, improvements in the production process can be measured via lead-time, which is a measure of innovation performance, if the improvements in the production process are made as a consequence of a new innovative process part. Changes in this measure can in turn lead to better customer profitability. New ways of communication with customers can be a measure of creativity in the innovation performance perspective. It can affect customer retention. The effects of the development of innovation capability on customer satisfaction can be indicated by measuring whether the new service process has improved the provided service. New innovative service processes, measured via capture percentage as an innovation performance measure, can make the customers more satisfied with the service. A new, improved version of a product or service may show as a bigger market share. Thus, number of new products or services can be linked to the measure of market share.

2. How does the development of innovation capability affect the internal *processes* within an organization?

The purpose for innovation capability development may be improving the operating efficiency continually. After all, processes, decisions and actions occurring throughout an organization have an effect on the fields from other performance perspectives. Also the flow of information through the organization can be examined. On the other hand, it is not enough to operate effectively, but also with high quality. Hence, the process perspective can include measures related to:

- Quality of products and services
- Flexibility of decision-making
- Reliability of deliveries
- Effectiveness of problem-solving

The linkage between innovation performance and the process perspective may be shown as follows. Improvements of production process can increase the quality of products. The effects

of innovation capability development on the quality of products can be measured via the proportion of secondary production. In addition, if the new production process leads to fewer errors (errors as a measure of innovation performance), this can come up as fewer reclamations (measure of product quality). If communication channels are innovated to be easier to use and are clarified to all employees, it will make the decision-making more flexible when information flows more effectively through the organization. In this case, the measure of innovation performance can be a questionnaire to the employees asking whether the communication channels are easy to use. This measure can be linked to the measure of business performance indicating whether the managers consider they have enough information for the decision-making. The reliability of deliveries may sharpen if optimization of stockpile is advanced by new innovations. To give an example, the reliability of deliveries could be measured by lead-time from order to delivery after and before the optimization of stockpile (innovation performance measure). New innovative use of the reporting system for history information of defaults can increase the effectiveness of problem-solving. The number of people using the reporting system to evaluating the organization's innovation activities can be a measure of motivation in the innovation performance perspective and it can be linked to the process perspective measure (the availability of information for problems occurred).

3. How can we create value to our *personnel* via the development of innovation capability?

The employees are the most important asset of an organization. An organization's ability to innovate, improve and learn is dependent on its employees, which is directly associated to the organization's value and competitiveness. It is important to create value to the employees, in order to increase the value of the organization. Investments made to train and reinforce the employees will return to the organization in the long run. Hence, the personnel perspective can include measures related to:

- Employee satisfaction
- Employee retention
- Employee skills

Some examples of the linkage between innovation performance and the personnel perspective are presented next. The new reward system should have an effect on employee satisfaction. The relationship between innovation capability development and employee satisfaction can be measured for example by clarifying the effects of a new reward system for employee satisfaction and retention. Thus, the amount of rewards as an innovation performance measure can be linked to an employee satisfaction survey, which can be further linked to the other business performance perspectives. This example is illustrated in Figure 4. Also new training programs can be developed through innovation capability development to increase the skills and satisfaction of the employees. The number of education events can be linked to the medium

number of tasks which each employee is capable of doing. Similarly, a new leadership style can be a key for motivating people, and when the employees are motivated to do their tasks, it may increase employee retention. In this case, the number of leaders that have applied participative methods in their leading can be linked to the number of employees that have resigned.

4. Have the outcomes of innovation capability development been *financially* successful?

The objectives of the other three perspectives are to assist financial objectives to come true. However, it is not easy to explicate the linkage between the financial perspective and different operations related to other perspectives. The main goal of any organization is to operate profitably. The development of innovation capability can be shown as improvements in profitability, growth and shareholder value. Hence, the financial perspective can include measures related to:

- Added value
- Profitability
- Growth

The linkage between innovation performance and the financial perspective can be shown as follows. Outlining a more powerful brand should add value to an organization. Innovation performance can be measured via the number of working hours used for brand creation. The added value received through brand creation can be measured by asking how big a portion of potential customers recognize the organization's name. New ways of using material in the production processes may affect the profitability of an organization, if work can be done more effectively with lower costs. The number of new innovative materials can be a measure of innovation performance which is linked to the profit margin of the product used as a financial perspective measure. The expansion of product variety may help the organization to penetrate to new markets and grow. The effects of innovation capability on the organization's growth can be measured via assessing whether the volume of the orders (measure of financial perspective) of new innovative products have increased (number of new innovative products as an innovation performance measure).

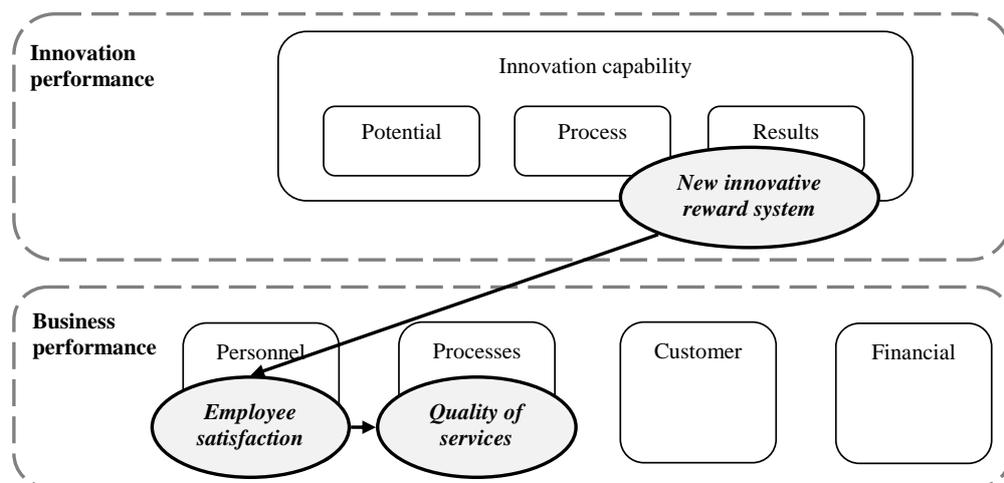


Figure 4. Example of the cause-effect linkages of the framework

As a summary, it can be stated that the above descriptions, linked both to innovation performance and four business performance perspectives, are examples of how innovation capability and its effects to an organization's business performance can be justified and measured. The framework does not propose any specific objectives or measures, because they depend on what part of innovation capability the organization is developing, and further, on the focus of the business performance affected by the innovation capability. Therefore, the objectives and measures are case-specific, whereas the measurement perspectives are the same in every case.

## 7 Discussion and conclusions

This paper contributes to the current literature by presenting a conceptual framework designed especially for the measurement of innovation capability and its effects. The issue is essential, because an organization has to improve its innovation capability to become innovative, and further to manage in business. So far, the problem has been the measurement of the effects of innovation capability.

The strategy map presented by Kaplan and Norton (2004) considers the innovation process as linear and separately identifiable construct. However, in the framework presented in this paper, innovation capability is seen in a more holistic way. Lawson and Samson (2001) point out that innovation capability is associated with the main processes within the firm, and it cannot be separated from other practices. All three elements of innovation capability can have effects on business performance related to the personnel, customers, processes and finances. The elements do not follow each other in a certain order. Every element can lead to improvement in business performance, either alone or through another element.

In addition, a majority of the previous models of the measurement of innovation capability and related concepts have not taken the cause-effect relationships into account. It is not enough to know how many new innovative processes, actions or products have been conducted, if there is no understanding about their connection to business performance. In Epstein's model (2007), the cause-effect relationships have been acknowledged, but the focus is not merely on innovation capability. The model discusses the inputs, processes and outputs of innovation, but does not take account of the variety of elements of innovation capability. Thus, the framework presented in the paper goes one step further than the previous models by discussing both the cause-effect relationships and the innovation capability view and its effects on business performance. Although many studies have confirmed a positive relationship between innovations, innovativeness and business performance, the current literature lacks a comprehensive framework for the measurement of innovation capability and its effects. The current literature also lacks procedures linking the development of innovation capability to the measures of business performance.

Traditionally, for example the Balanced Scorecard has contained innovation measures only in the personnel perspective. However, this viewpoint does not comprehensively cover the measurement of other innovative outputs, for example related to customers, internal processes, and finances. As the Balanced Scorecard is the most commonly used performance measurement system, the measurement of innovation capability has been connected to the four perspectives of it in the framework presented in this study. The main purpose of the framework is to show that the development of innovation capability should appear in all four business performance perspectives.

The other contribution of the paper is the definition of the concept of innovation capability, which has so far not been unambiguously defined. Based on the matching of earlier literature, innovation capability has been divided into three elements: innovation potential, innovation processes and the results of innovation activities. Innovation potential can be considered to have five categories, namely leadership and decision-making processes, organizational structures and communication, collaboration and external links, organizational culture and climate, and individual creativity and know-how. This study suggests that organizations which exploit these aspects effectively in their innovation processes are expected to have successful results of innovation activities, which will have an effect on the organization's overall performance in the long run. As an implication, the framework offers groundwork for assisting both academics and practitioners to understand the essence of innovation capability and how innovation capability can be linked to the business objectives.

The conceptual framework for the measurement of innovation capability and its effects is based on a literature review and the considerations of the researchers. In the future, the framework can be tested before decisions about its suitability can be made. The framework will be tested in a Finnish forest industry organization, but the data has not been collected yet. For further

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research, more case studies are needed to evaluate the suitability of the framework. For example, a scale for measuring innovation capability can be developed. The scale can be tested with empirical evidence, and it makes it possible to determine where a specific firm is located on that scale.

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