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Performance Measurement and Management (PMM) for SMEs: a literature review and a reference framework for PMM design.

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Abstract

In recent years, performance measurement and management (PMM) has received much attention from researchers and practitioners. Despite the growing use of PMM systems, different problems cause companies to experience difficulty in implementing such systems, with consequent risk of partial benefits or total goal failure. The literature on PMM is nowadays quite vast, but only a ten of models addresses the problem in its entirety and relatively little research addresses to Small and Medium Enterprises (SMEs). Based on a structured literature review of PMM models, factors influencing PMM initiatives in SMEs and milestones for PMM design, the authors provide an evaluation of frameworks today available. Based on the identification of strengths and weakness of these frameworks, the authors propose a new integrated framework for PMM design, which fulfills the identified lacks and optimizes strengths. The framework proposed is a significant contribute to enhance SME application of such a systems.

Introduction

Interest on Business Performance Measurement (BPM) has notably increased in the last twenty years. Particularly, it is important to remark the evolution of focusing performance from a financial perspective to a non-financial perspective. Since the middle of '80s in fact, companies manifested the growing need of controlling production processes and, more in general, business. Companies have understood that for competing in continuously changing environments, it is necessary to monitor and understand firm performances. Measurement has been recognised as a crucial element to improve business performance (Sharma, Bhagwat, Dangayach, 2005). To be world class and be classified as a world-class manufacturer, manufacturing organisations need to have a number of critical ingredients: one of these ingredients, is the presence of an appropriate performance measurement system (PMS) (Medori and Steeple, 2000). A PMS is a balanced and dynamic system that is able to support decision-making processes by gathering, elaborating and analyzing information (Neely et al.2002). The concept of “balance” refers the need of using different measures and perspectives, that tied together give an holistic view of the organization (Lynch and Cross (1991), Fitzgerald et al. (1991), Kaplan and Norton (1992, 1996), Keegan et al. (1989), Neely (1998) and Neely et al. (2002)). The concept of “dynamicity” refers instead to the need of developing a system which continuously monitors the internal and external context and reviews objectives and priorities (Bititci et al. 2000; Dixon et al. 1990; Eccles and Pyburn 1992; Ghalayini et al. 1997; Lingle and Schiemann 1996; Lynch and Cross 1991; Maskel 1989; Neely et al. 2000). An increasing competitive environment, the proneness of growing in dimension, the evolution of quality concept, the increased focus on continuous improvement and the significant developments in information and communication technologies are the most important changes in recent years that have created a favorable context for the implementation of PMSs in SMEs, particularly in the manufacturing sector (Garengo, Biazzo, Bititci, 2005). Although large research has been carried out to investigate the needs and characteristics of PMSs in large organizations, different appears the situation related to SMEs, where there is a distinct lack of published research on these issues

(Hudson, Lean, Smart, 2001). However, from the literature available it is possible to collect information regarding how SMEs manage performance measure processes. In first instance, there is evidence that many SMEs already have some kind of accounting systems in place, and these represent the base of their monitoring. Even though this accounting systems may be far from perfect (Fry, 1992), it nevertheless represents a concrete possibility of measuring various aspects of the financial performance of a company (Hvolby, Thorstenson, 2001). The limits of traditional accounting systems have been largely discussed, and SMEs seem to perceive such limits and see the value of PMSs, but today there are still significant barriers in the implementation of this systems in the SME context (Manville, 2006). It is not surprising to find that studies on the use of PM typically state that operational measures in SMEs are ad hoc and informal (Addy et al. 1994, Hudson et al. 1999), with no real understanding of key performance drivers (Greatbanks and Boaden 1998). This evidence highlights the need to better understand SME characteristics, in order to point out their needs and develop consequently tailored solutions.

Thus, the aim of this paper is first to investigate the relationship between PMSs and SMEs, and coherently to develop a BPM framework specifically tailored for small businesses. The paper is articulated as follow: in the first section it is presented a structured critical review of BPM models for SMEs. In the second section, starting from the dimensions and characteristics identified in BPM models today available, a gap analysis between theoretical models and real application in SMEs is carried out, and a new BPM framework is proposed. This framework is an attempt to fulfill the identified lacks and integrate the strengths of the models today available.

Research methodology

The literature review has been conducted along three different, but interrelated, perspectives. Each of them can be summarized in a specific research question, according to the methodology adopted by Garengo, Biazzo and Bititci (2005) and described in figure 1 (revisited from Sign 2004, Tranfield et al. 2003). The specific questions at the base of the literature review are: 1) Which are the characteristics of SMEs in relationship to BPM?; 2) Which are the factors influencing PM in SMEs?; 3) Which are the principal characteristics and dimensions of an “ideal” SME PM system?

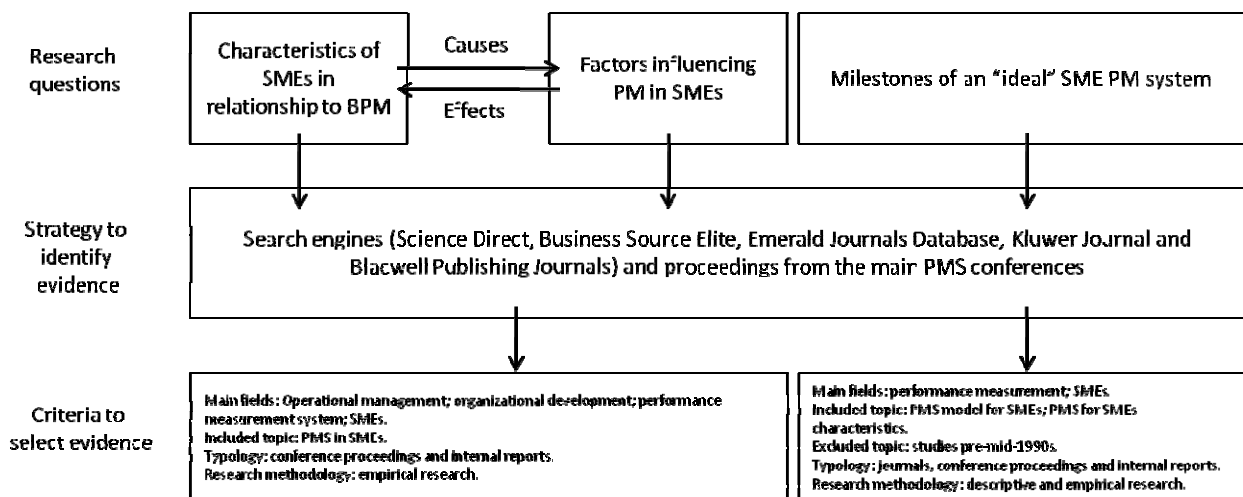


Figure 1 – Structure of the literature review

The criteria used in the review are different for the three research questions. The first two questions have been more deeply investigated through conference proceedings and internal reports, because the inadequacy of literature covering PMSs for SMEs (Hudson et al., 2001; Anderson et al., 2001). The third question instead, has been mainly investigated in journal papers, in which a more theoretical approach is used; this because the difficulty to investigate BPM system milestones, due to the lack of empirical research carried out on this topic (Garengo, Biazzo, Bititci, 2005).

Characteristics of SMEs in relationship to BPM

SMEs are characterized by some specific aspects due to their own dimensions and abilities, showing points of strength and contemporarily aspects of weakness.

Owners and the managers typically have a good knowledge of the local market and are well aware of the clients' demands; the relationships with the clients and the after-sales services are often more intensive in SMEs than in large organizations. The degree of bureaucracy is typically lower (Vinten, 1999) and the internal lines of communication are shorter (Winch and Mc Donald, 1999), usually guaranteeing a greater speed in the problems resolution and decision making. Moreover, the restricted number of managers, executives and experienced figures inside SMEs decreases notably the amount of expenses, as the restricted investment in infrastructures. In SMEs it is possible to dedicate efforts to niche markets, since it is easier to focus on a category of selected clients and satisfy them with customized products and personalized services.

In opposition, they often miss long-term strategies or, when these exist, they are strongly vague (Kueng et al., 2000): the first objective of SMEs, in fact, is that to survive in a highly competitive environment (Levy et al., 1999). Often the formal communication, necessary in SMEs (Vinten 1999), is replaced by informal alternative systems bringing to subjective evaluations. They are characterized by lack of financial stability and difficulty to face and resolve costly mistakes; lack of funding, since the majority of SMEs are family-run business; troubles in technology exploitation, low efficiency, lack of best practices, lack of data and legal constraints are also common issues. Finally, a good part of SMEs fails in the first 3-5 years of life and this is a global situation: it is a direct consequence of managerial incompetence, lack of managerial experience, inadequate planning, poor financial control and recording keeping (Baard and Watts, 2001).

For these reasons it is evidently obvious the importance for SMEs to measure and understand their own performances (Yusof and Aspinwall, 2000): in this way it is possible to endure the competitive pressure caused by market globalization which increases client expectations in quality and services (Underdown and Talluri, 2002).

According with Jarvis et al. (2000), SMEs focus their attentions and efforts in terms of performance measures on the cash flow matter. This vision is confirmed by Webb et al. (1999) which paid attention on the types of measures usually used in the manufacturing SMEs. Moreover, Masalla (1994) concluded that Italian SMEs pay little attention to non financial indicators , by focusing largely on financial figures.

Hynes (1998) underlined the necessity for SMEs to not exclusively address the PMS toward financial aspects. By focusing efforts exclusively on the financial perspective, it introduces significant disadvantages, such the fact that these indicators often leads to inhibit, rather than facilitate, the achievement of established objectives. To overcome this issue, there are a number of studies that provide good insights:

- on assessing and designing SMEs PM systems (Hynes 1998, Appiah-Adu and Singh 1998, Noci 1994);
- on the close examination of methods for the development of PM in SMEs (Barners et al. 1998, Chennel et al. 2000);
- on the Balanced Scorecard applied to the world of the SMEs (Hvolby and Thorstenson 2000, McAdam 2000; Chow, Haddad and Williamson 1997; Davig, Elbert and Brown 2004) or, alternatively, the use of Quick Response Manufacturing (Hvolby and Thorstenson 2000);
- on the developing structured PM systems in small companies, using the Activity Based Costing information (Laitenen 1996);

Nevertheless, according with Addy et al. (1994) and Hudson et al. (1999), all these approaches don't furnish an holistic perspective, reaching the conclusion that:

The characteristics of limited resources, limited cash flow coupled with a reliance on few customers, a firefighting mentality coupled with an emphasis on current performance, and potential staff turnover coupled with a flat organizational structure, means that SMEs require an alternative approach to strategic PM development. (Hudson et al. 2000).

Non-financial aspects are usually left out: CIMA (1993) states the increasing importance of non financial measurements inside SMEs, although there is still a disparity between practice and theory. This disparity is explained through the incomprehension of the indicators in general and, more specifically, of operational indicators (Walley et al. 1994, Webb et al. 1999). But the non-financial system is not problem-free: one of the difficulties of the non-financial system is the inability to dollarize the amount of improvement in non-financial indicators, and the tie between improvements in the non-financial measures and pro-fit is unclear, conflicting with the short-term perspective of SMEs (Fisher, 1992). The most common non-financial measures adopted by SMEs are number of employees (Orser, Hogarth-Scott, and Riding 2000; Mohr and Spekman 1994; Robinson and Sexton 1994; Loscocco and Leicht 1993; Davidsson 1991; O'Farell 1986), growth in revenue across time (Miller, Wilson, and Adams 1988), market share (O'Farell 1986) and revenue per employee (Johannisson 1993). These measures need to be reviewed and updated regularly ensuring that they remain suitable for the changing environments, competition, availability of resources (McGee, Dowling, and Megginson 1995), meeting the stakeholders' needs and expectations (Srinivasan, Woo, and Cooper 1994), and fit into internal planning and target settings (Merz and Sauber 1995). In addition, some traditional performance measurement systems are focused on short-term goals; long-term aspect, such as flexibility required to meet the increasing variety in manufacturing, information, and control decision system required, lead time in manufacturing, employee attitude, and public responsibilities are neglected or seen as optional or informal (Sharma, Bhagwat, Dangayach, 2005). The SME characteristics presented above explain the frequent failure of PM initiatives and provide good insights for future research.

Factors influencing performance measurement in SMEs

The previous section highlighted some critical points that represent the real context in which SMEs operate. These dimensions can be summarized with the following sentences, each of one entails distinct factors influencing performance measurement in SMEs. In particular it emerges that:

- SMEs difficultly has been involved in performance measurement projects (Tenhunen et al. 2001; Barnes et al.1998);
- either do not use any PM model or they use models incorrectly. (CIMA 1993; Tenhunen et al.2001; Hvolby and Thorstenson 2000; McAdam 2000);
- performance measurement implemented in SMEs rarely has a ‘holistic approach’. (Barnes et al. 1998; Rantanen and Holtari 2000);
- SMEs approach to performance measurement is informal, not planned and not based on a predefined model (Barnes et al. 1998; Addy et al. 1994; Chennell et al. 2000; CIMA 1993; Hudson et al. 1999);
- SMEs have limited resources for data analysis (Antonelli and Parbonetti 2002; Barnes et al. 1998).

Existing literature suggests that SMEs may be differentiated from larger enterprises by a number of key characteristics, which are generally described as follows and that represent the factors influencing the implementation of BPM within small firms (Addy et al., 1994; Burns and Dewhurst, 1996; Ghobadian and Gallear, 1997; Appiah-Adu and Singh, 1998; Berry, 1998; Marri et al., 1998; Haywood, 1999; Jennings and Beaver 1997; Marchini 1995; Martins and Salerno 1999; Bourne 2001; Hvolby and Thorstenson 2000; Hussein et al. 1998; McAdam 2000):

- personalized management, with little devolution of authority;
- resource limitations in terms of management and manpower, R&D, finance, marketing, etc.;
- reliance on small number of customers, and operating in limited markets;
- flat and flexible structures;
- high innovatory potential;

- reactive and fire fighting mentality;
- informal and dynamic strategies;
- tacit knowledge and little attention given to the formalization of processes;
- misconception of performance measurement.

All these factors underline the differences between SMEs and large organizations and the need of a different approach to PM in SMEs. Moreover, these factors could be useful to investigate crucial dimensions of PMSs for SMEs. These dimensions, in fact, should be tailored on the factors described above, in order to emphasize SME pros and valorize limits. Starting from the SMEs characterization conducted, the following section furnishes the description of the principal characteristics and dimensions of an “ideal” SME PM system.

Milestones of an “ideal” SME performance measurement system

The limited resources of SMEs require approaches and models that respond to their specific needs and are efficient and easy to implement. Starting from the SME characterization previously carried out, the following section provides description of the principal characteristics and dimensions of an “ideal” SME performance measurement system, in order to define the bases for PMS design. The authors specified “ideal” because none of the models analyzed in literature are able to integrate all of the following characteristics, by giving clear definitions and suggestions for a successful implementation (Balachandran, Lunghi, Taticchi, 2007).

Assessment. According that SMEs already have some kind of accounting system in place (Hvolby, Thorstenson, 2001), a new SME PM system should have an assessment system, able to evaluate the capability of the current system, in order to define a base for implementing eventual lacks identified. This element is very important for the success of a PMM system initiative, since it clarifies at the beginning what the actual PM architecture can offer and which efforts and actions are need to be taken to improve it (Balachandran, Lunghi, Taticchi, 2007).

Design. PM system should reflect the company business, therefore there is need to design a specific architecture and proper measures (Balachandran, Lunghi, Taticchi, 2007). The design of PMSs for SMEs must consider strategy linked with a strong focus on operational aspects (Garengo, Biazzo, Bititci, 2005); the consideration of different stakeholders perspective, that is the ability to meet the needs and expectations of the external stakeholders including the customers, suppliers, competitors (Daft 1995); performance should be measured based on a holistic approach which incorporates the financial and non-financial measures as well as time element and the integration of external and internal parameters (Noci, 1994).

Implementation. Limited SME managerial skills point out difficulties for successful BPM implementation (Noci, 1994). For this reason, once the framework and measures are designed, accurate indications for successful implementation should be clearly furnished (Balachandran, Lunghi, Taticchi, 2007). This is confirmed by numerous researches (Chennel et al., 2000; Hudson, Smart, Bourne, 2001; McAdam 2000; Manville, 2006; Garengo, Biazzo, Bititci, 2005; Marri, Gunasekaran, Grieve, 2000). A focused approach to performance measurement may also have advantages in attracting attention to and facilitating implementation of the measurement system (Hvolby, Thorstenson, 2001).

Communication/Alignment. A PMS must be designed and implemented in accordance with a company's business strategy in order to link the strategy to the objectives of functions, groups of people, and individuals, as well as to operational aspects (Garengo, Biazzo, Bititci, 2005). The aim of achieving company alignment should be accomplished with clear guidelines to effectively communicate performances inside the company. Communication is an important driver to achieve company alignment to strategy, but is not the only one. There is evidence in fact in literature that PMM systems should be joined by compensation systems to promote company alignment and performance growth (Balachandran, Lunghi, Taticchi, 2007).

Review. A dynamic performance measurement system should include system for reviewing measures and objectives that make it possible both to adapt the PMS quickly to the changes in the

internal and external contexts, and systematically to assess a company's strategy in order to support continuous improvement. The review system should also verify if the PMM system contributes to an overall improvement in performance (Robson, 2004) that is the general purpose of any PMM system.

These dimensions have been employed to drive the literature review and further to evaluate the characteristics of PM frameworks identified.

Review of BPM research

For clarity and brevity reasons, in this section a summarization of characteristics of models identified in the literature review is presented in the form of a table (table 1). This furnishes a clear vision of the results obtained through the literature review conducted; specifically the table highlights the models references, the period of development, the strengths and weaknesses.

Model	Author and Period	Strengths	Weaknesses
Dynamic performance measurement system (IPMS)	Laitinen, 1996	<ul style="list-style-type: none"> Innovative BPM system specific for SMEs. Dynamic and Integrated, Balanced and Logical. Based on a managerial view: it identifies the useful dimensions to evaluate for the increase of firms performance. The model is mainly intended as a general tool for measuring and improving performance without any special reference to the type of industry. 	<ul style="list-style-type: none"> The industry type may affect the relative importance of alternative factors in the IPMS. Absence of implementation guidelines. The author uses a survey to present preliminary empiric evidences of the importance of PMs, but the work is still in progress.
Application of Balanced Scorecard to Small Companies	Chow, Haddad, Williamson, 1997	<ul style="list-style-type: none"> Step-by-step operations for implementation are furnished. It provides indications for management to design a scorecard to fix the needs of the company. A survey is proposed to four different typology of firms. Multi-perspective dimension analysis. It defines four innovative perspectives which link long-term strategic objectives with short-term actions. 	<ul style="list-style-type: none"> The framework proposed is not clearly structured, and consequently application is subjective.
Customer orientation and performance	Appiah-Adu, Singh, 1998	<ul style="list-style-type: none"> It is focused on the effects of customer orientation on performance measures. It links customer orientation, innovation orientation, market dynamism and competitive intensity. It has been validated on a large number of UK firms. 	<ul style="list-style-type: none"> The model focuses only on a market perspective. The model doesn't permit an holistic view of performance
Activity Based Costing in small and medium enterprises	Gunasekaran, Marri, Grieve, 1999	<ul style="list-style-type: none"> It defines the criteria to implement ABC in SMEs. It provides guidelines for implementation 	<ul style="list-style-type: none"> The model exclusively focus on costs. There are just few cases of application of this model, which still require validation.
Computer Integrated Manufacturing (CIM)	Marri, Gunasekaran, Grieve, 2000	<ul style="list-style-type: none"> CIM defines guidelines for achieving long-term benefits for SMEs: strategic benefits and intangibles benefits. The model has been tested through on an empirical study which remarked good results. A framework has been developed on the basis of CIM performance measures specifically for SMEs. With CIM, SMEs have achieved significant performance measurements in different areas, e.g.: improvement of quality, responsiveness, improvement of sales and marketing information, growth in line productivity, increased staff productivity and lower overhead costs, reduce WIP inventory, reduction of lead times, 	<ul style="list-style-type: none"> Improvement in shop floor operations can be a hindrance for some SMEs. This high level of automation require resources that could not be available in SMEs. There is need to define criteria which would fix the conditions for implementing CIM projects in SMEs

		reduction of floor space, and reduced set-up costs.	
Organizational Performance Measurement (OPM)	Chennel et al., 2000	<ul style="list-style-type: none"> Specifically developed for SMEs. The system has been developed from an empirical case study research in both large enterprises and SMEs. 	<ul style="list-style-type: none"> Objectives are not clearly defined. The system proposed is in the dissemination phase and it has to be tested yet.
Quality models in an SME context	Rodney McAdamm, 2000	<ul style="list-style-type: none"> The model has increased the measurements and links between strategy and operational processes. The model provides a classification of factors influencing PM initiatives in SMEs 	<ul style="list-style-type: none"> The model uses a balanced scorecard as quality model. The model permits only qualitative analysis.
Indicators for performance measurement in SMEs	Hvolby, Thorstenson, 2001	<ul style="list-style-type: none"> The model focuses on moving from performance measurement to performance management and try to reduce the efforts that need to be allocated for PM initiatives in SMEs Performance measures are linked to strategy. 	<ul style="list-style-type: none"> There are few non financial indicators To obtain a balanced performance there is need to retain some of the financial performance measures that could be derived from the company's accounting system. The model still need validation.
Improving control through effective performance measurement in SMEs	Hudson, Lean, Smart, 2001	<ul style="list-style-type: none"> Specifically developed for SMEs. Incremental and iterative process to measure performance. Simple, clear and well defined to implement. The model has been applied in a case study. 	<ul style="list-style-type: none"> The model has been tested only in one company. It has to be proved the effective flexibility and adaptability of the model. The model is specifically developed for the manufacturing sector.
Theory and practice in SME performance measurement systems	Hudson, Smart, Bourne, 2001	<ul style="list-style-type: none"> Identification of critical characteristics of performance measures. Identification of critical dimensions of performance. It uses a survey to establish whether SMEs measure performance strategically. It uses a case study to investigate whether the process identified is appropriate within a SME context. The failure of the case study has allowed the gap analysis between the theoretical model and the PM system, which resulted in a greater understanding of SMEs. 	<ul style="list-style-type: none"> Application of an existing and non-ad-hoc model to the case study: the Cambridge process. Failure of the case study: the company did not achieve the implementation of the new balanced system. The model is too strategic oriented and requires too many resources for application Little short-term benefits. The model is not enough dynamic and flexible.
Adaptation of Balanced Scorecard to SMEs	Davig, Elbert, Brown, 2004	<ul style="list-style-type: none"> Balanced approach. Guidelines for implementation are given. Multi-perspective dimension analysis. It individuates indicators largely used by firms. 	<ul style="list-style-type: none"> The model refers to companies that have from 20 to 250 employees, a too large range. The measures suggested highly depend from company strategies It may take a couple of years to achieve a pay off.
Balanced Scorecard (BSC) in no profit SMEs	Manville, 2006	<ul style="list-style-type: none"> It is used a consolidated model of BPM The scorecard provides an opportunity to reconcile the analyzed organization business plan with its operational activities. The barriers for successful implementation seem to have been addressed. Clear correlation between indicators and financial performance. The model bases on cause-and-effect linkages. There is an holistic view of the organization. 	<ul style="list-style-type: none"> Only one SME is analyzed in the study. Only the service sector is analyzed in the study. Continuous improvement is necessary to evolve the framework to an integrated PMs. The model is static and does not follow business dynamics. Four perspectives are limiting. The survey provide suggestions but not specific guidelines for implementation.
Measuring performance of small-and-medium sized enterprises	Gin Chong, 2007	<ul style="list-style-type: none"> Measures used by SMEs have been identified. Multiple case study. Multiple data collection methods minimize the threats to validity and reliability of information. The process underline the fact that SMEs place equal attentions on both the financial and non-financial measures. 	<ul style="list-style-type: none"> Grounded theory use can lead to errors. Cross-sectional analysis gives only a snapshot on the approaches used by firms. Results are specific of single cases, difficult generalization of findings. Further research and tests need to be conducted. The survey provide suggestions but not specific guidelines for implementation.

Table 1 – Summarization of the literature review carried out

The previous summarization highlights the characteristics of the models reviewed. Next table evaluates such models in respect of the indications identified by Balachandran et al. (2007) which define the milestones that each PMS should have (Assessment, Design, Implementation, Communication/Alignment, Review).

It is important to remark that the last two works (Manville, 2006; Gin Chong, 2007) are conducted in the form of a survey analysis. The importance of these two studies as contribution to the research

on BPM in SMEs induced the authors to include them in the review. However, because their nature of survey, it has not been possible to include them in the evaluation process, presented in the following table (table 2).

	Assesment	Desgin	Implementation	Communication/Alignment	Review
Dynamic performance measurement system (IPMS)	√	√	X	X	√
Application of Balanced Scorecard to Small Companies	X	√	√	√	√
Customer orientation and performance	X	X	X	X	X
Activity Based Costing in small and medium enterprises	√	√	X	√	√
Computer Integrated Manufacturing (CIM)	X	√	X	X	X
Organizational Performance Measurement (OPM)	√	√	X	√	√
Quality models in an SME context	√	X	X	√	X
Indicators for performance measurement in SMEs	X	X	X	X	X
Improving control through effective performance measurement in SMEs	X	X	√	√	√
Theory and practice in SME performance measurement systems	√	X	X	X	X
Adaptation of Balanced Scorecard to SMEs	√	√	X	X	√
Balanced Scorecard (BSC) in not profit SME	It is a survey, the classification criteria isn't applicable for such a research				
Measuring performance of small-and-medium sized enterprises	It is a survey, the classification criteria isn't applicable for such a research				

Table 2 – Analysis of the literature review

Table 2 highlights that no one of the models reviewed is able to satisfy all criteria at the same time. Such result underlines the necessity of developing integrated frameworks which could better answer SMEs needs.

An integrated framework for SME performance measurement and management design

In the previous paragraphs the milestones of a “traditional” PMM system were presented (Balachandran, Lunghi, Taticchi, 2007) and the main frameworks proposed in literature discussed.

In respect of SME characteristics and factor influencing PM initiatives inside this typology of companies, the authors present in this paper an integrated framework for SME performance measurement and management. Particularly, the framework proposed respects all dimensions identified by Balachandran et al. (2007) and it is an attempt to face PMS design in an integrated way. The need of integration has been largely discussed and promoted by Robson (2004).

The integration need is particularly important for what concerns the framework and implementation design issues. In consequence of that, the authors propose a multi-system / multi-level model which represents a starting point for the design and implementation of PMM frameworks and measures.

Therefore, in the sections ahead, the framework related to design and implementation together with the “global framework” for PMM design are presented.

Reference Model for PMM framework and measures

The framework proposed integrates five systems:

1. A performance system;
2. A cost system;
3. A capability evaluation system;
4. A benchmarking system;
5. A planning system.

The framework is based on the belief that PMM is based on a deep business comprehension, which relies first on the analysis of the company activities and their drivers. Therefore, the framework

proposed ahead defines “which” information should be analyzed, “how” they should be processed and “how” they could be integrated for generating value information for managers actions.

The five systems interact in a multi-level way, as depicted in Figure 2:

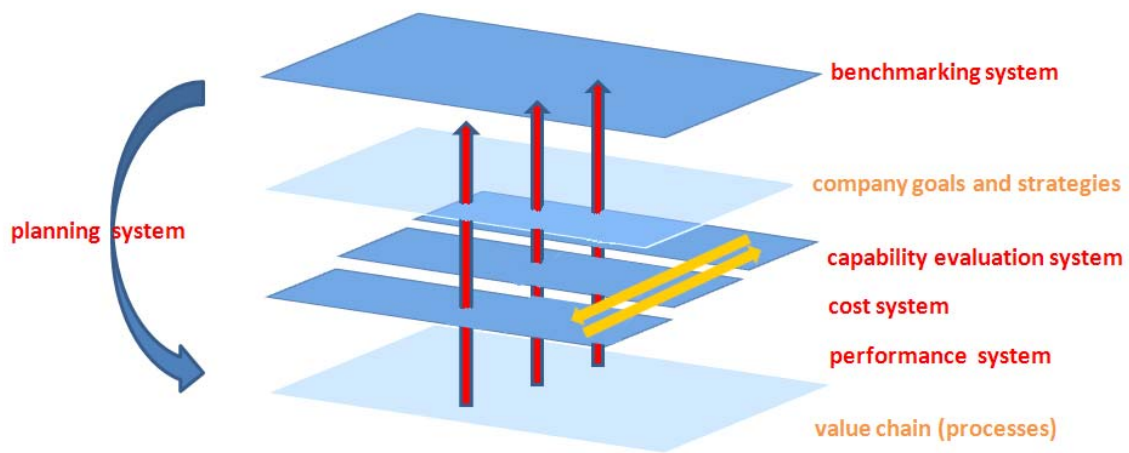


Figure 2 – How the Five Systems Work Together in a Multi-Level Way

As depicted in Figure 2, the framework defines that value chain processes are the input of the three upper systems of analysis. These means that processes should be analyzed by highlighting activities and related drivers so as to provide a comprehensive understanding of the company business. Not always companies have defined process and activities (especially small and medium companies) therefore effort should be put in order to identify the company value chain, and thus company processes, activities and related drivers. This work can be time and resource consuming, but the detail achieved in this phase affects the overall PMM system effectiveness. Once processes are identified, they are evaluated by the performance system which reports the results achieved. The performance system focuses on the measurement of company processes and other particular parameters (key performance indicators, KPIs) which are relevant for the business. Particularly, a good performance measurement system, should not only be limited to a list of KPIs, but should identify relations between them and their level of impact over the business.

In order to understand the information coming from the performance system and make it useful for decision-making, results have to be analyzed in comparison of the “physical capabilities” of the company. By “physical capabilities” the authors mean the reasons that limit the performance of a

specific process (e.g. the production flexibility could be limited by technological aspects or the materials availability could be limited by an inadequate MRP system or the purchasing activity could be limited by human resources).

The comparison between performance and physical capability is particularly important in SMEs, where limited resources can often be the reason of limited performances.

In order to support managers in their decision-making processes, at this point the information coming from the Cost System is taken in consideration. In fact, the Cost System has the key role of providing information regarding process and activity costs which is essential to solve the trade off which comes up from the comparison of the Performance and Capability System.

The output of this comparison should be therefore a clear understanding of the process performance, the comprehension of what can be done to optimize the performance and the identification of possible physical constraints that could be removed: however, trade-offs should be made on a cost/revenue-basis.

The information coming from the performance system and from the comparison with the company physical capability should be therefore compared with company strategies and goals, so as to ensure alignment of the overall structure. Therefore, performances achieved should be benchmarked with top-performing-companies, so as to identify further targets coherently with company capabilities. Planning is therefore carried out consequently, so as to achieve new goals identified. It is important to underline that the authors do not limit the planning activity to financial budgeting, instead we extend it to non-financial measures budgeting and to business planning.

Reference Framework for PMMS Design

In the previous paragraph a detailed framework for PMM framework and measures design has been presented. However, this aspect represents the most critical issues on PMM initiatives and this is the reason of why the authors decided to discuss this section separately and more deeply.

Further, on respect of the milestone identified by Balachandran et al. (2007), the authors identified guidelines for the remaining aspects (assessment, communication/alignment and review) by referring the work of other authors. Therefore, the global framework for PMMS design is presented in figure 3:

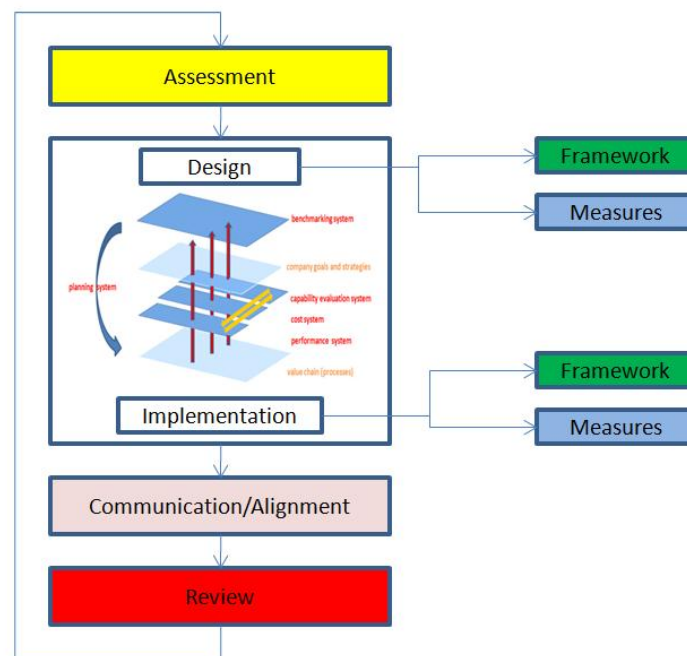


Figure 3 - Reference Framework for PMMS Design

For what concerns the “assessment” process, the authors suggest the methodologies proposed by Dixon et al. (1990), Bititci et al., (1997; 2000), the European Foundation for Quality Management (EFQM, 2007a), St-Pierre and Delisle, (2006).

For what concerns the “communication/alignment” process, the authors suggest the methodologies proposed by Kaplan and Norton, (1992), Kanji, (1998), Bititci et al., (2000), St-Pierre and Delisle, (2006).

For what concerns the “review” process, the authors suggest the methodologies proposed by Cross and Lynch, (1988), Dixon et al. (1990), Neely et al., (1996), Bititci et al., (1997), Epstein and Westbrook, (2001). The framework proposed has an integrated approach to PMMS design, by providing guidelines for assessment, design, implementation, communication/alignment and review. By doing this, the framework proposed represents a real contribute to the SME PMM research, since it integrates all the crucial points were previous models failed (Table 2).

Conclusions

In this paper the authors carried out a structured literature review which highlighted the state of the art of PMM research applied to SMEs.

By focusing on PMMS design, the authors analyzed the characteristics of the PMM models available in literature through the classification proposed by Balachandran et al. (2007).

Based on this analysis, the authors presented a framework which is a merging of PMM models available in the literature together with the integration of missing elements. Particularly, the authors went into more depth regarding the design of frameworks and measures in SMEs. Based on a strong emphasis on processes, the framework fixes through which systems information should be analyzed, and provides explanation of how this system of information reading and analysis generates value for decision-making processes. Nanni et al. (1992) refer that a PM system is like a room thermostat, which assess the room temperature by sensing it and by sending proper feedback signals to the air conditioning system.

With the integration of the systems proposed by the authors, the vision of Nanni et al. is overcome, since the PM system becomes also able to understand the physical constraints that limit the temperature range and which should be the ideal temperature through a benchmarking process.

The majority of PMM models available today limit their focus on the performance system, therefore losing much information and potential effectiveness. By integrating instead the five mentioned

systems, the complexity and peculiarities of today businesses are more deeper understood and analyzed, and therefore an effective support is given to management in decision-making processes. The final framework proposed constitutes the base for PMM system design, by providing guidelines for achieving an integrated approach to performance measurement and management.

References

- Addy, C., Pearce, J., and Bennett, J., (1994), "Performance measures in small manufacturing enterprises: are firms measuring what matters?". In Proceedings 10th National Conference on Manufacturing Research (Loughborough: Taylor & Francis Publishing) pp. 110–114.
- Anderson, H., Cobbold, I. and Lawrie, G. (2001), "Balanced scorecard implementation in SMEs: reflection in literature and practice", paper presented at the 2001 SME Conference.
- Antonelli, V. and Parbonetti, A. (2002). I sistemi di governo nelle imprese minori: il caso Calabria. *Small business*, 1, 71–98.
- Appiah-Adu, K., and Singh, S., (1998), "Customer orientation and performance: a study of SMEs". *Management Decision*, 36(6), 385–394.
- Baard, V., Watts, T., (2001), 'The Design of a Performance Measurement Model for Small Firms within the Service Sector'.
- Balachandran, K., Lunghi, P., Taticchi, P., (2007). Performance Measurement and Management: A review of Systems and Frameworks and Considerations for Small Firms. 12th International Conference on Quality and Productivity Research, Haifa, Israel, July 10-12.
- Barnes, M., Dickinson, T., Coulton, L., Dransfield, S., Field, J., Fisher, N., Saunders, I., and Shaw, D., (1998), "A new approach to performance measurement for small to medium enterprises". In Conference Proceedings Performance Measurement –Theory and Practice, Vol 1, (Cambridge: Cambridge University), pp. 86–92.
- Berry, M. (1998) 'Strategic planning in small and high tech companies', *Long Range Planning*, Vol. 31, No. 3, pp.455–466.
- Bititci, U.S., Turner, T., Begemann, C., (1997) "Integrated Performance Measurement Systems: a Development Guide", *International Journal of Operations & Production Management*, 17, 5, pp. 522-534
- Bititci, U.S., Turner, T. and Begemann, C. (2000). Dynamics of performance measurement systems. *International Journal of Operations and Production Management*, 20, 692–704.

- Bourne, M. (2001). Implementation Issues, Hand Book of Performance Measurement. London: GEE.
- Burns, P. and Dewhurst, J. (1996) Small Business and Entrepreneurship, 2nd edition, London: Macmillan Press.
- Chennell, A., Dransfield, S., Field, J., Fisher, N., Saunders, I., and Shaw, D., (2000), OPM: “A system for organizational performance measurement”. In Conference Proceedings Performance Measurement – Past, Present and Future, (Cranfield: Cranfield University), pp. 96-103.
- Chow, C, W. Haddad, K.M. & Williamson, J.E., (1997), “Applying the balanced scorecard to small companies”, Management Accounting, 79(2):21-28.
- CIMA (1993). Performance Measurement in the Manufacturing Sector. London: CIMA.
- Cross, K.F., Lynch, R.L., (1988) “The SMART way to define and sustain success”, National Productivity Review, (1986-1998), 8, 1, pg. 23
- Daft, R. L. (1995). Organization Theory and Design. New York: West Publishing.
- Davidsson, P. (1991) ‘Continued Entrepreneurship: Ability, Need and Opportunity as Determinants of Small Firm Growth’, Journal of Business Venturing, Vol. 6, pp. 405-429.
- Davig, W. Elbert, N. & Brown, S., (2004), “Implementing a Strategic Planning Model for Small Manufacturing Firms: An Adaptation of the Balanced Scorecard”, S.A.M Advanced Management Journal, 69(1): 18-25.
- Dixon, J.R., Nanni, A.J. and Vollmann, T.E. (1990). The New Performance Challenge: Measuring Operations for World Class Competition. Homewood, IL: Dow Jones/Irwin.
- Eccles, R.G. and Pyburn, P.J. (1992). Creating a comprehensive system to measure performance. Management Accounting, 41–44.
- EFQM, (2007a) “Introducing Excellence”, available at: <http://www.efqm.org>
- Epstein, M.J., Westbrook, R.A., (2001) “Linking Action to Profits in Strategic Decision Making”, MIT Sloan Management Review, Spring 2001, 42, 3, pp. 39–49
- Fisher, J. (1992). Use of nonfinancial performance measures. Journal of Cost Management, 6(1), 31-38.
- Fitzgerald, L., Johnson, R., Brignall, S., Silvestro, R. and Voss, C. (1991). Performance Measurement in Service Businesses. London: CIMA.
- Fry, T. D. Manufacturing performance and cost accounting. Prod. and Inventory Managmt J., 1992, 33(3).
- Garengo, P., Biazzo, S., Bititci, U.S., (2005). “Performance measurement systems in SMEs: A review for a research agenda”. International Journal of Management Reviews Volume 7 Issue 1 pp. 25–47.
- Ghalayini, A., Noble, J. and Crowe, T. (1997). An integrated dynamic performance measurement system for improving manufacturing competitiveness. International Journal of Production Economics,

48, 207–225.

Ghobadian, A. and Gallea, D. (1997) 'TQM and organizational size', *International Journal of Operations and Production Management*, Vol. 17, No. 2, pp.121–163.

Greatbanks, R., and Boaden, R., (1998), "Can SMMEs afford to measure performance?". In *Conference Proceedings Performance Measurement – Theory and Practice*, Vol 1, (Cambridge: Cambridge University), pp. 117–124.

Greatbanks, R., and Boaden, R., 1998, Can SMMEs afford to measure performance? In *Conference Proceedings Performance Measurement – Theory and Practice*, Vol 1, (Cambridge: Cambridge University), pp. 117–124.

Haywood, M. (1999) 'Software based supply chain links in SMEs in the North West', *Stimulating Manufacturing Excellence in SMEs (Conference Proceedings)*, University of Plymouth, Plymouth.

Hudson, M., and Smith, D., (2000), Running before walking: the difficulties of developing strategic performance measurement systems in SMEs. In *EurOMA Conference Proceedings Operations Management*, (Ghent: Academia Press Scientific Publishers), pp. 292–298.

Hudson, M., Bennett, J., Smary, P. A., and Bourne, M., 1999, Performance measurement for planning and control in SMEs. In *Conference Proceedings Advances in Production Management Systems* (Berlin: Kluwer Academic Publishers), pp. 219–225.

Hudson, M., Lean, J., Smart, P. A., (2001). "Improving control through effective performance measurement in SMEs". *Production planning & control*, 2001, vol. 12, no. 8, 804–813.

Hudson, M., Smart, A. and Bourne, M. (2001), "Theory and practice in SME performance measurement systems", *International Journal of Operations & Production Management*, Vol. 21 No. 8, pp. 1096-115.

Hussein, M., Gunasekaran, A. and Laitinen, E.K. (1998). Management accounting system in Finnish service firms. *Technovation*, 18, 57–67.

Hvolby, H., and Thorstenson, A., (2000), "Performance measurement in small and medium-sized enterprises". In *Proceedings 3rd International Conference on Stimulating Manufacturing Excellence in SMEs* (Coventry: Coventry University), pp. 324–332.

Hvolby, H., Thorstenson, A., "Indicators for performance measurement in small and medium-sized enterprises". *Proc Instn Mech Engrs Vol 215 Part B*.

Hynes, B., (1998), "Small firm growth: performance measurement issues", In *Conference Proceedings Performance Measurement – Theory and Practice*, Vol. 2, (Cambridge: Cambridge University), pp. 499–506.

Jarvis, R., Curran, J., Kitching, J., and Lightfoot, G., (2000), "The use of quantitative and qualitative criteria in the measurement of performance in small firms", *Journal of Small Business and Enterprise Development*, 7(2), pp. 123–133.

Jennings, P. and Beaver, G. (1997). The performance and competitive advantage of small firms: a

management perspective. *International Small Business Journal*, 15, 34–58.

Johannisson, B. (1993) 'Designing Supportive Contexts for Emerging Enterprises', in C. Karlsson, B. Johannisson, and D. Storey (Eds.), *Small Business Dynamics: International, National and Regional Perspectives*, London: Routledge.

Kanji, G.K., (1998) "Measurement of Business Excellence", *Total Quality Management*, 9, 7, pp.633-643

Kaplan, R. and Norton, D. (1992). *The Balanced Scorecard: the measures that drive performance*. *Harvard Business Review*, Jan–Feb, 71–79.

Kaplan, R. and Norton, D. (1996). *Using the Balanced Scorecard as a strategic management system*. *Harvard Business Review*, Jan–Feb, 75–85.

Keegan, D.P., Eiler, R.G. and Jones, C.R. (1989). *Are your performance measures obsolete?* *Management Accounting*, 70, 45–50.

Kueng, P., Meier, A. and Wettstein, T. (2000) *Computer-Based Performance Measurement in SMEs: Is there any Option?*, (Internal Working Paper), Institute of Informatics, University of Fribourg, Paper No. 00–11.

Laitinen, E., (1996), *Framework for Small Business Performance Measurement* (Vaasan yliopisto: University of Vaasa).

Levy, M., Powell, P. and Galliers, B. (1999) 'Assessing information system strategy development frameworks in SMEs', *Information and Management*, Vol. 36, No. 5, pp.247–261.

Lingle, J.H. and Schiemann, W.A. (1996). *From Balanced Scorecard to Strategy Gauge: is measurement worth it?* *Management Review*, 3, 56– 62.

Loscocco K. A., and K. T. Leicht (1993) 'Gender, Work-Family Linkages and Economic among Small Business Owners', *Journal of Marriage and The Family*, Vol. 5, pp. 875-887.

Lynch, R. and Cross, K. (1991). *Measure Up! Yardsticks for Continuous Improvement*. Cambridge: Blackwell.

Manville, G., (2006). "Implementing a balanced scorecard framework in a not for profit SME". *International Journal of Productivity and Performance Management* Vol. 56 No. 2, 2007 pp. 162-169.

Marchini, I. (1995). *Il governo della piccola impresa*, vol. 3 – *La gestione delle funzioni*, Genova: ASPI/INS-EDIT.

Marri, H., Gunasekaran, A. and Grieve, R. (1998) 'An investigation into the implementation of the computer integrated manufacturing in small and medium sized enterprises', *International Journal of Advanced Manufacturing Technology*, Vol. 14, No. 6, pp.935–942.

Martins, R.A. and Salerno, M.S. (1999). *Use of new performance measurement system, some empirical findings*. In *Managing Operations Networks – VI International EurOMA Conference*,

Venice, Italy, 7–8 June.

Masalla, C., (1994), “Designing a performance measurement system for a small company: a case study”, In Proceedings of the 1st EurOMA Conference, (Cambridge, UK: Cambridge University), pp. 325–330.

Maskel, B. (1989). Performance measures for world class manufacturing. *Management Accounting*, 5, 32–33.

McAdam, R., (2000), “Quality models in an SME context”. *International Journal of Quality and Reliability Management*, 17(3), 305–323.

McGee, J. E., M. J. Dowling, and W. L. Megginson. (1995) ‘Cooperative Strategy and New Venture Performance: The Role of Business Strategy and Management Experience,’ *Strategic Management Journal*, Vol. 16, pp. 565-580.

Medori, D. and Steeple, D. (2000) “A framework for auditing and enhancing performance measurement systems”, *International Journal of Operations and Production Management*, Vol. 20, No. 5, pp.520–533.

Merz, G. R.,and M. H. Sauber (1995) ‘Profiles of Managerial Activities in Small Firms,’ *Strategic Management Journal*, Vol. 16, pp. 551-564.

Miller, A., B. Willson, and M. Adams (1988) ‘Financial Performance Patterns of New Corporate Ventures: An Alternative to Traditional Measures,’ *Journal of Business Venturing*, Vol 3, no. 4, pp. 287-299.

Mohr, J. and Spekman, R. (1994) ‘Characteristics of partnership success: partnership attributes, communication behavior, and conflict-resolution techniques’, *Strategic Management Journal*, Vol. 15: pp. 135-152.

Nanni, A.J., Dixon, J.R. and Vollmann, T.E. (1992), “Integrated performance measurement: management accounting to support the new manufacturing realities”, *Journal of Management Accounting Research*, 4, 1-19.

Neely, A., Mills, J., Gregory, M., Richards, H., Platts, K. and Bourne, M., (1996) “Getting the Measure of Your Business”, Findlay, London

Neely, A. (1998). *Measuring Business Performance*. London: The Economist in association with Profile Books.

Neely, A., Adams, C. and Kennerley, M. (2002). *The Performance Prism: the Scorecard for Measuring and Managing Stakeholder Relationship*. London: Prentice Hall.

Neely, A., Mills, J., Richards, H., Gregory, M., Bourne, J. and Kennerley, M. (2000). “Performance measurement system design: developing and testing a process-based approach”. *International Journal of Operations and Production Management*, 20, 1119–1145.

Noci, G., (1994). Accounting and non-accounting measures of quality-based performances in small firms. *International Journal of Operations & Production Management*, Vol. 15 No. 7, 1995, pp. 78-

- O'Farrell, P. (1986) 'The Nature of New Firms in Ireland: Empirical Evidence and Policy Implications,' in D. Keele, and E. Wever (Eds.) *New Firms and Regional Development in Europe*. London: Croom Helm, pp. 151-183.
- Orser, B. J., S. Hogarth-Scott, and A. L. Riding (2000) 'Performance, Firm Size and Management Problem Solving,' *Journal of Small Business Management*, Vol. 38, no. 4, pp. 42-58.
- Rantanen, H. and Holtari, J. (2000). Performance analysis in Finnish SMEs. In *Proceeding of the 11th International Working Seminar on Production Economics*. Innsbruck, 21–25 February.
- Robinson, P. B., and E. A. Sexton (1994) 'The Effect of Education and Experience on Self-Employment Success,' *Journal of Business Venturing*, Vol. 9, no. 2, pp. 141-156.
- Robson, I., (2004). From process measurement to performance improvement. *Business Process Management Journal* Vol. 10 No. 5, 2004 pp. 510-521.
- Sharma, M.K., Bhagwat, R., Dangayach, G.S., (2005), "Practice of performance measurement: experience from Indian SMEs", *Int. J. Globalisation and Small Business*, Vol. 1, No. 2, 2005.
- Sign (2004). Systematic literature review. In *A Guideline Developers' Handbook*; SIGN Publication No. 50.
- Srinivasan, R., C. Y. Woo, and A. C. Cooper (1994) 'Performance Determinants for Men and Female Entrepreneurs,' in N. C. Churchill (Ed.) *Frontiers of Entrepreneurship Research*, Wesley, MA: Babson College Press.
- St-Pierre, J., Delisle, S., (2006) "An Expert Diagnosis System for the Benchmarking of SMEs' Performance", *Benchmarking: An International Journal*, 13, 1/2, pp. 106-119
- Tenhunen, J., Rantanen, H. and Ukko, J. (2001). *SME-oriented Implementation of a Performance Measurement System*. Lahti, Finland: Department of Industrial Engineering and Management, Lappeenranta University of Technology.
- Tranfield, D., Denyer, D. and Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14, 207– 222.
- Underdown, R. and Tallury, S. (2002), "Cycle of success: a strategy for becoming agile through benchmarking", *Benchmarking: An International Journal*, Vol. 9 No. 3, pp. 278-92.
- Veitch, K., and Smith, E., (2000), "The evaluation of customer service performance and the small business – a case study within the packaging supply chain". In *Proceedings 3rd International Conference on Stimulating Manufacturing Excellence in SMEs* (Coventry: Coventry University), pp 216–221.
- Vinten, G. (1999) 'Corporate communication in small and medium-sized enterprises', *Industrial and Commercial Training*, Vol. 31, No. 3, pp.112–119.

Walley, P., Tayles, M., and Duberley, J., (1994), "Strategy and performance measurement compatibility: selected case examples". In Proceedings of the 1st EurOMA Conference (Cambridge, UK: Cambridge University), pp. 403–408.

Webb, D., Greatbanks, R., and Hough, J., (1999), "A foundation for improving performance measurement in manufacturing SMEs", Proceedings 2nd International Conference on Stimulating Manufacturing Excellence in SMEs (Plymouth: University of Plymouth), pp. 201–210.

Winch, G. and McDonald, J. (1999) 'SMEs in an environment of change-computer based tools to aid learning and change management', *Industrial and Commercial Training*, Vol. 31, No. 2, pp.49–56.

Yusof, S.M. and Aspinwall, E.M. (2000), "Critical success factors in small and medium enterprises: survey results", *Total Quality Management & Business Excellence*, Vol. 11 No 4-6, pp. S448-62.