Facilitating innovation capability through performance measurement: A study of Finnish SMEs

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FACILITATING INNOVATION CAPABILITY THROUGH PERFORMANCE MEASUREMENT: A STUDY OF FINNISH SMES

Structured Abstract

Purpose – The study aims to clarify the issue of whether measurement has a positive effect on different aspects of innovation capability. The study contributes to the current understanding in two ways; first by presenting the important aspects of organisational innovation capability, and second by showing the importance of measurement in promoting different aspects of innovation capability.

Design/methodology/approach – The study has been executed by conducting a web-based survey in small- and medium-sized enterprises (SMEs). A sample of 2,400 SMEs was randomly selected. A representative of management and employees in each company received an invitation to participate in the study. A total of 311 valid responses were received.

Findings – The study contains a comprehensive description of the impacts of measurement on different aspects of innovation capability in SMEs. According to the results, performance measurement has positive effects on issues related to innovation capability. The measurement of the aspects of innovation capability is rare in SMEs, although innovation capability and measurement are positively related. The study suggests that both academics and practitioners should focus on the development of new methods and practices for measuring issues related to innovation capability in order to develop innovation capability and further contribute to firm success.

Originality/value – The paper discusses the value of measurement in a context of innovation management.

Keywords: Performance measurement, Measurement, Innovation, SME, Innovation capability, Innovation management

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1 Introduction

Successful operation of organisations in almost all industries is becoming highly dependent on their ability to produce innovations. Innovation is an evolutionary process within an organisation to adopt any change pertaining to a device, system, process, policy, or service that is new to the organisation (Calantone et al., 2002). Thus, innovation can be regarded as an organisational capability, because it is an act that deploys resources with a new ability to create value (Yang et al., 2006). Developing innovation capability is important, as innovation plays a key role in the survival and growth of organisations (Francis and Bessant, 2005). In order to manage innovation capability, it has to be measured. Measurement can have a positive effect on many things, if the measurement is conducted in a right way (Ukko et al., 2008). The importance of measurement is especially true for innovations where there is need to bring clarity to a fundamentally creative process (Skarzynski and Gibson, 2008). Traditionally, small and medium sized enterprises (SMEs) have little resources to measure their performance or issues related to innovation capability. Earlier studies have shown that the measurement of issues related to innovation capability is on a poor level in Finnish SMEs (e.g. Saunila et al., 2011). Contrary to the assumption that small companies have less opportunities for innovation development, the study of Sloan and Sloan (2011) concludes that firm size does not have a significant influence at least in the generation of incremental innovations.

The objective of this research is to study the relationship between organisational innovation capability and performance measurement. The study contributes to the current understanding in the field of innovation management by presenting the important aspects of organisational innovation capability and by showing the importance of measurement in promoting different aspects of innovation capability. The results contribute to the existing discussion on measurement innovation capability by diminishing the gap between theory and practice and by building requisites for further research. The study concludes that organisations can affect their innovation capability by measurement. Both academics and practitioners should focus on the development of new methods and practices for measuring issues related to innovation capability.

The paper is organised as follows. The study consists of six chapters, including the introduction, a literature review, the research methodology, the findings, discussion and conclusions. The literature review covers the concept of innovation capability, as well as performance measurement and its impacts. The research methodology includes the questionnaire design, sample and data collection, and description of the data. In the findings chapter, the results of statistical analyses are presented. The last two chapters consist of a discussion and conclusions of the findings, and summarise the contribution of the study.

2 Literature review

2.1 Innovation capability

The term innovation capability has been defined in several ways. According to Neely et al. (2001), an organisation's innovation capability can be described as its potential to generate innovative outputs. Similarly, 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". Innovation capability has been suggested to be a multi-faceted construct. There is no common way of analysis by which to study it, due to the variety of perspectives of innovation management (Perdomo-Ortiz et al., 2006). The streams of study in the area of innovation capability have often adopted a certain type of innovation, such as product innovation, instead of the overall innovation capability (Ibrahim et al., 2009). Innovation capability has also been divided into radical and incremental innovation capability (Sen and Egelhoff, 2000). According to the study of Forsman and Annala (2011) the majority of the SMEs are biased towards incremental innovation development resulting in a variety of innovation types: products, services, processes, production methods and single functions. Moreover, the current literature has concentrated on evaluating an organisation's innovation capability by defining types of capabilities that the overall innovation capability consists of. These include, for example, perspectives of product innovation capability, process innovation capability, market innovation capability, strategic innovation capability, organisational capability, manufacturing capability, networking capability, entrepreneurial capability, and R&D capability (see e.g. Christensen, 1995; Guan and Ma, 2003; Wang and Ahmed, 2004; Forsman, 2009).

Another viewpoint is to point out the organisational aspects of innovation. According to Lawson and Samson (2001), innovation capability is a theoretical framework aiming to describe the actions that can be taken to improve the success of innovation activities. Sáenz et al. (2009) consider innovation as a dynamic capability (i.e. a capability that allows the organisation to integrate, build, and reconfigure internal and external competences in order to address rapidly changing environments (Teece et al., 1997)) with multiple aspects. The aspects of innovation capability can also be considered as inputs of innovation activities. According to Davila et al. (2006), inputs are the resources dedicated to the creation of innovations. The inputs may be tangible, namely people, money, time, equipment etc., or intangible, such as motivation, knowledge and organisational culture. Prajogo and Ahmed (2006) discuss the technological factors of innovation management and human factors of innovation management. Human factors include the people and social practices as ingredients in organisational success. Perdomo-Ortiz et al. (2006) have used a term business innovation capability to describe the critical success factors of innovation processes. These critical factors can be interpreted as business innovation capability dimensions, and thus the capability can be measured with the factors.

In this study, innovation capability is defined to consist of the drivers of successful innovation, or aspects influencing an organisation's capability to manage innovation. According to earlier literature, these aspects include for example leadership practices (Bessant, 2003; Tidd et al., 2005; Perdomo-Ortiz et al. 2006; Martensen et al., 2007; Skarzynski and Gibson, 2008; Smith et al., 2008; Paalanen et al., 2009), employees' skills and innovativeness (Perdomo-Ortiz et al. 2006; Martensen et al., 2007; Skarzynski and Gibson, 2008; Tura et al., 2008; Smith et al., 2008; Paalanen et al., 2009; Liu, 2009), processes and tools for idea management (Lawson and Samson, 2001; Tidd et al., 2005; Skarzynski and Gibson, 2008; Smith et al., 2008), supporting culture (Lawson and Samson, 2001; Tidd et al., 2005; Martensen et al., 2007; Skarzynski and Gibson, 2008; Smith et al., 2008; Paalanen et al., 2009; Liu, 2009), external sources for information (Romijn and Albaladejo, 2002; Tidd et al., 2005; Perdomo-Ortiz et al. 2006; Paalanen et al., 2009; Laforet, 2011), development of individual knowledge (Bessant, 2003; Tidd et al., 2005), employees' welfare (Laforet, 2011), and linkage to strategic goals (Bessant, 2003; Martensen et al., 2007; Smith et al., 2008). Also Francis and Bessant (2005) conclude that innovation capability may not be a unitary set of attributes, meaning that different aspects may be needed to create different kinds of innovations.

2.2 Performance measurement

"Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action" (Neely et al., 2005). Radnor and Barnes (2007) define performance measurement as quantifying the input, output, or level of activity of an event or process. Performance measurement has traditionally concentrated on financial measures. Today, performance measurement has moved towards examining the organisation as a whole (Amaratunga and Baldry, 2002). This means that all things happening in the organisation are seen to have an impact on its performance. These things include leadership and management, employees' task motivation, the quality of operations, and the ability of products to fulfil customers' needs (Franco and Bourne, 2003; Bourne et al., 2005; Bititci et al., 2006). Measurement provides the basis for an organisation's assessment on how it reaches its objectives. Measurement also helps to identify areas of weaknesses and to decide on future initiatives. Measurement is not an end in itself, rather a tool for more effective management (Amaratunga and Baldry, 2002).

According to Radnor and Barnes (2007), performance management is an action based on performance measurement, which results in improvements in behaviour, motivation and processes. Further, they consider that performance measurement is about efficiency, productivity and utilisation, whereas performance management builds on performance measurement and is concerned with effectiveness and a broader, more holistic, even qualitative view of operations and the organisation. Amaratunga and Baldry (2002) state that performance

management provides organisations the opportunity to refine and improve their development activities.

2.3 Impacts of performance measurement

It is obvious that improving the innovation capability is the key to acquiring sustainable competitive advantage for an organisation. Thus, it is significant to evaluate the organisation's innovation capability accurately (Shan and Zhang, 2009). According to Skarzynski and Gibson (2008), innovation measures can help managers in two ways: first, to make informed decisions based on objective data; second, to help align goals and daily endeavours with the near- and long-term innovation agenda. Appropriate measures of performance can contribute to a significantly better understanding of innovation. Most appropriate are those measures that enable the innovation to focus (Birchall et al., 2011). All in all, evaluation is an important link in the control structure of organisations (Ferreira and Otley, 2009).

The impacts of performance measurement have been studied by many researchers. According to Pavlov and Bourne (2011), the impacts of performance measurement depend on the way it is used. Performance measurement can affect an organisation's routines in three ways. Pavlov and Bourne (2011) call them as the trigger effect of measurement, the guidance effect of measurement, and the intensification effect of measurement. First, when measurement is used in its feedback-generating function, the measures communicate the results of the past execution of the routine and indicate whether its performance is adequate to the demands of the environment. Second, when measurement is used in its feed-forward function, it can affect the direction of the change in organisational processes. Third, measuring performance forces to search for a match between the existing idea and expression of the routine and stimulates the process of adjusting them in order to respond to the new demands of the environment.

A study of Ukko et al. (2007) concludes that performance measurement has positive impacts on leadership. A greater amount of more specific and exploitable information provides a more solid base for management–employee communication. The study also suggests that performance measurement has impacts on the different areas of management, and the impacts are positive, when performance measurement is conducted in a right way. According to Graftona et al. (2010), the increased use of decision-facilitating measures for feedback control may result as the organisation's greater ability to exploit existing strategic capabilities. On the other hand, the increased use of such measures for feed-forward control is connected to an organisation's capacity to identify and develop new strategic capabilities. Phusavat et al. (2009) have discovered a connection between the extensive use of information and communication technology and effective performance measurement. A study of de Leeuwa and van den Berg (2011) reveals that performance management practices influence some behavioural factors, which they call understanding, motivation and focus on improvement. "Understanding" is related to understanding shopfloor performance; "motivation" is related to the acceptance of

performance measures by operators and motivation to realise performance and active discussion of performance; and "focus on improvement" is related to using performance management to improve within and across organisational departments. Also Ukko et al. (2008) have found that performance measurement has a positive impact on the employees' motivation, learning opportunities, decision-making opportunities, and achievement of goals.

Also the impacts of performance measurement systems have been the subject of many previous studies. For example, the study of Martinez (2005) presents eight positive impacts of performance measurement systems.

- Focus people's attention on what is important to the company
- Get business improvement
- Improve customer satisfaction
- Increase productivity
- Align operational performance with strategic objectives
- Improve people's satisfaction
- Align people's behaviours towards continuous improvement
- Improve company reputation

A successfully implemented and used performance measurement system, through cultural change, leads to a more participative and consultative management style. Similarly, the correct use of performance measurement systems can lead to an achievement culture (Bititci et al., 2004; Bititci et al., 2006). Also Hall (2008) has studied the impacts of performance measurement systems on management. The results indicate that comprehensive performance measurement systems influence managers' cognition and motivation. The findings of Dumond (1994) suggest that a performance measurement system has a positive impact on an individual's performance, decision-making and job satisfaction. Similarly, Lawson et al. (2003) found that the performance measurement system resulted in significant improvement in employee satisfaction.

Another stream of literature suggests that performance measurement is not essential for running a well-performing organisation (e.g. Johnson and Broms, 2000). Organisations that have clear policies and actions with genuine beliefs may not benefit from formal monitoring of individual performance (Sobótka and Platts, 2010). Increased control does not lead anywhere by itself, organisations need to learn to perform, with or without measures (Bititci et al., 2011).

As explained above, the objective of this study is to examine the relationship between innovation capability and performance measurement. On the basis of the studied literature, innovation capability is defined to be composed of the important aspects needed to manage innovation activities. In this study, it is argued that performance measurement plays a significant role for developing innovation capability. In other words, the current state of

innovation capability is better in companies that measure it actively than in those which do not. On the basis of the findings of earlier literature, the following hypothesis was formed:

The higher the firm's measurement activity, the greater its innovation capability

3 Methodology

3.1 Questionnaire design

The approach of this study is quantitative. The questionnaire developed for the study consists of two major parts. The first part comprises 30 items measuring different issues related to innovation capability. The second part comprises 9 items measuring the activity of measurement in the organisation. The items for the questionnaire were operationalised on the basis of a literature review. Some efforts were made to maximise the validity and reliability of the construct. When available and appropriate, existing measurements that had been empirically tested were utilised. New items were built on the basis of previous studies. The items were reviewed and revised with a group of researchers. The researchers were asked to critically analyse each of the items with respect to the concept it was intended to measure, on the appropriateness of each item, easiness of comprehension, and possible improvements in wording. This resulted in minor changes to the presentation of the questionnaire. The items of innovation capability and their references are presented in Table 1. The scale included also 9 items to measure the activity of performance measurement and the use of measurement information. The respondents were asked to respond to different questions: whether the organisation has measures for evaluating development, in which aspects of innovation capability are measured, and whether measurement information is used for developing the actions and operations of the organisation. For each of the 30 items of innovation capability and the 9 items of measurement, the respondents were asked to indicate their opinion on a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). A neutral response "neither disagree nor agree", was adopted to reduce uninformed responses.

Table 1. Original references of the items

Item	Original items	References
1 My work community encourages gaining knowledge through external contacts	People in the organisation possess a willingness to accept and adopt ''external'' ideas We are encouraged to flush out information on what most would consider the "not so obvious" or even obscure	Martensen et al. 2007 Dobni 2008
2 We have developed our ways of action by comparing our operations to other organisations	Understanding competitors' core technology competence	Guan and Ma 2003
3 We develop our actions together with our stakeholders (customers etc.)	We co-define value with our customers We generate ideas for new products and/or services with our customers	Dobni 2008 Kallio et al.
4 Co-operation works well in our organisation	Cooperation between different functions works well	Kallio et al.

5 We have a clear way of processing and developing ideas	Innovation processes are supported by sufficient tools, and systems	Martensen et al. 2007
6 The employees get feedback for their ideas	We have clear feedback practices	Otala 2003
7 Our reward system encourages ideating	My organisation recognises and rewards innovative and enterprising employees	Tang 1999
8 Our organisation seeks new ways of action actively	I seek out new ways to do things Creating, acquiring and transferring of new knowledge and skills are a part of company culture	Hurt et al. 1977 Martensen et al. 2007
9 Our organisation has the courage to try new ways of action	We are willing to try new ways of doing things and seek unusual, novel solutions	Wang and Ahmed 2004
10 When experimenting with new ways of action, mistakes are allowed	There is an understanding that mistakes will occur or an opportunity will not transpire as expected	Dobni 2008
11 The employees have the courage to disagree	In our company, we tolerate individuals who do things in a different way	Wang and Ahmed 2004
12 The managers encourage initiatives	We get a lot of support from managers if we want to try new ways of doing things My supervisor encourages me to express my opinion on things	Wang and Ahmed 2004 Kallio et al.
13 The managers give positive feedback	Feedback is given to the individual as well as to the team concerning improvement suggestions for innovation.	Martensen et al. 2007
14 The managers pass employees' ideas to the upper levels of the organisation	Our management helps break down barriers that stand in the way of implementation Important information is shared quickly and accurately to the right persons – up, down and sideways in the organisation	Dobni 2008 Martensen et al. 2007
15 The managers participate in ideation and development	Our top managers show great enthusiasm for innovation and work improvement	Tang 1999
16 The employees are willing to participate in development	In my organisation employees are active in making suggestions about work improvement I participate in the organisation's innovation activities	Tang 1999 Kallio et al.
17 It is easy for the employees to adopt new ways of action	I am reluctant about adopting new ways of doing things until I see them working for people around me	Hurt et al. 1977
18 The employees know how to be critical towards current ways of action when needed	I am encouraged to challenge decisions and actions in this organisation if I think there is a better way	Dobni 2008
19 All employees have a possibility for education	We have an organisation-wide training and development process, including career path planning, for all our employees	Samson and Terziovski 1999
20 We have instructions and responsible persons for work orientation	We have instructions and responsible persons for work orientation	Otala 2003
21 The employees are encouraged to be multi-skilled	The employees are encouraged to be multi-skilled	Otala 2003
22 Voluntary learning and development of expertise are supported in our organisation	Voluntary learning and development of expertise are supported in our organisation	Otala 2003
23 There are practices for transferring tacit knowledge	There are practices for transferring tacit knowledge	Otala 2003
24 In our organisation, learning is an investment, not an expense	The sense around here is that employee learning is an investment, not an expense	Calantone et al. 2002
25 The employees prosper in our organisation	Employee satisfaction is formally and regularly measured	Samson and Terziovski 1999
26 The employees are treated equally	Employees are treated as equals amongst peers, and this is evident in their participation levels	Dobni 2008
27 The employees are appreciated for their work	My contributions are valued by my fellow employees	Dobni 2008
28 The number of working tasks is suitable	My work schedule allows me time to think of creative solutions to problems	Tang 1999
29 The quality, demands and responsibility of tasks are suitable	The quality, demands and responsibility of tasks are suitable	Otala 2003
30 There is an opportunity for flexible working and working hours in our organisation	There is an opportunity for flexible working and working hours in our organisation	Otala 2003

3.2 Sample and data collection

The data of the study was gathered from Finnish SMEs with a web-based questionnaire. SMEs with less than 10 employees were excluded from the sample. A sample of 2400 SMEs, employing 11-249 persons and having a revenue of 2-50 Meuro, was randomly selected. The questionnaire was targeted to both small and medium-sized enterprises, because both groups would presumably benefit from performance measurement. Also, a representative of both management and employees received an invitation to participate in the study. Thus, 4800 questionnaires were sent. A total of 4050 questionnaires reached the respondents, while 750 questionnaires were returned to the researchers with return to sender (RTS) messages, indicating that the addresses were no longer valid. The delivery of the questionnaire was conducted in four waves. One week after the first mailing of the questionnaire, reminder questionnaires were sent out. The remaining two reminders were sent a week after the previous reminder. This process resulted in a total of 311 responses, and after discounting the number of RTS mails, the final response rate accounted for 7.68 per cent.

To check the non-response bias, an analysis of variance (ANOVA) test was performed. The respondents were divided into four groups: the first respondents, the first follow-ups, the second follow-ups and the third follow-ups. The results of the ANOVA test revealed that there was no significant difference (at the 5 per cent significance level) between the four groups. Therefore, it can be assumed that the responses reflect the whole sample well.

3.3 Description of the data

The background information of the respondents is presented in Table 2. In terms of organisational size based on the number of employees, 72 per cent of the respondents came from firms with 49 employees or less, and around 28 per cent were from firms with 50-249 employees. Based on revenue, around 45 per cent of the respondents were from firms with 2-5 Meuro revenue, around 43 per cent from firms with 5-20 Meuro revenue, and around 11 per cent from firms with 20-50 Meuro revenue. The division of responses depending on the revenue and number of employees are well in line with the total of Finnish SMEs. As can be seen, the responses are quite nearly equal between industrial and service sectors. A majority of the responses were received from executives, and about 30 per cent of the responses were from employees.

Table 2. Background information of the respondents

		n	**%**
Revenue (Meuro)	2-5	141	45.3
	5-20	135	43.4
	20-50	35	11.3
No of employees	10-49	224	72.0

	50-249	87	28.0
Industry	Industrial	145	46.6
	Service	159	51.1
	No response	7	2.3
Organisational position	Executive	222	71.4
	White-collar worker	68	21.9
	Blue-collar worker	12	3.9
	No response	9	2.9

4 Findings

To analyse the collected data, factor analysis was used to extract the underlying factors of innovation capability. The adequacy of the sample was checked with the Kaiser-Meyer-Olkin (KMO) test. The overall KMO value was 0.87, which is acceptable for this type of analysis. Then, construct validity was assessed by principal component analysis with Varimax rotation. One item was excluded, because it loaded alone among other items into one factor. Seven factors (based on eigenvalue greater than 1) were obtained (see Table 4) with the factor analysis. This solution explained 58.2 per cent of the total variance. The seven factors extracted on the basis of this solution are:

Participatory leadership culture factor. The first factor comprises six items. This first factor includes a set of items directly or indirectly related to an organisational culture that supports innovation. The dimension reflects both the overall atmosphere of the organisation that supports and motivates innovation, and also a leadership culture that facilitates innovation. The items of the factor are: “The managers encourage initiatives”, “The managers give positive feedback”, “The managers pass employees’ ideas to the upper levels of the organisation”, “The managers participate in ideation and development”, “There are practices for transferring tacit knowledge” and “The employees are appreciated for their work”. The factor explains 28.2 per cent of the variance.

Ideation and organising structures factor. The second factor also comprises six items. This factor includes a set of items directly related to the structures and systems that successful innovation requires. This includes the generation, development and implementation of innovations, and the ways how the work tasks of the organisation are organised. The six items of the factor are: “We have a clear way of processing and developing ideas”, “The employees get feedback for their ideas”, “Our reward system encourages ideating”, “We have instructions and responsible persons for work orientation”, “The number of working tasks is suitable” and “The quality, demands and responsibility of tasks are suitable”. The factor explains 6.78 per cent of the variance.

Work climate and wellbeing factor. The third factor comprises five items. This factor includes the items that represent the wellbeing of the employees and further the work climate for innovation development, including collaboration and values. The five items of the factor are:

"Co-operation works well in our organisation", "The employees have the courage to disagree", "The employees are encouraged to be multi-skilled", "The employees prosper in our organisation" and "The employees are treated equally". The factor explains 5.84 per cent of the variance.

Know-how development factor. The fourth factor comprises three items. This factor concludes that also the expertise of the employees play an important role for the development of the innovation capability of the organisation. This includes the utilisation of knowledge as well as the improvement of employee skills. The three items of the factor are: "All employees have a possibility for education", "Voluntary learning and development of expertise are supported in our organisation" and "In our organisation, learning is an investment, not an expense". The factor explains 4.79 per cent of the variance.

Table 4. Factor analysis results (loadings over 0.4 presented)

	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factor 6**	**Factor 7**	**Comm.**
Cronbach´s alpha	0.803	0.708	0.786	0.738	0.766	0.625	0.486	
12	0.698							0.584
13	0.702							0.631
14	0.705							0.648
15	0.756							0.677
23	0.404							0.350
27	0.469		0.442					0.565
5		0.688						0.673
6		0.517						0.532
7		0.556						0.573
20		0.497						0.461
28		0.514						0.436
29		0.574						0.469
4			0.491					0.550
11	0.416		0.476					0.537
21	0.429		0.496					0.512
25			0.768					0.682
26			0.731					0.687
19				0.737				0.634
22				0.711				0.642
24				0.655				0.618
8					0.676			0.661
9					0.742			0.671
10					0.740			0.672
1					0.442	0.592		0.563
2						0.797		0.712
3						0.726		0.590
16							0.697	0.562
17							0.654	0.526
18							0.550	0.473
Eigenvalue	8.196	1.966	1.694	1.389	1.261	1.229	1.154	
% of variance explained	28.262	6.778	5.843	4.790	4.349	4.239	3.981	
Cumulative	28.262	35.040	40.883	45.673	50.022	54.260	58.241	

Principal component analysis – Varimax rotation
KMO measure of sampling adequacy 0.878

Regeneration factor. The fifth factor also comprises three items. This factor includes items that measure the organisation's ability to learn from earlier experience and to use that experience to create innovations and develop their operations. The items of the factor are: "Our organisation seeks new ways of action actively", "Our organisation has the courage to try new ways of action" and "When experimenting with new ways of action, mistakes are allowed". The factor explains 4.35 per cent of the variance.

External knowledge factor. Also the sixth factor is comprises three items. This factor clearly underlines the importance of exploiting external networks and knowledge to the overall organisational innovation capability. The three items of the factor are: "My work community encourages gaining knowledge through external contacts", "We have developed our ways of action by comparing our operations to other organisations" and "We develop our actions together with our stakeholders (customers etc.)". The factor explains 4.24 per cent of the variance.

Individual activity factor. The seventh factor also comprises three items. This factor expresses that the employees' individual innovation capability and activity is needed to form the organisation's overall innovation capability. This factor takes into account the characteristics associated to higher innovation capability and the motivation of the employees. The three items of the factor are: "The employees are willing to participate in development", "It is easy for the employees to adopt new ways of action" and "The employees know how to be critical towards current ways of action when needed". The factor explains 3.98 per cent of the variance.

To test the reliability of the results, a Cronbach's alpha test was performed. The alpha value of six factors, as shown in Table 4, are greater than 0.60. In one factor (individual activity) the alpha value is less than 0.50, which indicates that the reliability of the factor can be questioned, and therefore the results concerning the factor should be handled circumspectly. The overall alpha value of the remaining 29 items is 0.903. The overall reliability of the construct is therefore supported.

Also the nine items of measurement were subjected into principal component analysis to test the unidimensionality of the constructs and to eliminate unreliable items. The results of the analysis suggest that the standardized loadings are highly significant for the items, suggesting that the underlying construct is valid.

Table 5 presents the means, standard deviations (SD) and intercorrelations of the variables used in this study. It was found that measurement had significant and positive correlations with the aspects of innovation capability. In order to assess the extent of multicollinearity, the variance inflation factor (VIF) was computed. The VIFs ranged from 1.015 to 1.382, which are significantly below the cut-off value of 10, and therefore it is suggested that multicollinearity is not a problem.

Table 5. Means, standard deviations and intercorrelations of the variables

	Mean	SD	1	2	3	4	5	6	7
1 External knowledge	3.96	0.733	1.000						
2 Work climate and wellbeing	3.94	0.597	0.285***	1.000					
3 Ideation and organising structures	3.45	0.628	0.269***	0.494***	1.000				
4 Regeneration	3.80	0.784	0.405***	0.370***	0.394***	1.000			
5 Participatory leadership culture	3.65	0.613	0.271***	0.533***	0.504***	0.508***	1.000		
6 Individual activity	3.59	0.612	0.194***	0.400***	0.293***	0.391***	0.409***	1.000	
7 Know-how development	3.76	0.783	0.251***	0.469***	0.449***	0.361***	0.427***	0.274***	1.000
8 Measurement	3.19	0.719	0.257***	0.359***	0.558***	0.364***	0.398***	0.261***	0.408***

Sign. *** ≤ 0.001, ** 0.001 < p ≤ 0.01, * 0.01 < p ≤ 0.05

The hypothesis was tested by using the linear regression method. The analyses were conducted on each innovation capability dimension. Three control variables that might affect an organisation's innovation capability were included: the industry and firm size (measured by both revenue and number of employees). A dummy variable was used for the industry, divided into manufacturing and service industries. The results reported in Tables 6 and 7 support the hypothesis. Measurement is significantly and positively related to different aspects of innovation capability. Measurement has the strongest impact on ideation and organising structures and know-how development. However, the significance is strong in all aspects of innovation capability.

Table 6. Regression results of dependent variables

Dependent variables	Ideation and organising structures		Know-how development		Participatory leadership culture	
	Beta	t	Beta	t	Beta	t
Independent variable						
Measurement	0.586	11.795***	0.495	9.606***	0.445	8.241***
Control Variables						
Revenue	-0.015	-0.254	0.043	0.721	-0.141	-2.268*
No of employees	-0.060	-1.034	-0.182	-3.044**	-0.075	-1.201
Industry	0.029	0.578	0.205	4.004***	-0.063	-1.177
F		34.832***		27.559***		19.106***
R		0.579		0.534		0.466
R^2		0.335		0.285		0.217

Sign. *** ≤ 0.001, ** 0.001 < p ≤ 0.01, * 0.01 < p ≤ 0.05

The regression model (see Table 6), studying the relationship between measurement and ideation and organising structures, is significant (F = 34.832, Sig. 0.000). The adjusted R^2 is 0.335, meaning that 33.5 per cent of the variance in the dependent variable (ideation and organising structures) can be explained by measurement and control variables. The standardised beta of measurement is 0.586 and is significant (Sig. 0.000). The results indicate

that performance measurement tends to be positively related to ideation and organising structures, which is consistent with the hypothesis. No significant differences were found in control variables as regards the ideation and organising structures.

When checking the relationship between know-how development and performance measurement, the following was found: the regression model (Table 6) is significant (F = 27.559, Sig. 0.000), with 28.5 per cent of the variance explained; the standardised beta is 0.495 and significant (Sig. 0.000). Therefore, the results reveal a positive relationship between measurement and know-how development. An analysis of the impact of the control variables in the relationships between measurement and know-how development was also done. When checking the impact of the control variables (size of the company by revenue and number of employees and industry), a negative association between the number of employees and know-how development was found. Also the type of industry was found to have an effect; service-oriented companies pay more attention to know-how development than industry-oriented companies.

The regression model (Table 6) concentrating on participatory leadership culture is significant (F = 19.106, Sig. 0.000). The adjusted R^2 is 0.217, meaning that 21.7 per cent of the variance in the dependent variable (participatory leadership culture) can be explained by the measurement and control variables. The standardised beta is 0.445 and significant (sig. 0.000). Therefore, the hypothesis is also supported by the model, showing that measurement tends to be positively associated with participatory leadership culture. The results show that the size of the company (measured by revenue) also seems to be related to participatory leadership culture. Companies with higher revenue apply less participatory leadership culture than companies with lower revenue. This may be a consequence of the fact that in small companies the management is more involved in daily routines than in bigger companies.

Table 7. Regression results of dependent variables (continued)

Dependent variables	**Work climate and wellbeing**		**Regeneration**		**Individual activity**		**External knowledge**	
	Beta	**t**	**Beta**	**t**	**Beta**	**t**	**Beta**	**t**
Independent variable								
Measurement	0.415	7.481***	0.390	6.973***	0.282	4.849***	0.252	4.281***
Control Variables								
Revenue	-0.009	-0.144	-0.088	-1.365	-0.037	-0.550	-0.018	-0.270
No of employees	-0.058	-0.899	0.049	0.749	-0.041	-0.610	0.065	0.946
Industry	-0.025	-0.458	0.042	0.758	0.120	2.068*	-0.007	-0.113
F		14.129***		12.936***		6.920***		5.273***
R		0.412		0.397		0.302		0.266
R^2		0.170		0.158		0.091		0.071

Sign. *** ≤ 0.001, ** 0.001 < p ≤ 0.01, * 0.01 < p ≤ 0.05

The regression model (Table 7) investigating the relationship between work climate and wellbeing and performance measurement is significant (F = 14.129, Sig. 0.000). The adjusted R^2 is 0.170, which shows that the model has a 17.0 per cent of the total variation in the dependent variable (work climate and wellbeing). The standardised beta is 0.415 and significant (Sig. 0.000). The results indicate that performance measurement tends to be positively related to the work climate and wellbeing, which is also consistent with the hypothesis. The control variables were not found to be influential.

The next model, presented in Table 7, investigates the effects of measurement to regeneration of a firm. This model is significant (Sig. 0.000) with F statistics (= 12.936). The adjusted R^2 indicates that 15.8 per cent of the variation in regeneration is explained by the measurement and control variables. The standardised beta of measurement is 0.390 and significant (Sig. 0.000). The results indicate that performance measurement has a positive effect on regeneration, which is consistent with the hypothesis. No significant differences were found in the control variables as regards regeneration.

Also the individual activity of the employees was found to be positively associated with measurement (see Table 7). The regression model is significant (F = 6.920, Sig. 0.000). However, the adjusted R^2 is only 0.091, meaning that only 9.1 per cent of the variance in the dependent variable (individual activity) can be explained by performance measurement and control variables. The standardised beta is 0.62 (Sig. = 0.000) for measurement, and the industry also has an influence on the individual activity. The employees of service-oriented companies tend to be more active as regards the activity of innovation. The other control variables were not found to be influential.

The regression model (Table 7) investigating the relationship between external knowledge and performance measurement is significant (F = 5.273, Sig. 0.000). However, the adjusted R^2 indicates that only 7.1 per cent of the variation in exploitation of external knowledge is explained by measurement and control variables. The standardised beta of measurement is 0.252 and significant (Sig. 0.000). The results indicate that performance measurement tends to be positively related to exploitation of external knowledge, at least to some extent. This is also consistent with the hypothesis. No significant differences were found in control variables as regards the exploitation of external knowledge.

It can be concluded from the regression results that the seven aspects of innovation capability can be influenced by performance measurement. The state of ideation and organising structures, know-how development and participatory leadership culture are most subject to performance measurement. It also can be noted that other than these three aspects of innovation capability can be affected by measurement at least to some extent. Only a little effect was

discovered at the control variables, apart from know-how development, where both size and industry (together with measurement) affect the current state of know-how development.

5 Discussion

The results of the study present some novel insights regarding the concept of innovation capability and the role of performance measurement when managing innovation capability. There is a common consensus among researchers that innovation capability should consist of all the essential aspects that facilitate innovation activities in organisations (e.g. Teece et al., 1997; Lawson and Samson, 2001; Perdomo-Ortiz et al., 2006; Sáenz et al., 2009). However, many of the earlier definitions of innovation capability are based on theoretical considerations, and there is no common way of analysis by which to study it, due to the variety of perspectives of innovation management (e.g. Perdomo-Ortiz et al., 2006). Further, most studies in the area of innovation capability have adopted a certain type of innovation, such as product innovation, instead of the overall innovation capability (Ibrahim et al., 2009). In the current research, a wide range of different items of innovation capability was examined, aiming to define an overall innovation capability. Based on explorative factor analysis, seven factors of innovation capability were found. The study thus contributes to the fragmented literature of innovation capability by presenting an overall definition of innovation capability including the aspects of participatory leadership culture, ideation and organizing structures, work climate and wellbeing, know-how development, regeneration, external knowledge, and individual activity. The study contributes to the current understanding by diminishing the gap between theory and practice, when a majority of the studies that have tried to capture the aspects of innovation capability as a whole, are theoretical.

The study also investigated the relationship between innovation capability and performance measurement. The findings contribute to the current theory by indicating that all the seven aspects of innovation capability are dependent on the state of measurement. This is in line with the major stream of the studies of the impacts of performance measurement, and for example the studies of Ukko et al. (2007, 2008), Graftona et al. (2010), and Pavlov and Bourne (2011) indicate a positive relationship between performance measurement and most of the aspects of innovation capability included in this study. However, the role of performance measurement is never unambiguous, and the more the measurement is focused on individual performance, the more difficult it is to show the benefits (e.g. Sobótka and Platts, 2010). According to Neely and Bourne (2000), people can far too often recollect examples where senior management has used measurement data to score points over other managers and illustrate why they have failed to perform. In such organisations, especially where there is a culture of blame, measurement becomes almost impossible because nobody really wants measurement data to become available. Most of the studied seven aspects of innovation capability are related to individual performance, which should be taken into account when measuring them. For example, understanding shopfloor performance, the acceptance of performance measures by operators,

the motivation to realise performance together with active discussion of performance, and "focus on improvement" are related to using performance management to improve within and across organisational departments (de Leeuwa and van den Berg, 2011). The findings of Bourne et al. (2002) and Franco and Bourne (2003) highlight that a paternalistic culture that encourages actions and improvement and does not punish for errors will lead to successful implementation and use of a performance measurement system. The positive relationship between performance measurement and innovation capability may indicate that at least some of the features presented above exist in the studied companies. However, further investigation is needed to clarify how the measurement of innovation capability is put into practice in the studied companies. The low level of measurement of innovation capability (see Table 5) indicates that more sophisticated methods are needed. This is supported by Sobótka and Platts (2010), who state that formal monitoring is not enough. The data should be analysed and utilised, and the organisations need to learn to perform with or without measures (Bititci et al., 2011). This is also the case with the measurement of innovation capability. The managerial perspective should not be forgotten.

Regarding the managerial implications of the study, it can be stated that the overall definition of innovation capability provides a solid starting point for the development of different aspects of innovation capability. It is difficult to think of a situation where an organisation could develop their know-how and individual activity by ignoring for example the aspect of work climate and wellbeing. Organisations can start the development for example by making a diagnosis of the different aspects of innovation capability, after which they can decide what the most important aspects of development are. After this decision, the measurement could focus on these aspects, not forgetting the complexity of performance measurement.

Finally, as hypothesised, the relationship between measurement and innovation capability is positive and significant, and therefore the organisational innovation capability can be enhanced by measuring it. As such, organisations should pay attention to the development of the measurement of issues related to innovation capability to benefit from their overall innovation capability.

6 Conclusions

The study contributes to the literature of innovation capability by presenting an overall definition of innovation capability that consists of seven aspects: participatory leadership culture, ideation and organising structures, work climate and wellbeing, know-how development, regeneration, external knowledge, and individual activity. The study diminishes the gap between theory and practice, when a majority of the studies that aim to capture the aspects of innovation capability as a whole, are theoretical. This study has shown that organisations can affect their innovation capability by measurement. According to the results, performance measurement has a positive impact on all seven aspects related to innovation

capability described in this study. Therefore, innovation capability can be improved by measuring it. Despite this finding, the managerial aspect of performance measurement and the complexity of performance measurement cannot be ignored. The study suggests that both academics and practitioners should focus on the development of new methods and practices for measuring issues related to innovation capability. In addition, this study caters to various aspects of innovation capability, departing from the majority of existing studies that focus on one or two aspects of innovation capability. Therefore, the study contributes to the current understanding by presenting aspects of innovation capability that can be supported by performance measurement. The relationship between innovation capability and measurement is challenging, but the results of the study provide a good starting point for in-depth studies of the subject.

This study has some limitations which should be acknowledged. Finnish SMEs employing 11-249 persons and having a revenue of 2-50 Meuro were the target of the study. On the basis of the response rate, it can be assumed that the results reflect the whole sample well and therefore the results can be generalised to SMEs at least in Finland. However, micro companies were excluded from the sample, and more research is needed to investigate whether the results are supported in the context of micro companies as well. Second, this study has shown a positive relationship between innovation capability and performance measurement, but it has not dealt with the type of measurement needed to enhance innovation capability. As revealed in the study of Pavlov and Bourne (2011), the impacts of performance measurement depend on the way it is used. The current study has not paid attention to the way measurement is used to achieve higher innovation capability. Therefore, more research is needed to capture the linkage between innovation capability and performance measurement in detail. Third, the measurement of aspects related to innovation capability seems to be rare in SMEs. However, the measurement has an effect on the state of innovation capability, and more attention should be paid to the measurement actions to develop innovation capability.

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