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**The structure of balanced scorecards:
empirical evidence from Norway**

by

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The structure of balanced scorecards: empirical evidence from Norway

This study explores the structures of performance measurement systems used in Norwegian manufacturing industry as a nominalistic phenomenon. The study builds on the premise that leaders enact their performance measurement systems through their use of information, and explores, based on balanced scorecard (BSC) theories, the leaders' use of information in 83 Norwegian manufacturing companies. The study shows that the nominalistic structures of performance measurement systems comprise many of the measures, financial as well as non-financial, found in BSCs, irrespective of whether or not the companies have in fact implemented this system. By undertaking a factor analysis, we identify four dimensions in the performance measurement systems' nominalistic structure: the owner dimension, the customer dimension, the operations dimension, and the learning and growth dimension. A cluster analysis is undertaken to identify any strategic patterns that might reflect the companies' strategic intentions. This indicates that the use of performance measurement systems and their inherent measures is primarily a question of management culture.

1. Introduction

The structures of performance measurement systems appear to have changed dramatically in recent years. At pace with the growing opportunities for information exchange, brought about by the technological development, and at pace with the increasing rate of competition and change which puts ever higher demands on leaders' ability to keep updated, the practitioners' cry for comprehensive systems that report all strategically important information is becoming increasingly loud (Eccles, 2001, Boulton et al., 2000). In parallel with this development, work has been going on to develop new performance measurement systems with structures that enable leaders to keep updated. Systems such as the balanced scorecard (Kaplan and Norton, 1992), performance measurement in service businesses (Fitzgerald et al., 1991) and the performance pyramid (Lynch and Cross, 1991) all claim to be describing the measures, dimensions and structures which performance measurement systems need to include in order to successfully support the work of leaders in a change-oriented setting.

The structures of performance measurement systems have been changing over the last decade, and the question of their current nature largely remains unresolved. The question has been intensely debated, and it has been argued that the new systems have revolutionized old structures, bringing about a greater emphasis on the measurement of factors which reflect the strategic intentions of companies, and supplementing the traditional and financial measures with non-financial measures relating to customers, internal business processes, operations, quality, flexibility, resource utilization,

innovation, learning and growth, and other dimensions (Laitinen, 2002, Kaplan and Norton, 2001a). It has also been argued that the new systems ignore a number of important dimensions, such as public authorities, suppliers, and competitors, and that they should measure more and different factors than what is currently the case (Nørreklit, 2000, Kloot, 1997).

The purpose of this paper is to explore the structures of performance measurement systems used in Norwegian manufacturing industry. It bases its argument on the structure of balanced scorecard, which in terms of take-up and academic attention is the performance measurement system which has enjoyed the greatest success since the beginning of the 90s, in Norway and elsewhere (Malmi, 2001, Silk, 1998, Olsen, 1999). Based on a questionnaire completed by 83 companies, the paper seeks to identify the degree to which performance measurement systems used in Norwegian manufacturing industry have the properties prescribed by the BSC.

According to the literature on BSCs, performance measurement systems should reflect a company's strategic intentions, they should comprise dimensions which are similar to the perspectives of finance, customers, internal business processes, and learning and growth, and they should comprise non-financial measures (Kaplan and Norton, 1996a, 2001a, Malmi, 2001). The study outcomes demonstrate that non-financial measures form an important mainstay for the performance measurement systems employed in Norwegian manufacturing industry, and by means of a factor analysis four dimensions were identified as being strikingly similar to the perspectives of the original BSC: the dimensions of owners, customers, operations, and learning and growth. The performance measurement systems were scrutinized for strategic patterns which might reflect the companies' strategic intentions, yet none were found. The study also reveals that there are only modest differences between the structures of performance measurement systems in BSC companies and those in non-BSC companies.

The following section reviews the literature on the structure of BSCs, and culminates with the definition of a set of research issues. The methodology and findings of the study are then described, before a conclusion is drawn up and comments are made with respect to further research.

2. The structure of BSCs

The BSC construct has been developing continually since its launch in 1992 (Kaplan and Norton, 2001b, Malmi, 2001). In the beginning, its founders were generally focusing on which properties performance measurement systems should have (Kaplan and Norton, 1992). At a later stage, they tended to direct their attention to the ways in which performance measurement systems can be used in strategic management (Kaplan and Norton, 1996a, 2001a). In parallel with this development, companies, government agencies and not-for-profit organisations have acquired practical

experience of Kaplan and Norton's ideas, and they have been extensively researched (see e.g. Epstein and Manzoni, 2002, Kaplan and Norton, 2001a, Kloot and Martin, 2000).

The BSCs' development demonstrates the dynamic and flexible nature of the construct. Nevertheless, literature's description of its structural properties has remained relatively constant over time (Kaplan and Norton, 1992, 2001a, Malmi, 2001). Kaplan and Norton's writings, and other publications, describe non-financial measures as an important mainstay of performance measurement systems, whose most significant dimensions are normally described in terms of financial, customer, internal business processes, and learning and growth perspectives, and it is argued that the constituent elements of such systems should be derived from and reflect a company's strategic intentions. In recent years, literature on BSC has pointed out that strategies make up holistic logics with inherent coherences and causalities (see Stemsrudhagen, 2002b, for a literature review), and that performance measurement systems should visualise these strategic patterns (Kaplan and Norton, 1996a, 2001a, Nørreklit, 2000).

Strategic patterns

BSC is a performance measurement system which visualises companies' strategic intentions by concretizing them in various dimensions and coherences. Consequently, in order to understand BSCs, it is necessary to understand the concept of strategic intention, and how such intentions may be reflected in performance measurement systems.

Strategic intentions are deliberate descriptions of a future organizational state (Hamel and Prahalad, 1989). Such descriptions normally consist of rational models with a restricted number of dimensions which describe the strategic logic on which a company's profitability is based. A prominent example is Porter's strategic typology (Porter, 1980, 1985). He described how the value chain incorporates one set of value drivers and one set of cost drivers, and argued that work to reduce costs and increase revenues was to some degree incompatible, and that businesses would therefore have to choose between differentiation and cost leadership (possibly restricting the competitive scope). Another well-known example is the typology of Miles and Snow (1978). Their focus was on the willingness of companies to alter their products and markets (Hambrick, 1983:690), and they described three successful strategic logics which each reflected different ways of handling change: prospectors emphasize entrepreneurial activities, monitoring the market and stressing product development and changes; defenders have a narrow product-market domain, with stable technology and operations, and they emphasize engineering tasks and improvements in efficiency; while the analysts are in the middle, exhibiting the characteristics of both prospectors and defenders.

The literature on BSCs argues that performance measurement systems should reflect the dimensions and logics which are intrinsic to strategic intentions. In general, text books on BSC use Porter's differentiation and cost leadership strategy, and describe how a differentiation strategy should mean that companies attach importance to measures of image, customer relations and/or product attributes, while a cost leadership strategy should involve a measurement system which accentuates operational efficiency (Kaplan and Norton, 2001a, Horngren and Foster, 2003, Simons, 2000). The founders of the BSC have increasingly emphasized that performance measurement systems should reflect the logics which are inherent in strategic intentions. In the course of the decade or so that has passed since their first publication on this topic, the strategic logics of performance measurement systems have moved to the very centre of the BSC, and Kaplan and Norton are currently attaching importance to the use of strategy maps for describing them (Kaplan and Norton, 2001a, 2001b).

Dimensions

According to the BSC literature, the dimensions of performance measurement systems are constructs which reflect the inherent logic of the company's strategic intentions. The BSC describes such logics in terms of finance, customers, internal business processes and learning and growth. The underlying rationale is that these dimensions, and their coherence, determine a company's ability to generate profits. To secure sustainable profits, companies need to establish the necessary infrastructure for producing innovative organizations that are capable of learning and growth. Such infrastructures consist of the skills and knowledge of employees, the technology they use, and the culture of the organization, and they drive the organization's ability to change and improve its internal business processes in the long run. The internal business processes embrace the activities necessary to create customer value, and consist of activities such as product design, brand and market development, sales, service, operations and logistics. These activities drive the customer dimension, and consequently the revenues of a company, while also driving costs. The customer dimension describes how a company differentiates to attract and retain customers, and it describes the company's success in terms of satisfying their customers. The financial dimension describes the financial objectives of a company, and shows the financial consequences of the other dimensions of a scorecard.

Kaplan and Norton (1992, 1996a) argue that the dimensions of finance, customers, internal business processes and learning and growth may be used to depict almost any strategic logic in any organization. Even if they describe specific types of organization which are special enough to warrant their own dimensions, such as government agencies and not-for-profit organizations (Kaplan and Norton, 2001a), their standard argument is that the four dimensions are universally valid constructs which can be adapted to any organization by emphasising the various dimensions in accordance with the characteristics and strategic intentions of the organization.

The BSC has been intensively criticized for its exclusive focus on the dimensions of finance, customers, internal business processes, and learning and growth. In general, there is a tendency to argue that performance measurement systems should reflect every strategically relevant dimension within and outwith an organization (Eccles, 2001, Kloot, 1997, Epstein and Mantzoni, 2002). More specifically, the BSC has been criticized for failing to take account of dimensions which are of strategic importance to most organizations, such as public authorities and suppliers, and dynamic factors such as competitors, technological developments, networks, and factors capable of generating external shock (Nørreklit, 2000). This criticism is implicit in a number of studies on organizations which have been using BSCs or similar performance measurement systems. These studies often conclude that in practice, performance measurement systems of this kind will contain dimensions beyond those included in Kaplan and Norton's conventional framework (see e.g. Fitzgerald et al., 1991, Laitinen, 2002, Ewing and Lundahl, 1996, Epstein and Mantzoni, 2002).

Measures

The measures of a BSC are constructs which reflect scorecard-inherent perspectives (Kaplan and Norton, 1996a), and Kaplan and Norton have suggested a wide array of measures which are appropriate for the four perspectives of a conventional BSC (see table 1). These measures should make the company visible from four different angles: they work as indicators of organizational qualities which are of interest from the respective perspectives of owners, customers, internal business processes, and learning and growth.

The link between perspectives and measures of performance measurement systems is elusive. In real terms, it tends to be difficult to place measurements within a specific perspective, and it is fully possible to develop systems which comprise widely different perspectives and dimensions, yet rely on identical measures (Laitinen, 2002). For instance, performance measurement in service businesses (Fitzgerald et al., 1991) is a system whose dimensions are customised for service providers and which thus differ from those found in BSCs, yet the system comprises a number of measures which are identical to those employed in BSC systems (Stemsrudhagen, 2002b).

The categorization of different measures into dimensions or perspectives is of importance to the perception of a performance measurement system, and thus illustrates the fact that the structural properties of a performance measurement system give meaning to the system and its inherent measures. This can also be illustrated by the fact that differences in strategic logics of performance measurement systems may result in different perceptions of the systems' inherent measures, even if they are in fact identical, objectively speaking. For example, if one company pursues a differentiation strategy while another pursues a cost leadership strategy, the two companies may well interpret certain measures differently, even if the measures refer to the same values (Shank and Govindarajan, 1993).

Research questions

The distinctive quality of the BSC is its structure (Malmi, 2001), and the purpose of this paper is to explore the degree to which performance measurement systems, in real terms, have the structural properties which are inherent to the BSC. I will do this by raising three research questions. Firstly, I will ask whether performance measurement systems contain logics and dimensions, i.e. strategic patterns, which would typically characterize systems which are firmly rooted in a company's strategic intentions. The second question is whether performance measurement systems comprise the dimensions originally proposed by Kaplan and Norton, or whether the criticism directed at their exclusive focus on these four dimensions reflects the fact that, in practice, other dimensions are of relevance. The third question is how important different types of measures, especially non-financial ones, are to performance measurement systems.

The structure of the BSC is not necessarily specific to companies which have implemented Kaplan and Norton's ideas (Malmi, 2001). Methods such as performance measurement in service businesses (Fitzgerald et al., 1991), tableau de bord (Lebas, 1994), and the performance pyramid (Lynch and Cross, 1991) all have qualities similar to the BSC, and it may well be that a company's performance measurement system has the structural properties described by the BSC without the company actually having implemented this system. Furthermore, as we will see below, it may well be that the nominalistic structures of a company's performance measurement system do not depend on whether or not the company has implemented a balanced scorecard system (Simons, 1990). In connection with our investigation of the three research questions set out above, it is therefore interesting to pose yet another question: Are the properties of the performance measurement systems in BSC companies different from the properties found in non-BSC companies?

3. Methodology

In researching this paper, the first step on the way was to identify which measures are usually associated with BSCs. Most literature on this topic is based on the early writings of the construct's founders, and the measures were thus identified by means of Kaplan and Norton's first three publications on BSCs (1992, 1993, 1996b). In addition, by studying one of the most prominent books on BSCs in Scandinavia (Olve et al., 1999) we sought to allow for any particular Scandinavian features to be taken into account. This review resulted in the list of measures set out in the first column of the tables below.

The next step was to devise the questionnaire. It was soon evident that this work would have to be based on an ontologic presupposition with respect to BSCs and performance measurement systems: are their structures a realistic phenomenon which exist irrespective of the users of the systems, or do they constitute a nominalistic

phenomenon (Burrell and Morgan, 1979)? There are various lines of reasoning on this question, and Malmi's (2001) and Simons' (1990) views represent two opposite extremes. Malmi discusses what a BSC is, and concludes that ".....the BSC should be defined as a construct, not how this construct is used". This means that the structure of the BSC is perceived as an inherent property of the system: ".....for a measurement system to be a BSC, it should fulfil the following criteria: it should contain financial and non-financial measures, these measures should be derived from strategy, and the measurement framework should contain perspectives derived from the original four". Simons (1990) argues that performance measurement systems are enacted through the choice of which management controls to make interactive. The structure of performance measurement systems is created in interaction between managers and a long series of widely disparate sources of information (see e.g. Bruns and McKinnon, 1993, Guilding et al., 2000, Stemsrudhagen, 2002a, for empirical studies of the sources of information employed by managers), and this nominalistic construct may well have structures which are identical to those prescribed by the BSC, without assuming the existence of a separate BSC system (Simons, 1995, Bettis and Prahalad, 1995).

This paper seeks to explore and map the structures of performance measurement systems in practice, and we should adopt the ontological assumption which maximises our opportunity to increase our knowledge of these structures. Were we to adopt Malmi's view, our study would provide knowledge of the degree to which companies employ systems that contain the measures, dimensions and strategic links described by Kaplan and Norton, i.e. about the diffusion of BSC systems. A number of such studies have already been undertaken (see e.g. Malmi, 2001, Silk, 1998, Olsen, 1999). More importantly, however, putting constraints on BSC systems as a realistic phenomenon seems to serve little purpose in today's reality. We know that managers are currently flooded with information, and that one of their greatest challenges is to focus their attention on the strategically most important information (Simons, 1995, Stemsrudhagen, 2002a). Also, we are well aware that the technological possibilities are unlimited, and managers may be on-line to strategically important information, e.g. about the four BSC dimensions, with the aid of seamless systems and networks which lack the BSC's properties on system level. This paper thus adopts Simons' view, and presupposes that performance measurement systems are enacted through managers' use of information, and that exploring these nominalistic structures is of greater interest than focusing on whether companies have adopted a specific system which had its properties assigned a priori.

Consequently, the questionnaire asked respondents to answer the following question for each of the measures listed in table 1: "To what extent is the measure used for managing the company?" The answers were measured on a Likert scale, on which 1 signified "not at all", while 5 signified "to a large extent". Respondents were also asked to specify whether they had any knowledge of BSCs (yes or no), and whether they were using a BSC (yes or no). The questionnaire was sent to Norwegian manufacturing companies with a turnover in excess of NOK 500 mill. Through a

search in the Kompass Europe database 182 such companies were identified. It is normal in Norwegian companies for the accounting department to manage large parts of the information systems, so the questionnaire was addressed to the companies' chief accountants. This represents a potential bias for the study. 83 companies returned the forms, which gave a response rate of 45.6%.

Once the forms had been returned, the answers were entered into a database which formed the basis for three different analyses. Firstly, performance measurement systems used in Norwegian industry were analysed and the properties of the systems employed by BSC companies were compared to those employed by non-BSC companies. The comparison showed that there were only minor differences between the two groups, and the following analyses were therefore run on the entire sample. A factor analysis was run to identify the dimensions of performance measurement systems in the sample. Also, in our attempt to uncover any strategic patterns and logics that might be inherent in the systems, we cluster analysed the 83 companies over the variables which described the extent to which different measures were employed by the companies' management. The analyses are described in further detail in connection with the presentation of the results below.

4. Results

The three research questions raised by this paper are discussed in the following three sections, the first of which will map the various measures' importance to Norwegian manufacturing companies and compare the performance measurement systems employed by BSC-companies with those employed by non-BSC companies. The following section will attempt to identify the dimensions of performance measurement systems used in Norwegian manufacturing industry by running a factor analysis on the variables which describe the use of different measures. The last section will use a cluster analysis to uncover any strategic patterns that may be inherent in the performance measurement systems.

The use of measures in Norwegian industry

Table 1 sets out the importance of the various measures within Norwegian industry. The table shows that managers of Norwegian manufacturing companies are well informed. They make use of information on all the dimensions which are inherent to the original BSC, and for 19 of the 35 measures the average score is higher than 3. The management index measure is clearly in a different category, as it is hardly being used at all, which seems a bit of a paradox when viewed against the recognition, and the literature's argumentation, that management is essential to the success of organizations. This argument is particularly prominent in literature on performance measurement systems. Economic value added is another measure which is in little use, possibly due to the fact that this measure is relatively new in a Norwegian

context. The number of companies responding to the questions on management index and economic value added was significantly lower than for the other questions, which indicates that these measures are used even less than indicated by the table.

The table shows a clear pattern in the use of different types of measures. The financial measures are clearly the ones in most widespread use among company managers. Return on sales, operating margin, contribution margin, and budget variances all score between 4 and 5 on average, and most of the other financial measures have high scores. The measures relating to customer aspects and internal processes score relatively evenly, most of them ranking close to the middle of the scale from 1 to 5. There is a tendency for measures relating to Kaplan and Norton's learning and growth dimension – such as R&D input, course expenses per employee, and management index – to be used somewhat less than the other measures listed in the table.

	N	Mean	S.D.	Median
Return on sales	80	4.01	0.14	4.5
Operating margin	80	4.38	0.11	5.0
Return on total assets	82	3.72	0.14	4.0
Contribution margin	82	4.33	0.12	5.0
Return on equity	81	3.04	0.14	3.0
Revenue growth	82	3.69	0.13	4.0
Cashflow	81	3.53	0.14	4.0
Budget variances	83	4.41	0.10	5.0
Economic value added	62	2.29	0.18	2.0
Customer satisfaction	81	3.59	0.12	4.0
Number of new customers	81	2.47	0.13	2.0
Repurchase percentage	78	2.47	0.15	2.0
Market share	82	3.99	0.12	4.0
Number of complaints	82	3.32	0.13	3.0
Ratio of sales to new customers	81	2.36	0.13	2.0
Customers lost	81	2.72	0.13	3.0
Customer profitability	81	3.19	0.13	3.0
Inventory turnover	83	3.51	0.12	4.0
Setup time	77	2.40	0.14	2.0
% defects	76	2.93	0.14	3.0
Lead time	75	2.92	0.13	3.0
On-time delivery	80	3.65	0.14	4.0
Non-financial productivity measures	78	3.32	0.15	4.0
Value of inventory	82	3.63	0.13	4.0
Manufacturing time	78	2.58	0.13	3.0
R&D expenses/total expenses	82	2.83	0.15	3.0
Investment in new products	81	2.93	0.15	3.0
Revenue from new products	81	3.14	0.15	3.0
R&D, number of hours	80	2.19	0.13	2.0
Course expenses per employee	81	2.10	0.10	2.0
Investment in IT	82	3.15	0.12	3.0
Management index	60	1.77	0.14	1.0
Staff turnover	81	2.59	0.14	2.0
Absence	83	3.40	0.14	4.0
Employee satisfaction	76	2.79	0.14	3.0

Table 1 To what extent is the measure used for managing the company?

Table 2 is collated on the basis of the same data as table 1, but the figures are split between those relating to BSC companies and those relating to non-BSC companies. Furthermore, this table also reports the results of a Wilcoxon rank sum test. Significant p-values are highlighted.

	BSC				Non-BSC				
	N	Mean	S.D.	Med.	N	Mean	S.D.	Med.	p
Return on sales	21	3.90	0.29	4.0	55	3.98	0.16	4.0	0.90
Operating margin	21	4.24	0.29	5.0	55	4.42	0.11	5.0	0.86
Return on total assets	21	3.86	0.28	4.0	57	3.63	0.16	4.0	0.42
Contribution margin	21	4.29	0.25	5.0	57	4.33	0.15	5.0	0.76
Return on equity	21	3.14	0.31	3.0	56	3.05	0.17	3.0	0.82
Revenue growth	21	3.76	0.26	4.0	57	3.60	0.15	4.0	0.52
Cashflow	20	3.90	0.25	4.0	57	3.37	0.17	3.0	0.12
Budget variances	21	4.29	0.20	5.0	58	4.41	0.12	5.0	0.45
Economic value added	17	3.18	0.40	3.0	41	1.88	0.18	1.0	0.00
Customer satisfaction	20	3.85	0.21	4.0	57	3.47	0.15	4.0	0.19
Number of new custom.	20	2.65	0.24	3.0	57	2.42	0.16	2.0	0.28
Repurchase percentage	19	2.47	0.31	2.0	56	2.52	0.17	2.0	0.87
Market share	21	4.14	0.30	5.0	57	3.89	0.14	4.0	0.15
Number of complaints	20	3.55	0.28	3.5	58	3.28	0.16	3.5	0.40
Ratio of sales to new cust.	20	2.45	0.26	2.5	57	2.37	0.16	2.0	0.68
Customers lost	20	2.65	0.28	2.5	57	2.79	0.15	3.0	0.61
Customer profitability	21	3.24	0.28	3.0	56	3.18	0.15	3.0	0.80
Inventory turnover	21	3.67	0.26	4.0	58	3.41	0.14	3.0	0.36
Setup time	20	3.00	0.29	3.0	53	2.15	0.15	2.0	0.01
% defects	20	3.25	0.28	3.5	53	2.83	0.17	3.0	0.18
Lead time	21	3.33	0.22	3.0	50	2.74	0.16	3.0	0.04
On-time delivery	20	3.90	0.26	4.0	56	3.52	0.17	4.0	0.26
Non-financial prod. measures	20	3.95	0.21	4.0	54	3.09	0.18	3.0	0.01
Value of inventory	20	3.75	0.28	4.0	58	3.57	0.16	4.0	0.50
Manufacturing time	21	2.71	0.27	3.0	53	2.55	0.15	2.0	0.62
R&D expense/total exp.	21	2.86	0.27	3.0	57	2.84	0.19	3.0	0.91
Investment in new prod.	20	2.65	0.24	2.5	57	3.02	0.18	3.0	0.37
Revenue from new prod.	21	3.43	0.29	4.0	56	3.02	0.19	3.0	0.25
R&D, number of hours	20	2.15	0.24	2.0	56	2.25	0.15	2.0	0.77
Course expenses per employee	20	2.15	0.15	2.0	57	2.05	0.12	2.0	0.40
	20	3.30	0.24	3.0	58	3.12	0.14	3.0	0.54
Investment in IT	13	2.08	0.29	2.0	44	1.73	0.16	1.0	0.15
Management index	20	2.80	0.27	3.0	57	2.54	0.17	2.0	0.37
Staff turnover	21	3.38	0.24	4.0	58	3.41	0.17	4.0	0.83
Absence	20	3.35	0.23	3.5	52	2.56	0.16	2.5	0.01
Employee satisfaction									

Table 2 The performance measurement systems in BSC companies versus non-BSC companies.

The overall impression is that there are only minor differences between the ways in which BSC companies and non-BSC companies make use of the various measures. Out of a total of 35 measures, a significant difference between the two groups of companies was found for only 5 of them. Three of these measures relate to internal processes, i.e. set-up time, lead time and non-financial productivity measures. Also, economic value added and employee satisfaction are in wider use among BSC companies than among non-BSC companies.

Table 2 suggests that, in practice, the BSC is of limited importance. A probable explanation is that the structure of performance measurement systems is primarily a nominalistic phenomenon. The fact that the structure of the management's use of information is relatively uniform in all companies, whether they have BSC systems implemented or not, indicates that the realistic structure of performance measurement systems has only limited impact on the nominalistic structure: managers enact their systems through their use of information, and this enactment is not determined by the structures which are inherent in the systems. Another, but rather unlikely explanation, is that companies without a BSC make use of systems with similar properties, perhaps because they have implemented other performance measurement systems which resemble the BSC. This explanation is not very probable, however, as the Norwegian take-up of performance measurement systems such as the performance pyramid and performance measurement in service businesses is only very small.

The dimensions of the performance measurement systems

The second question we raised above, was what dimensions performance measurement systems contain in real terms. Factor analysis is a method frequently used to define the underlying dimensions of data sets, and in order to identify the dimensions of performance measurement systems in Norway, a factor analysis was conducted on the variables that describe the extent to which the measures were used for managing the companies.

The factor analysis outcomes are presented in table 3. The analysis identified four underlying dimensions, referred to as dimension one, two, three and four in the table. The four dimensions explain 26.5%, 10.3%, 7.7% and 7.2% of the total variation respectively, which totals 51.7% overall. The table shows the factor loadings for the different variables and the four dimensions after an oblique transformation, as this facilitates interpretation. All factor loadings higher than 0.5 are highlighted.

	Dimension one	Dimension two	Dimension three	Dimension four
Return on sales	-0.12	-0.25	-0.52	-0.06
Operating margin	-0.29	-0.18	-0.50	0.31
Return on total assets	0.76	-0.02	0.09	-0.07
Contribution margin	-0.34	-0.09	-0.56	0.07
Return on equity	0.32	-0.56	0.02	-0.10
Revenue growth	-0.50	-0.44	-0.05	0.45
Cashflow	0.51	0.02	-0.15	0.29
Budget variances	-0.12	0.15	-0.58	-0.06
Economic value added	0.66	0.04	0.05	0.16
Customer satisfaction	0.22	-0.56	0.20	0.20
Number of new customers	-0.36	-0.69	0.15	0.33
Repurchase percentage	-0.05	-0.86	-0.01	-0.22
Market share	-0.23	-0.42	-0.19	0.42
Number of complaints	0.21	-0.49	-0.40	-0.09
Ratio of sales to new customers	0.04	-0.93	-0.08	-0.20
Customers lost	-0.11	-0.83	0.05	0.21
Customer profitability	-0.03	-0.69	-0.15	-0.13
Inventory turnover	0.15	-0.03	-0.82	-0.13
Setup time	0.26	-0.09	-0.45	0.45
% defects	0.25	-0.16	-0.53	0.15
Lead time	0.20	-0.10	-0.51	0.11
On-time delivery	-0.05	0.02	-0.53	0.26
Non-financial prod. measures	0.35	-0.29	-0.09	0.23
Value of inventory	0.03	0.05	-0.83	-0.10
Manufacturing time	0.22	0.12	-0.72	0.06
R&D expense/total expense	0.16	0.01	-0.08	0.72
Investment in new products	-0.10	0.10	0.05	0.77
Revenue from new products	0.07	-0.04	-0.30	0.20
R&D, number of hours	0.09	-0.03	-0.02	0.51
Course expenses per employee	0.35	-0.26	-0.08	0.29
Investment in IT	0.14	-0.04	-0.01	0.64
Management index	0.40	-0.19	-0.21	0.40
Staff turnover	0.01	0.16	0.00	0.75
Absence	0.33	-0.29	-0.27	0.02
Employee satisfaction	0.61	-0.11	-0.17	0.16

Table 3 Dimensions of performance measurement systems in Norwegian manufacturing companies.

The analysis demonstrates that the greater the importance of dimension one in a Norwegian manufacturing company, the more will its management be using return on total assets, cashflow, economic value added and employee satisfaction. Dimension one principally relates to key figures which measure the financial aspects which are of chief concern to company's owners. Consequently, it resembles the financial BSC perspective, but differs slightly in that it accentuates the owners' interests even stronger than Kaplan and Norton (see e.g. Kaplan and Norton, 1996a, 2001a). It thus appears that this dimension would be more appropriately referred to as "the owner dimension" rather than "the financial dimension".

Dimension two coincides with Kaplan and Norton's customer perspective. In companies to which this dimension is central, the management will largely be using customer-related measures such as customer satisfaction, number of new customers, repurchase percentage, ratio of sales to new customers, customers lost, and customer profitability.

Dimension three is similar to Kaplan and Norton's internal business process perspective. In companies that attach importance to this dimension, the management will largely be using measures such as inventory turnover, % defects, lead time, on-time delivery, value of inventory and manufacturing time. One difference appears to be that this dimension relies more heavily on financial measures such as budget variances, contribution margin, and return on sales, i.e. conventional measures which have traditionally played an important role in the control of a company's operative processes. In order to pinpoint this difference, this dimension is referred to as the operations dimension rather than the internal process dimension.

The last dimension in table 3 corresponds to the learning and growth perspective of a traditional BSC. To the extent that this dimension is central to a company, managers will accentuate the use of different measures for staff turnover, investment in IT, investment in new products, and R&D in their efforts to manage the company.

The patterns of the performance measurement systems

The remaining research question is that of whether performance measurement systems contain strategic patterns which reflect strategic intentions. The data set collected from Norwegian manufacturing companies was searched for such patterns by cluster analysing the 83 companies over the 35 variables which describe the managers use of information (see table 4). The similarities between the companies were measured by means of Euclidean distances and Pearson correlations, respectively. The analysis thus attempted to classify the companies based on the magnitude of various types of information as well as the patterns across the variables. The clusters were formed by means of the average linkage procedure. This procedure is a hierarchical agglomerative method, which has proved superior to non-hierarchical methods when only random seed points are available, which was the case for the analyses described

in this paper. Due to the fact that there are no pure objective way to determine the number of clusters in such analyses (Everitt et al., 2001), no effort was made to determine a "correct" number of clusters, but to analyse the properties of the various clusters at different numbers of clusters (up to and including 5 clusters).

The analysis did not produce any pattern which might be related to strategic intentions, but a pattern did become apparent across various cluster numbers. This is exemplified in table 4, which shows the properties of the clusters that were identified when the similarities between the companies were measured by means of Euclidean distances and the number of clusters was set to 2. The difference between these two clusters is that all measures listed in the table are in wider use by managers in cluster 2 companies than in cluster 1 companies. This means that the dominating pattern was the extent to which managers made use of information.

Table 4 illustrates the fact that Norwegian manufacturing companies can be classified on the basis of their managers' tendency to make use of performance measurement systems. This indicates that management culture is important to the pattern in the managers' use of various measures: in some companies the management culture is founded on the use of performance measurement systems, and this type of company will be using all measures to a greater extent than other companies. This conforms with the findings of certain earlier studies (see Macintosh, 1985, for an overview).

	Cluster 1		Cluster 2		p ¹
	Mean	Median	Mean	Median	
Return on sales	3.83	4.0	4.44	5.0	0.29
Operating margin	4.20	4.5	4.89	5.0	0.03
Return on total assets	3.47	4.0	4.44	5.0	0.03
Contribution margin	4.07	5.0	4.67	5.0	0.24
Return on equity	2.70	3.0	3.89	4.0	0.01
Revenue growth	3.43	4.0	3.78	4.0	0.51
Cashflow	3.20	3.0	4.78	5.0	0.00
Budget variances	4.33	5.0	4.44	5.0	0.93
Economic value added	1.57	1.0	3.22	3.0	0.00
Customer satisfaction	3.40	3.5	4.11	4.0	0.04
Number of new customers	2.43	2.0	2.56	2.0	0.68
Repurchase percentage	2.23	2.0	2.56	2.0	0.46
Market share	3.70	4.0	4.44	5.0	0.05
Number of complaints	2.97	3.0	4.11	4.0	0.01
Ratio of sales to new customers	2.20	2.0	2.89	3.0	0.13
Customers lost	2.43	2.0	3.22	3.0	0.10
Customer profitability	3.13	3.0	3.56	4.0	0.24
Inventory turnover	3.20	3.0	4.44	5.0	0.00
Setup time	2.00	2.0	4.22	4.0	0.00
% defects	2.77	3.0	4.00	4.0	0.01
Lead time	2.67	3.0	3.89	4.0	0.00
On-time delivery	3.33	3.5	4.22	4.0	0.05
Non-financial prod. measures	2.97	3.0	4.33	5.0	0.01
Value of inventory	3.27	3.0	4.00	4.0	0.12
Manufacturing time	2.33	2.0	3.78	4.0	0.00
R&D expense/total expense	2.37	2.0	3.67	4.0	0.01
Investment in new products	2.47	2.0	3.33	3.0	0.04
Revenue from new products	2.60	3.0	3.56	4.0	0.04
R&D, number of hours	1.93	2.0	2.78	3.0	0.02
Course expenses per employee	1.67	2.0	2.33	2.0	0.01
Investment in IT	2.80	3.0	4.11	5.0	0.01
Management index	1.37	1.0	3.33	3.0	0.00
Staff turnover	2.40	2.0	3.00	3.0	0.15
Absence	3.03	3.0	3.78	4.0	0.12
Employee satisfaction	2.40	2.0	3.89	4.0	0.00

Table 4 Clusters of performance measurement systems in Norwegian manufacturing companies.

¹ The p-values show the results of a Wilcoxon rank sum test.

5. Conclusions and further research

This study explores performance measurement systems in Norwegian manufacturing industry as a nominalistic phenomenon. The study focuses on the ways in which managers enact their performance measurement systems through their use of information. The paper shows that the enactment structures were all relatively similar, whether the managers operated within a BSC company or not. This indicates that managers' enactment is relatively unconstrained by the concrete structures of their performance measurement systems.

If managers enact their performance measurement systems, we should be calling for the development of performance measurement systems that facilitate managers' enactment. Today's technological possibilities are limitless in terms of creating seamless information systems, networks and multimedia terminals for supporting managers' enactment. In this day and age, when managers have on-line access to all types of information irrespective of time and space and are able to impose their own structures on performance measurement systems, the traditional assumption that comprehensive systems with predetermined structures derived from a company's strategic intentions are at the core of a company's performance measurement system, may very well be an anachronism.

The study also shows that Norwegian managers are well informed, and that conventional, financial measures such as return on sales, operating margin, contribution margin and budget variances are the ones in most widespread use. The managers also made use of various measures relating to customers and internal processes, and there was a tendency for them to be using the various measures relating to learning and growth to a lesser extent than other measures. At the risk of labouring the point made above, this means that most managers in Norwegian manufacturing industry were well informed with respect to the dimensions and measures which are inherent in the BSC, irrespective of whether or not they employ this type of system.

The search for dimensions in managers' use of information was carried out by means of a factor analysis, through which four performance measurement system dimensions were identified: the owner dimension, the customer dimension, the operations dimension, and the learning and growth dimension. The study thus provides a certain level of empirical support for the claim that the structure of the BSC retains its relevance when performance measurement systems are seen as a nominalistic phenomenon, albeit differences were also found: The owner dimension bears a good resemblance to Kaplan and Norton's financial dimension, but puts even greater emphasis on the owners than what the founders of the BSC do in their financial perspective. The operations dimension is similar to Kaplan and Norton's perspective of internal business processes, but puts greater emphasis on conventional, financial measures which have traditionally been used to control a company's operative processes.

A cluster analysis was undertaken to identify any strategic patterns in the performance measurement systems. The analysis resulted in a classification of the companies based on the extent to which the management made use of performance measurement systems. This shows that the dominating pattern was the extent to which information was used in the management of the companies, a fact which may be interpreted to indicate that the use of different measures is primarily a matter of management culture. In some companies this is based on performance measurement systems, and to the extent that this is the case, the study indicates that all types of measure will be used to a greater extent than in companies with other management cultures.

To sum up, this study made use of explorative techniques such as factor and cluster analyses to explore the nominalistic structures of performance measurement systems used in Norwegian manufacturing industry. The study indicates that we should emphasise the nominalistic structures of performance measurement systems; that these structures include many of the measures used in BSC systems, irrespective of whether the companies had implemented such a system or not; that the dimensions of the nominalistic structures bore a strong resemblance to the dimensions proposed by Kaplan and Norton; and that the cluster analysis can be interpreted to indicate that the use of performance measurement systems and their inherent measures is primarily a question of management culture. The study thus provides useful contributions to our efforts to understand the nominalistic structures of performance measurement systems, yet its explorative character means there is a great need for further research on such structures, involving different settings, different respondents, different methods and different perspectives.

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