



# Collaborative performance management: present gaps and future research

Collaborative performance management

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## Abstract

**Purpose** – To identify gaps in current research concerning the critical issues, threats and opportunities in the design of a system for managing performance in collaborative enterprises; and to define a performance management research agenda.

**Design/methodology/approach** – An interdisciplinary study examines performance management from different disciplinary perspectives with the purpose of giving insights into the area, which is currently not sufficiently explained. Three sources of knowledge are investigated: scientific literature; practitioners' magazines; and research project reports.

**Findings** – There is a lack of understanding of what collaboration means and what it implies on the development of appropriate performance measurement systems. Future research should study the nature of collaboration and the characteristics of performance indicators to support it.

**Research limitations/implications** – The selection of the disciplines to be investigated and knowledge sources to be searched is based on the authors' definition of collaborative performance management. This implies that different definitions of the same concept could lead other researchers to study different disciplines, reach different conclusions and define a different research agenda.

**Practical implications** – It helps researchers build a sound knowledge base in collaborative performance management and focuses their research efforts on the most relevant issues.

**Originality/value** – The value of this paper resides in its ability to structurally gather most of the information available in the area, which is usually scattered in several different disciplines. This paper's contribution should be seen in the context of an ever-increasing use in performance management research of the constructive approach, where a priori knowledge is very important.

**Keywords** Performance management, Performance measurement (quality)

**Paper type** Literature review

## Introduction

Performance management as an identifiable subject for academic study and research arguably began in the late 1980s (Johnson and Kaplan, 1987; Lynch and Cross, 1991; Eccles, 1991; Kaplan and Norton, 1992; EFQM, 1999; Thorpe, 2004). Ever since, much research has been carried out and industrial initiatives have been undertaken in several fields: logistics management, marketing, human resources management and operations management among the others. This increased attention from academia and industry has led to enormous amount of papers,



research projects, commercial tools etc. Neely (1999) estimated that between 1994 and 1996, 3,615 articles on performance measurement were published; and in 1996 books on the subject appeared at a rate of one every two weeks in the USA alone. A more recent study carried out at Cranfield University (Franco and Bourne, 2003) has confirmed such interest.

However, most existing studies are losing relevance in today's industrial dynamics. Business models such as supply chain, extended enterprise and virtual enterprise are merely the tip of an emerging trend in new organization alliances, boundary redefinition, and market structures. Today's manufacturing systems should be measured and managed in the context of the total business they are part of: back through the supplier chain and forward into the distribution and customer chain (Browne and Sackett, 1995). Despite the increasing focus on collaboration between enterprises from one side, existing studies in the area of performance management still narrowly look at the single enterprise and its "within-enterprise" processes and people (e.g. Beamon, 1999; Neely *et al.*, 1995;).

The main objective of the research behind this paper was hence to go beyond existing work and thoroughly analyse existing knowledge in different disciplines in order to develop a better understanding of the issue of performance management in collaborative enterprises. We aimed at identifying gaps in current knowledge concerning the critical issues, threats and opportunities that must be considered and the challenges that must be faced when designing a system for managing performance in collaborative enterprises and to define a research agenda for future performance management studies.

### Research methodology

Research in the field of performance management is increasingly being characterised by an applied focus and the growth in academic interest in performance management has mirrored the development of actual performance management practice (Thorpe, 2004, Bourne, 2003; Korpela *et al.*, 2001). Action- and constructive- research and plant-based-case-study strategies seem to be the most appropriate and most widely used approaches in operations management research, helping reduce the gap between theory and practice (see for example Hill *et al.*, 1999, Vafidis, 2002).

The growing emphasis on constructivism in the field of performance management is posing numerous challenges on the way to do research. The strength point of constructive research is that it combines existing knowledge from previous research with experience from the organisation(s) involved (Korpela, 1994, Vafidis, 2002). Constructive researchers must have or build an *a priori* extensive knowledge ground to support thorough understanding of the research problem and its implications in its context (see also Lukka, 2003; Coughlan and Coughlan, 2002).

Given the dynamic nature of performance management discipline, and the growing interdisciplinary interest in organization performance (Neely and Waggoner, 1998), building the required a priori knowledge is not an easy task. We identify two major challenges to be overcome, concerning:

- (1) The selection of sources of knowledge: should the investigator look only for literature or should he look for knowledge in other forms, e.g. project reports, interviews, etc.? (see also Rowley and Slack, 2004).

- (2) The design of the study of existing knowledge: should the study analyze knowledge across a number of disciplines, or should it focus only on a specific one? How to select the discipline(s) of interest and for what reasons? (see also Thorpe, 2004).

As for the selection of knowledge sources for the study, literature review is often seen as an important part of any research project (see also Tranfield *et al.*, 2003). However, we question the very meaning of knowledge. We actually argue that knowledge as such cannot be limited to existing literature only; on the opposite it is embedded in all what surround us. It is therefore a skill of the investigator understanding where to look for the available knowledge that is most relevant for his or hers study's purpose, e.g. on-going research activities, practitioners' experience, etc.

We selected mainly three sources of knowledge to be studied within our investigation:

- (1) scientific literature;
- (2) practitioners' magazines; and
- (3) reports from completed and on-going research projects.

As suggested by Rowley and Slack (2004), we decided to use professional and practitioner journal articles and project reports to design the literature review, selecting topical themes and identifying recent developments. We then decided to use the outcome of this first analysis as a guideline for the interdisciplinary review of up-to-date literature and scientific articles in scholarly and research journals

The practice of performance management crosscuts different management areas. For the sake of this study we hence opted for an inter-disciplinary study. As Thorpe (2004) concluded, inter-disciplinary studies might attempt to examine performance management from different disciplinary perspectives, and observes where they touch, with the purpose of giving insights into situations or phenomena currently unexplained. The selection of the relevant disciplines was based on how we define integrated performance management in collaborative enterprises:

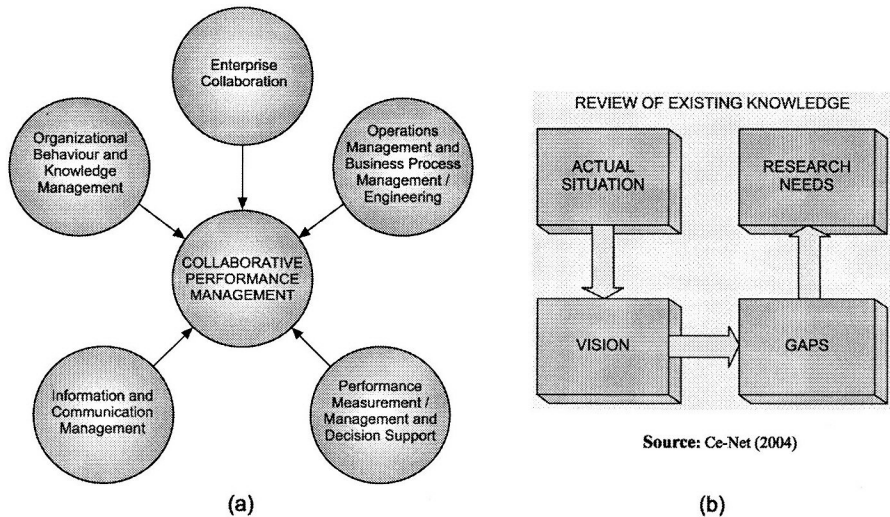
Integrated performance management in collaborative enterprises is the process of using *inter-organizational systems to collaboratively measuring performance of collaborative enterprise processes* and using the measurement to enable decision-makers to proactively and strategically manage the collaborative enterprise itself.

Five "actors" can be identified in this definition:

- (1) the collaborative enterprise;
- (2) the collaborative operational processes;
- (3) the collaborative process of measuring and managing performance;
- (4) the inter-organizational systems; and
- (5) the decision makers.

Hence the choice of analyzing collaborative performance management with the tools and knowledge archetypal of each of the following (Figure 1a):

- enterprise collaboration;
- operations management and business process management/engineering;



**Figure 1.**  
(a) The disciplines having an impact on performance management and (b) the dimensions of related information investigated during the study

- performance measurement/management and decisions support;
- information and communication management; and
- organizational behaviour and knowledge management.

The information analyzed during the review process was used to highlight four major “dimensions” of the research problem being analyzed (Figure 1b): actual situation, vision, gaps and research needs.

The core findings of the interdisciplinary study are discussed in the remainder of the paper.

### The emerging collaborative enterprise business model

The fact that today’s marketplace is more fiercely competitive than ever before is indeed widely acknowledged (e.g. Fawcett and Magnan, 2002; Patterson *et al.*, 2003). Globalization, technological change, and demanding customers constantly push the performance bar upward (Fawcett and Magnan, 2002). As a consequence over the past decade companies have been forced to persistently restructure themselves (see for example: Browne and Zhang, 1999; Lee and Whang, 2001; Jagdev and Thoben, 2001; Fawcett and Magnan, 2002; Lee *et al.*, 2003; Bititci *et al.*, 2004). Table I shows the identified trends that call for and influence the development of new management philosophies and management tools.

The agreed upon bottom-line both in literature and in industry is that “to cope with today’s increasing competitive marketplace, companies have, and should, become more collaborative” (Burgess *et al.*, 1997). The aim is to form a network that boasts as a whole all those resources and competencies needed to satisfy the end customer (Fawcett and Magnan, 2002). As a matter of fact, “the millennium is clearly going to be about the collaborative agile enterprise, which will be able to continuously and quickly change its organization, process, people, products, facilities, information systems, performance measures, business partners and so on to adapt in to a continuously

Trend	Consequence
Market and business globalization	Increased complexity of business networks Challenges in management of both information- and material-flow between suppliers, manufacturers and customers
Increased customer focus	High investments for lowering both costs and lead-times and increasing quality and overall customer satisfaction Increasing proliferation of product variety; increased costs Lack of resources and/or competencies needed to satisfy customer demand
Advances in ICT	Huge potential for facilitating and managing the flow of information from suppliers to customers
Knowledge based economy	Increased importance of knowledge generation and sharing New knowledge management methods Trust development techniques to foster information sharing

**Table I.**  
Trends influencing the  
development of new  
management  
philosophies

changing business environment” (Bititci and Carrie, 1998; Jagdev and Browne, 1998; see also Papazoglou and Ribbers, 2000).

As Ballou *et al.* (2000) point out, although the benefits of total partners coordination may be several and easy to identify, realizing these benefits will require new tools and techniques not previously possessed by management. Despite several studies recognize that enlightened companies do try to look beyond their four-walls and achieve the required integration with both suppliers and customers, empirical data still indicate that:

- Very few companies have actually reached a stage of extensive integration (Fawcett and Magnan, 2002).
- Network-wise collaboration has proved difficult to implement (e.g. Sabath and Fontanella, 2002).
- In most cases partners fail to reach the desired intensity of collaborative relationship (e.g. Wognum and Faber, 2002).
- In reality collaboration is still far from being achieved (Holmberg, 2000).

It is generally agreed that lack of understanding of collaboration structure and dynamics is the major cause of failure of collaborative initiatives. Operations management research calls for newer methods, tools and techniques that will support management of collaborative enterprise (e.g. Wognum and Faber, 2002)

After having gone through different phases (i.e. mass production, just in time, total quality management, etc.) operations managers today focus on:

- managing extended processes within and beyond the single company’s boundaries;
- managing the collaborative enterprise performance, not only measuring it;
- creating and managing cross organisational multidisciplinary teams;
- deploying integrated ICT across organizations; and
- creating and sharing knowledge.

The authors argue that the objective of collaborative enterprise operations management is to optimally design and manage the extended business processes in order to concurrently and seamlessly design, manufacture and deliver the products to the final-customer. Managers and researchers alike acknowledge that traditional operations management practices and technologies that integrate productive activities within the factory are necessary but not sufficient anymore (Greis and Kasarda, 1997; Quinn, 1997; Brunell, 1999; Stock *et al.*, 2000). Traditional models still widely in use nowadays cover one company and traditional business management methods focus on the optimization of the internal activities in that company (Lee *et al.*, 2002). A single-firm management style when managing a collaborative enterprise is likely to obstruct partners' integration (Holmberg, 2000). Innovation of organizational processes becomes a major business challenge critical for success (Patterson *et al.*, 2003). It follows that understanding the processes, structures and operations becomes extremely important.

The resulting increased complexity of the extended enterprise (La Londe and Masters, 1994; Chow *et al.*, 1995; Stank and Traichal, 1998; Holmberg, 2000; Lee and Whang, 2001; Lambert and Pohlen, 2001; Wognum and Faber, 2002; Bititci *et al.*, 2004) represents a major challenge in the design and management of such business model. In particular when it comes to defining the boundaries and intensity of specific relationships in a world where multiple relationships exist between the same companies (Fawcett and Magnan, 2002).

In conclusion, process re-engineering and process integration among partners is required and are part of the process of implementing collaboration among enterprises (Burgess *et al.*, 1997; Horvath, 2001).

Most authors point out that it is information and communication technology, and, in particular, the Internet, that make enterprise collaboration possible in practice (Konsynski, 1993; Fawcett and Magnan, 2002; Wright and Etemad, 2001; Jagdev and Thoben, 2001; Boyson *et al.*, 2003; Lee *et al.* 2003). Technology has gained a central role in the design of business models and operations, in the definition of business strategy and partners' relationships, in the design of performance measurement techniques, and in the integration of processes and organizations (Bowersox and Daugherty, 1995; Patterson *et al.*, 2003). "It is no longer merely an implementation issue; rather, the exercise of information technology is a critical organization design issue" (Konsynski, 1993). In order to be able stay competitive, organizations have started to develop and deploy interorganizational systems (IOS) that enable electronic commerce practices (Kurnia and Johnston, 2000; Lee *et al.*, 2003).

Attaran and Attaran (2002) define "collaborative computing" those products and services that foster collaboration among partners. "Collaborative computing" technologies are capable of: information retrieval and utilization; communication and data transmission, distribution of products and services, organizational transactions (Attaran and Attaran, 2002). Examples of "collaborative computing" technologies are: relational databases, client/server architecture, TCP/IP network protocols, multimedia wireless technology, and the Internet (Lee and Whang, 2001).

In conclusion, the following facts are widely acknowledged in literature:

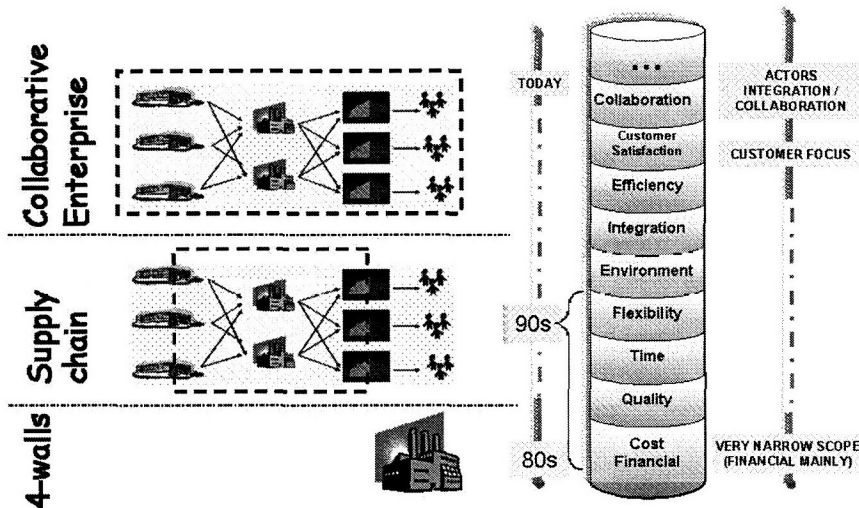
- The speed of response to customer demand is the key attribute to business success (Mason-Jones and Towill, 1997).

- Information exchange is viewed as an absolutely necessary and indisputable component in any successful enterprise network (Holmberg, 2000).
- To maximize competitive advantage all network's partners should "seamlessly" work together to serve the end consumer (Towill, 1997).
- ICT has increased the amount of information available to individuals and their ability to share such information far beyond everybody's expectations (Papazoglou and Ribbers, 2000; Corsi and Boyson, 2003).
- Collaborative computing technologies foster collaboration between partners (Attaran and Attaran, 2002).

**Collaborative performance management: where are we?**

A number of authors (see for example, Sink and Tuttle, 1989) indicate the 1940s and 1950s quality management Japanese philosophies as the roots of today's performance measurement theories and tools. The dissatisfaction with traditional approaches to monitor performance mainly through financial measures had fuelled during the 1980s a whole new interest in the area of performance measurement (Hayes and Abernathy, 1980; Goldratt and Cox, 1986; Johnson and Kaplan, 1987; Keegan *et al.*, 1989; Dixon *et al.*, 1990; Eccles, 1991; Kaplan and Norton, 1992; Neely *et al.*, 1995; Ghalayini *et al.*, 1997; Yenyiurt, 2003; Thorpe, 2004). Performance measurement eventually stopped being only a part of wider management philosophies and started to gain an identity on its own as "the process of quantifying the efficiency and effectiveness of past actions though acquisition, collation, sorting, analysis, interpretation and dissemination of appropriate data" (Neely, 1998). Nowadays performance measurement is an established concept that has taken on renewed importance in a variety of organizations (Camarata and Camarata, 2000).

A "revolution" is taking place in the area of performance measurement (Figure 2). Scientists and practitioners alike are questioning the relevance and applicability of the measurement principles, measures and measurement systems developed so far.



**Figure 2.** Evolution of performance measurement and measures

The major transformations taking place in this “revolution” can be grouped within the following headings:

- From performance measurement to performance management.
- From individual to collaborative performance measurement.
- From lagging to leading performance management.

*From performance measurement to performance management*

Performance measurement is merely the practical and technical exercise within the much wider “performance management” practice. The importance of looking beyond performance measurement and into performance management is supported by several authors (e.g. Otley, 1999, Schmitz and Platts, 2004).

Waggoner *et al.* (1999) argue that performance measurement in business serves the purposes of monitoring performance, identifying the areas that need attention, enhancing motivation, improving communications and strengthening accountability. Neely *et al.* (1995) define performance measurement system as the set of metrics used to quantify both the efficiency and effectiveness of actions. However, if measures are not used or are used in the wrong way, performance measurement fails to deliver any of the promised benefits. Organizations have started to realize that in order to reap the benefits of performance measurement, they have to make use of their measures, i.e. they have to manage through measures (Amaratunga and Baldry, 2002).

Performance management is therefore defined as: “the use of performance measurement information to effect positive change in organizational culture, systems and processes, by helping to set agreed-upon performance goals, allocating and prioritising resources, informing managers to either confirm or change current policy or programme directions to meet those goals, and sharing results of performance in pursuing those goals” (Amaratunga and Baldry, 2002)[1]. It follows that managing performance involves a cycle of clarifying business goals and then agreeing individual objectives and standards of performance (Macaulay and Cook, 1994). The supporting performance management system would include the following key elements:

- a structured methodology to design the performance measurement system;
- a structured management-process for using performance measurement information to help make decisions, set performance goals, allocate resources, inform management, and report success (see also Amaratunga and Baldry, 2002);
- a set of requirements specifications of the necessary electronic tools for data gathering, processing and analysis (see also Waggoner *et al.* 1999);
- theoretical guidelines on how to manage through measures (as Adair *et al.* (2003) points out, performance management systems are used to apply the information and knowledge arising from performance measurement systems); and
- a review process to ensure that measures are constantly updated to reflect changes in strategy and/or market conditions (see also Waggoner *et al.* 1999).

Several studies confirm that practitioners are generally dissatisfied with the performance measurement systems and performance measures in use today (Eccles, 1991, Ittner and Larcker, 1998), the main reason being a missing link between strategy and performance measures. “Because of the missing connection [between strategy and



performance measures] measures and measurement activities seem focused on internal functions instead of overall company performance and customer needs” (Holmberg, 2000)

#### *From individual to collaborative performance measurement*

The move toward more collaborative type of networks calls for new processes, new strategy, new measures and new way of managing performance. In the collaborative enterprise, companies will be closer than ever. Collaborative performance measurement and management means that customers and suppliers get access to performance information beyond their own firm and give access to performance information to the other partners in the network. By sharing performance data with partners, firms can identify bottlenecks and “weak links” in the network, and act in accordance to improve the overall performance (Stank *et al.*, 1999b; Holmberg, 2000; Lummus and Vokurka, 1999; Ireland and Bruce, 2000).

Traditionally, the focus of performance measurement has been on process operations within the organizational boundaries of a firm: when the forerunners of today’s performance measurement principles were developed there was at best a focus on procurement, quality of inbound goods, and supplier monitoring, but the concept of more extensive networks and collaborative enterprise had not yet fully emerged (Hronec, 1993). As Konsynski (1993) argues however “it is clearly impossible in today’s business climate to ignore those aspects of the organization that extend beyond the traditional, or legal, boundaries of the organizations”. This explains the increasing concern within academic research and industry on the performance of the global business network (Beamon, 1996).

Lee *et al.* (2003) points out that “unlike the past the performance of an enterprise now depends much on the performance of its partners in the value chain”. Despite the variety of existing frameworks for performance measurement most organizations are still unable or unwilling to measure and manage performance collaboratively with partners (e.g. Holmberg, 2000). They fail to understand that “when limiting their focus to a single organization and neglecting to consider local measurement activities as part of a greater whole, they miss an opportunity of capitalize on how the measurement system could contribute to improving [the business network’s] performance by taking waste out of the [business network], not just moving it somewhere else” (Holmberg, 2000).

The difficulty of developing a collaborative culture and the difficulty of developing appropriate performance measures have been identified as the major barriers to the successful implementation of collaborative performance management system.

Several studies have analyzed the issue of local versus overall performance measures concluding that collaborative performance measurement systems should evaluate both local measures and business network-wide measures in order to maintain relevance and effectiveness in the collaborative enterprise business model (e.g. Caplice and Sheffi, 1995). The vast majority of metrics in use today though measure only local performance (Waggoner *et al.*, 1999; Lambert and Pohlen, 2001; Simatupang, 2002).

The collaborative enterprise business model is based on braking down traditional physical boundaries and getting the partners to behave as a single unit. Integrating different organizations implies forming teams of different people with different

cultures, policies and routines (Holmberg, 2000). Managing multi-disciplinary teams poses a number of challenges related to communication, trust, and behaviour (Bruce *et al.* 1995). Considering that collaborative enterprise can be regarded as a team of companies, development of appropriate measure could benefit by taking in consideration existing theories developed in team performance management. Macbryde and Mendibil (2003) suggest employing three different kinds of measures:

- (1) process measures (i.e. how is the process performing?);
- (2) teaming measures (i.e. are people working as a team, bypassing the challenges related to trust and culture?); and
- (3) team management measures (i.e. is the management creating the right environment for the team to work as a team?).

Based on this work, we suggest analyzing performance of collaborative enterprises using the following measures:

- extended process measures (i.e. how is the extended process performing?);
- collaborating measures (i.e. are the enterprises able to work as a single unit?); and
- collaboration management measures (is the management of the companies providing creating and environment to allow collaboration to flourish?).

Difficulties in defining appropriate balanced set of measures for collaborative performance management have been related to:

- the complexity of overlapping business network (Lambert and Pohlen, 2001);
- the sharing of information between organizations (Lambert and Pohlen, 2001); and
- the kind of evaluation (qualitative or quantitative) and the unit of analysis (single organizations or many, on product line or many, an so on) (Beamon, 1999, Rafele, 2004).

#### *From lagging to leading performance management*

The ability to have access to real demand clearly contributes to the enterprise network agility (Mason-Jones and Towill, 1999). Unfortunately, though, one of the major problems in today's enterprise networks is the limited visibility of real demand (Christopher and Towill, 2000).

Many researchers are suggesting new approaches to performance management based on the use of timely and relevant information (Ghalayini *et al.*, 1997). Performance measurement systems have historically been developed and used to identify poor performance and improvement areas, but fail to incorporate redesign of measures based on feedback from operations. Nonetheless, the focus of operational control is shifting from past to present, and performance measurement is a key agent of this change (Amaratunga and Baldry, 2002).

A set of new words and phrases is being used such as "proactive" and "passive" performance management, feedback" and "feedforward" control, or "leading" and "lagging" measures, which reflect this shifting focus. Feedforward control involves the development and deployment of plans and objectives based on leading measures of real-time performance, while feedback control involves the measurement of

performance against those objectives through historical lagging measures. Proactive performance management based on both feedforward and feedback control is based on the premise that a balanced set of leading and lagging performance measures should anticipate and not only correct bad performance.

To maximize the efficiency of extended operations and processes, collaborative enterprises must be able to access accurate and timely information: selected leading measures, such as, aggregate demand and tracking data showing how products move through each distribution channel (Lee and Whang, 2001) enable decisions makers to be proactive. This means taking “improvement actions” before “corrective actions” are even needed, thanks to a better understanding of what is going on or what is about to happen (Holmberg, 2000, Schmitz and Platts, 2004).

Again the need for more appropriate measures is agreed upon in literature (e.g.: Schmitz and Platts, 2004). While in the previous section more appropriate was used related to the scope of the measures being required, here it refers to their ability to foster proactive management: “Performance measures must be selected that will allow for a more complete and accurate analysis” (Beamon, 1999). Although this area has been pointed out many times as strategically important, it still is not sufficiently understood (Keebler *et al.*, 1999, Atkinson *et al.*, 1997; Vitale and Mavrinac, 1995; Eccles, 1991).

### **Collaborative performance management: where should we go?**

Despite the vast amount of literature on performance measurement frameworks and systems most of the work is concerned with performance measurement within one organization (Schmitz and Platts, 2004). Previous work in this area has generally focused on (see also Beamon, 1999):

- developing new performance measures for specific applications;
- benchmarking, as in Camp (1989);
- categorizing existing performance measures, as in Neely *et al.* (1995);
- comparing methods, their application and empirically analyzing performance measurement systems already in use (Yeniyurt, 2003); and
- building rules or frameworks by which performance measurement systems can be designed and developed for various types of systems (Eccles, 1991; Kaplan and Norton 1992; Vitale and Mavrinac, 1995; Caplice and Sheffi, 1995; Keebler *et al.*, 1999).

There has been far too little focus on going beyond this previous work and developing a universal framework for the selection of performance measures for collaborative enterprises and the use of these measures to collaboratively manage the collaborative enterprise through measures. As a result, literature relating to strategic and performance management of collaborative enterprises is still rather rare (Bititci *et al.*, 2003; Bititci *et al.*, 2004; Busi and Andersen, 2004, Yeniyurt, 2003, Beamon, 1999). Schmitz and Platts(2004) conclude from their literature review that, although the importance of this area is widely acknowledged, there are “significant gaps in theoretical and empirical knowledge” and there is no research on any real application of an integrated performance measurement system for supply chain management. Rather this area is identified as a gap in the literature (see also Lambert *et al.*, 1998).

Future operations management research should start by clearly understanding collaboration and its mechanisms, and developing theories, methods, tools and techniques to ensure that all partners involved can clearly define and manage common goals, objectives and responsibilities (Bruce *et al.*, 1995; Barratt, 2004; Bititci *et al.*, 2003; Wognum and Faber, 2002). A body of knowledge dedicated to collaboration and its foundation and methods is widely acknowledged to be the one research outcome that will most likely support companies in successfully create efficient collaborative enterprises.

Researchers should keep in mind that collaboration and the collaborative enterprise business model involve: operational issues, infrastructural (technical) issues and behavioural issues.

Having discussed how processes must be managed beyond the boundaries of each organization, it follows that in order to support efficient collaborative operations management future research should focus on engineering extended operations and processes (e.g. Rafele, 2004)

In particular, regarding the process of managing performance in collaborative enterprise, there is the need to design a:

... dynamic process for managing strategy and performance [...] which continuously monitors [the collaborative enterprise] internal and external operational environment [...] and triggers actions which may change: the direction of the business, the way a business unit competes in its market or the priorities of an operate or support process (Bititci *et al.*, 2003, Yenyurt, 2003).

Definition of appropriate performance measures which are relevant and meaningful in the emerging collaborative business model is thus critical. Measurement systems should be designed to make use of a balanced set of performance measures: firstly, that monitor both external relations and the efficiency of internal and extended processes (Euske *et al.*, 1993; Kald and Nilsson, 2000); and secondly, that will support proactive management based on both feedback and feedforward operations control. Furthermore, a suggestion was made to look into team performance management and develop: extended process-, collaborating- and collaboration management performance measures. Future research should investigate this proposal in more detail. Lastly, concerning the infrastructure needed for collaborative performance management it is widely acknowledge that a suitable communication infrastructure is still lacking (Wognum and Faber, 2002).

Table II shows the major outcome of the interdisciplinary study. The research needs in Table II are translated into more precise research questions that future research agenda should prioritize (Table III).

### Conclusions

In this paper we have analyzed the issue of collaborative performance management and its implications in five main knowledge areas:

- (1) enterprise collaboration;
- (2) operations management and business process management/engineering;
- (3) performance measurement/management and decisions support;
- (4) information and communication management; and
- (5) organizational behaviour and knowledge management.

Actual situation	Vision	Gaps	Research needs
Companies are restructuring themselves but still insufficient integration among partners	The collaborative enterprise	Collaborative tools and management techniques	Understanding the structure and dynamics of collaborative enterprises
Traditional operations management practices and technologies are not sufficient anymore	Managing extended processes	Process models mapping the extended processes	Understanding extended processes' structures and operations
Existing performance measurement systems still focus on single enterprise performance	Managing collaborative enterprise performance	Collaborative performance management system	Developing a structured methodology to design the performance measurement system
Existing measures focuses on operational performance within one organization	Collaborative measures are used to measure: Extended processes Collaboration Collaboration management	Collaborative performance indicators	Understanding what to measure. (i.e. what are the differences between single enterprise and collaborative enterprise measures?)
Most organizations are still unable or unwilling to measure and manage performance collaboratively with partners	Customers and suppliers get access to performance information beyond their own firm and share knowledge within the collaborative enterprise	Collaborative culture	Developing a structured management process for using measures to support decisions makers, set goals, allocate resources and inform management
Performance measurement systems used to spot improvement areas	Performance measurement systems are used to redesign strategy	Existing performance measurement systems fail to incorporate redesign of measures based on feedback from operations	Understanding difference between leading and lagging indicators and proactive and passive management
Technology has gained a central role in the design and management of the collaborative enterprise	Partners seamlessly collaborate based on fully interoperable technologies	Integrated / interoperable collaborative computing technologies	Requirements specification of integrated/interoperable collaborative computing technologies

**Table II.**  
Actual situation, vision, gaps and suggestions for future research in collaborative performance management

Research needs	Research agenda and priorities
Understanding the structure and dynamics of collaborative enterprises <sup>a</sup>	Who is part of the collaborative enterprise? Who manages the collaborative enterprise? What is collaboratively managed in a collaborative enterprise? What are the factor conditions that would allow a collaborative enterprise succeed or fail? What is the nature of the extended processes? When/which processes should be extended? Who manages the extended processes?
Understanding extended processes' structures and operations <sup>a</sup>	What performance measures should be collaboratively selected?
Developing a structured methodology to design the performance measurement system	How multiple individual measures can be aggregated to give an overall picture of the collaborative enterprise performance? How can companies being part of more than one collaborative enterprise have one single measurement system? How can conflicting measures and objectives be managed in a collaborative enterprise?
Understanding what to measure. (i.e. what are the differences between single enterprise and collaborative enterprise measures?)	What are the appropriate performance measures? What are the differences between teaming measures and collaborating measures? What are the differences between: process- and extended process measure?
Developing a structured management process for using measures to support decisions makers, set goals, allocate resources and inform management	How should we use collaborative performance measures to maximise the performance of the collaborative enterprise as well as maximising or optimising the performances of individual partners?
Understanding difference between leading and lagging indicators and proactive and reactive management	In the context of a collaborative enterprise: What measures are leading measures? What measures are lagging measures? How can leading measures support proactive management? When proactive management should substitute reactive management and vice versa?
Specification of integrated / interoperable collaborative computing technologies	Assuming that the developing information and communications systems technology (internet etc) will play a central role in making truly collaborative enterprises a reality... What additional functionalities would be required of a software support programme to facilitate management of the collaborative enterprise? How may the management with measures be facilitated in a collaborative environment? How could the measurement system electronically gather real-time (or near-real time) data from other management systems?

**Table III.**  
Research agenda  
priorities in collaborative  
performance  
management

**Note:**<sup>a</sup> This may seem out of the scope of performance management research. However it is not possible to develop a performance management process for collaborative enterprises, unless researchers will answer these questions

Our main objective was to identify the gaps in literature concerning the critical issues, threats and opportunities to be considered and the challenges to be faced when designing a methodology for managing performance in collaborative enterprises; and to define a research agenda in the area of performance management.

#### Note

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1. Based on this assumption the authors choose to hereafter use the term performance management instead of measurement, when talking not only of the technical exercise.

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