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A PMS for facility services supply chain: A case in the healthcare sector

Alberto Felice De Toni, University of Udine, via delle Scienze 208 – 33100 Udine,

detoni@uniud.it, +39 0432 558330

Mattia Montagner, University of Udine, via delle Scienze 208 – 33100 Udine,

mattia.montagner@uniud.it, +39 0432 558043

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Abstract: Supply chain (SC) performance measurement is attracting the attention of practitioners and academic researchers. Many studies report the importance of measuring and managing SC performances to improve the understanding and cooperation among partners, to raise SC integration and finally to pursuit SC excellence. But, whereas literature about SC performance measurement is rich in theoretical approaches, empirical researches are still poor.

The work aims to increase fieldworks on this topic. This paper results from a three-years case study within a SC of facility services in the healthcare sector. The proposed performance measurement system adopts a balanced approach for performance evaluation and uses different levels of measurement and accountability: strategic, tactical and operational. The model shares measures and results among customer, prime contractor and subcontracting companies of the considered SC, supporting partners in highlighting opportunities for services improvement, getting better collaboration and coordination along SC and defining Service Level Agreements.

Keywords: Performance Measurement System; Supply Chain; Facility Management; Healthcare; Case Study.

1. INTRODUCTION

Business performance measurement is a topic of concern for both researchers and professionals for three decades at least (Neely et al., 2000). The discipline has evolved and extended throughout this period, driven by continuous academic research and industrial initiatives. This interest has given body to a great amount of scientific papers and books, conferences, commercial software, etc. However, since new emerging business models such as supply chain, extended enterprise and virtual enterprise are challenging managers and scholars, novel issues must be addressed by performance measurement researchers (Busi and Bititci, 2006). In a previous work, Neely (2005) analyses performance measurement literature in the last decade and briefly outlines a research agenda for the next. He states that, among the developments required by the theory on performance measurement, it should be investigated "how to measure performance across supply chains and networks rather than within organisations" (2005: 1273). On the same line, Busi and Bititci (2006) claim that today's industrial dynamics require a new perspective on performance measurement, that is to abandon the idea of narrowly looking at single enterprise performance in favour of a wider view at many enterprises performance, working collaboratively to satisfy the final consumer.

Looking at literature concerning supply chain management, we come to the same conclusion. Actually, although there are many contributions to supply chain performance measurement (Beamon, 1999; Brewer and Speh, 2000; Bullinger et al., 2002; Chan and Qi, 2003a; Gunasekaran et al., 2004), the topic has not received adequate attention by researchers yet (Cuthberson and Piotrowicz, 2008). Demands for improving knowledge on this subject are various, but what seems to be common among authors is the call for measurement systems that assess supply chains as one whole entity, rather than single-companies performance (Handfield and Nichols, 1999; Holmberg, 2000; Gunasekaran et al., 2001; Chan and Qi, 2003b). These authors stress the importance of an holistic view of the supply chain and demand for shared models, metrics and measurement methods among chain members (Holmberg, 2000; Cuthberson and Piotrowicz, 2008). Brewer and Speh (2001) claim that in supply chain management the emphasis is on how well a group of companies –

not only one enterprise – performs in terms of value creation for the final consumer; thus also the measurement system should adopt an holistic perspective, considering supply chain as a whole. In other words, Gunasekaran and colleagues (2004) make clear that "efforts are needed to design new measures and new programs for assessing the performance of the supply chain as a whole entity as well as the performance of each organization that is a part of the supply chain" (2004: 346).

The purpose of this paper is hence to enrich knowledge about measurement systems for evaluating the overall performance of supply chains. We argue that sharing the measurement tool among chain members is a main principle for working cooperatively in the supply chain and, consequently, for improving the overall performance. Nevertheless, we do not pretend to offer a comprehensive pattern for exceeding the myopia on single enterprise performance, that is becoming very restrictive in supply chain context. On the opposite, we believe that generalizations concerning supply chain overall performance assessment could be hazardous till a wider knowledge on this subject is developed. Consistently, we prefer to focus the attention of this study on a specific context only, i.e. facility services supply chains, an emerging area of research where we have noticed the opportunity for sharing the measurement tool (De Toni, 2007).

The remainder of the paper is organized as follows. The next section deals with the academic literature on performance measurement. The state of the art of performance measurement in supply chain management and facility management is proposed. The third section describes the shared measurement system we have designed for facility services supply chain. Next the tool is implemented in a case study in the healthcare sector. Thus, section four reports the implementation process, the performance measures and the critical factors for tool implementation in the considered case. The paper ends with implications for practice and research. Further studies are also proposed.

2. LITERATURE REVIEW: PERFORMANCE MEASUREMENT SYSTEMS (PMSs)

The subject of performance measurement for business management is very discussed both in academy and practice since the '80s (Neely, 1999). The interest in measurement systems has shown

in a good deal of publications, new associations and conferences on performance measurement, nevertheless the term Performance Measurement System (PMS) is rarely defined (Neely et al., 1995). Neely (1998) says that a PMS is a tool that allows managers having informed decisions, as it quantifies the efficiency and effectiveness of past actions through acquisition, collation, sorting, analysis, interpretation and dissemination of appropriate data. PMS offers to business managers useful news about company's competitive position, business unit's performance progress, employees motivation and customer needs. A comprehensive picture of the functions of performance measurement is offered by Schmitz and Platts (2004). In their review, the authors point out that PMS serves for various purposes: strategy formulation and clarification, management information, vertical and horizontal communication, decision making and prioritising, co-ordination and alignment, motivation, and learning.

Three primary elements must be defined in order to build a quality measurement system:

1. a set of performance measures that quantifies the efficiency and effectiveness of actions;
2. a reference framework combining the measures;
3. an infrastructure supporting acquisition, collation, sorting, analysis, interpretation and dissemination of data.

PMS makes use of a set of performance measures that supports business managers to recognize where improvements are required. Many authors emphasize that the group of measures should not be mono-dimensional, different types of measure should be considered instead: financial and non-financial measures (Kaplan and Norton, 1992), internal and external measures (Keegan et al., 1989), global measures for senior managers and local measures for low-level managers (Flapper et al., 1996), lag measures to quantify past actions ("feedback" performance control) and lead measures to forecast future performance ("feedforward" performance control) (Kaplan and Norton, 1992).

Performance measures shouldn't form a confused and random group, however. The PMS needs a reference framework that defines the criteria for selecting and combining the measures. To this purpose, many frameworks have been proposed and applied; some of these have large application,

while others are context specific. Among the most recognized frameworks, we report the Performance Measurement Matrix (Keegan et al., 1989), the Performance Pyramid (Lynch and Cross, 1991), the Results and Determinants (Fitzgerald et al., 1991), the EFQM Business Excellence Model introduced at the beginning of 1992 by the European Foundation for Quality Management, the Balanced Scorecard (BSC) (Kaplan and Norton, 1992), the Macro Process Model (Brown, 1996), and recently the Performance Prism (Neely et al., 2002). More specific description and a review about the measurement frameworks can be found in Neely and colleagues (2000).

Finally, the measurement system is completed by an infrastructure for simplifying and mechanizing the process of measuring and evaluating the business performance. The infrastructure is composed by checklists, guidelines and standards for performance measurement, criteria for performance assessment, etc. Usually, information technologies and software solutions accomplish to these functions so that a great deal of software vendors have recognized the opportunity to develop novel products for performance measurement or to integrate the existing ERP applications with business performance assessments. If anyone would major insight on this matter, she/he might refer to the software report by Marr and Neely (2003).

The rest of this section deals with investigations in PMS literature. Next we briefly describe the BSC model, that is the most famous framework in practice and research. The rationale behind the description of this model is that it will be used as the theoretical basis in our study. Then, we illustrate the state of the art on performance measurement in both supply chain management and facility management literatures. We collect knowledge in both in order to design a quality PMS for facility services supply chains. We analyze next only what concerns performance measures and frameworks for supply chains and facility services, while we do not care about infrastructures for performance measurement and evaluation.

2.1. The balanced scorecard

It is beyond doubt that the Balanced Scorecard (BSC) – by Kaplan and Norton (1992) – is very

renowned among researchers and professionals of every sector. Since its conception, the BSC model has aroused so lively interest that many times it has been applied in practice (Kaplan, 2005): for example, Apple (Kaplan and Norton, 1993), Pepsi (Jensen and Gerr, 1994), Metro Bank (Kaplan and Norton, 1996), the Swedish Law Enforcement (Carmona and Gronlund, 2003), Nike (Lohman et al., 2004), the U.S. Army and Chrysler (Kaplan and Norton, 2005). Neely (2005) confirms that academic researchers show great attention in this model as well. He notices that Kaplan and Norton's seminal work on BSC has been the most cited article by authors in performance measurement between 1998 and 2005.

The BSC starts with the definition of the corporate strategy and its communication to all levels of the organization. By then performance measurement scholars agree that outlining strategy is an issue of primary importance for business performance management, but it is also a major point to connect corporate strategy to the tasks of managers and workers, specifying how the work of single employees can contribute to the achievement of the company's strategic objectives (Kaplan and Norton, 2004). The process of cascading down strategy across the organization is supported by what authors call "linking measurements to strategy", that is translating company's strategy into a coherent set of performance measures for everyone.

But the originality of the BSC consists in balancing purely financial issues with those elements needed for the value creation, as the traditional financial performance measures have become lacking in today's competitive environment. Thus, the authors prompt that managers should use different perspectives to assess business performance, answering to the following questions: how do we look to shareholders (financial perspective)? how do customers see us (customer perspective)? what must we excel at (internal business perspective)? can we continue to improve and create value (innovation and learning perspective)? The financial perspective is insufficient to describe business performance results, however it remains indispensable for the shareholders. Indeed they evaluate business through financial measures as ROI, turnover, net margin, etc. to verify gains and losses. The customer perspective analyses the value proposition to customers and consists of measures for

market penetration by goods/services, relations with customers, company brand, etc. The internal business perspective identifies where to excel in order to rise competitiveness and profits; effectiveness and efficiency of internal processes and tasks are measured here. Finally the innovation and learning perspective considers those issues that qualify the firm to realize good results in the other perspectives: employees competences and skills, technologies, corporate culture, etc. (Kaplan and Norton, 2000).

As we will look next, BSC applications may be discovered in supply chain management literature and in facility management one. The original framework and its modified versions have been used by various authors to assess the performance of supply chains and facility services, so that Kaplan and Norton's model results a bridge between the two literatures. For this reason, the BSC model appears to be a clear starting point to design a measurement system for facility services supply chains.

2.2. PMS for supply chain management

Supply chain (SC) performance measurement is attracting the attention of practitioners and academic researchers. Various authors report the importance of measuring and managing SC performance to improve the understanding and cooperation among partners (Brewer and Speh, 2001; Chan et al., 2003), to raise SC coordination (Romano and Danese, 2006) and finally to pursuit SC excellence (Brewer and Speh, 2000; Chan and Qi, 2003a).

Among the earliest authors in SC performance measurement, Beamon (1998) points out the opportunity to classify measures in qualitative and quantitative. Typical measures concerning the first one are customer satisfaction, flexibility, information and material flow integration, effective risk management and supplier performance; while distinctive indicators for the second are costs and customer responsiveness. In a subsequent work, the same author (Beamon, 1999) proposes also to distinguish measures in three dimensions: resource (distribution costs, inventory, ROI, etc.) that analyses efficiency levels, output (sales, on-time deliveries, customer complaints, etc.) that

measures business results and finally flexibility (reductions in the number of lost sales, increased customer satisfaction, etc.) which evaluates SC readiness to the dynamism of the environment. Besides, Shepherd and Gunter (2006) and Cuthberson and Piotrowicz (2008) offer interesting reviews of performance metrics in SCM literature. They produce taxonomies to categorize and organize the measures.

In addition to these studies on measures classification, literature includes also measurement models to evaluate SC performance. Some authors (Handfield and Nichols, 1999; Hines et al., 2000) suggest the BSC model, however Schmitz and Platts (2004) claim that "they deal with this issue in a rather cursory way without much consideration about possibly necessary changes to the BSC framework that have to be considered due to the differences between the intra-organisational management of companies as compared to the management of an inter-firm supply chain" (2004: 235). Also Brewer and Speh (2000, 2001) draw on the BSC model and distribute performance measures in the well-known perspectives: financial, customer, internal business and innovation and growth. But, they do not translate the corporate objectives and measures into targets and measures on lower levels, failing the full adoption of the BSC (Schmitz and Platts, 2004). Bullinger and colleagues (2002) adopt an hybrid BSC, instead. Their model considers different perspectives for the value creation process as well as three different levels of supply chain management: functional level for operating units as purchasing, manufacturing or logistics; process level for cross-functional processes as consumer product distribution; and supply chain level for inter-enterprise processes across SC. As a consequence, they propose to assign the responsibility for results to different levels of the firm.

Also Gunasekaran and colleagues (2001, 2004) recognize that diverse levels of the organization could contribute to performance objectives through different tasks. These authors propose a measurement model founded on three levels, on the basis of the ability of people to affect the results. The levels are hierarchical in nature: strategic for top management, tactical for mid-level management and operational for low level management and workers. Contrary to Bullinger and

colleagues, they give up the idea of balancing measures through perspectives, whereas they prefer to analyse the macro-processes of the firm: plan, source, make/assemble and deliver/customer.

The Supply Chain Operations Reference (SCOR) model (Supply-Chain Council, 2006) distinguishes three measurement levels as well. Top Level (level one) considers the macro-processes, divided in plan, source, make, deliver, and return or customer satisfaction. On the second level, Configuration Level, macro-processes are dismantled in processes and process-measures are defined. Finally on the Process Level (level three) activities become the focus. The SCOR seems very similar to the model by Gunasekaran and colleagues. But, in addition the SCOR model discriminates measures in five dimensions: reliability, responsiveness, flexibility, costs and assets management.

It is manifest that the above mentioned models can be categorized by different architectonic connotations. De Toni and Tonchia (2001) tell us that three types of architectures characterize PMSs: vertical architecture, hierarchical models characterized by performances on different levels of aggregation; horizontal architecture, models which are related to the value chain; balanced architecture, models considering performance from diverse perspectives. In Table 1 we report the classification by architecture of measurement models for SCM.

Table 1 – Classification by architecture of measurement models for SCM

MEASUREMENT MODEL FOR SCM	**PMS ARCHITECTURE**		
	VERTICAL ARCHITECTURE	**HORIZONTAL ARCHITECTURE**	**BALANCED ARCHITECTURE**
TRADITIONAL BSC *(Brewer and Speh, 2000, 2001)*			✓
HYBRID BSC *(Bullinger et al., 2002)*	✓		✓
LEVELS vs. PROCESSES *(Gunasekaran et al., 2001, 2004)*	✓	✓	
SCOR MODEL *(Supply-Chain Council, 2006)*	✓	✓	

Despite the just reported studies offer various cues on the subject of SC performance measurement,

many authors recognize that further research is needed. Papers on this topic are still poor (Beamon, 1999; Holmberg, 2000; Gunasekaran et al., 2001; Chan et al., 2003; Schmitz and Platts, 2004; Theeranuphattana and Tang, 2008). Studies are especially conceptual, while there is a need for empirical researches and case studies supporting the proposed concepts, techniques and models (Gunasekaran et al., 2004; Schmitz and Platts, 2004; Cuthberson and Piotrowicz, 2008). Other authors (Beamon, 1999; Chan and Qi, 2003b; Schmitz and Platts, 2004) suggest that PMS design and measures selection for SCM must also be addressed. Furthermore, we highlight the shortage of studies on models or measures for SC in service contexts. The majority of papers concerns the measurement of manufacturing supply chains and the applied measures are unlikely to be used in services.

Probably, what seems the most fascinating issue for further research is to adopt an holistic approach to SC performance measurement. Many authors report that supply chain should be viewed as one whole entity, thus also the PMS should consider the entire SC (Handfield and Nichols, 1999; Holmberg, 2000; Gunasekaran et al., 2001; Chan and Qi, 2003b). Others add that there is a need for shared models, metrics and measurement methods across the SC (Holmberg, 2000; Kleijnen and Smits, 2003; Cuthberson and Piotrowicz, 2008). For example, Hewlett-Packard introduced a new set of performance measures shared downstream with its reseller in order to establish an effective collaboration (Callioni and Billington, 2001). Thus, SC firms should have a common PMS; but this doesn't mean that the major company dictates the measures along the SC, rather that all participants should have a role in the development of the measurement system (Gunasekaran et al., 2004). The needs of every firm must be considered so that everyone takes advantage (Angerhofer and Angelides, 2006). To this purpose, it might be fair to form a mixed team with members from different companies for designing the measurement system (Chan and Qi, 2003a). Obviously sharing objectives is not sufficient, but also responsibility for results have to be shared across the SC. Performance measures should be assigned to all actors so that everybody knows where to excel and who must improve performance to reach the SC objectives and overall excellence. This

approach is pivotal to stimulate inter-company collaboration and to assess the impact of single actors on the whole SC performance. Thus, a new way of looking at supply chain performance measurement is requested. There is an opportunity to design and develop a shared PMS among the actors of supply chains (Figure 1).

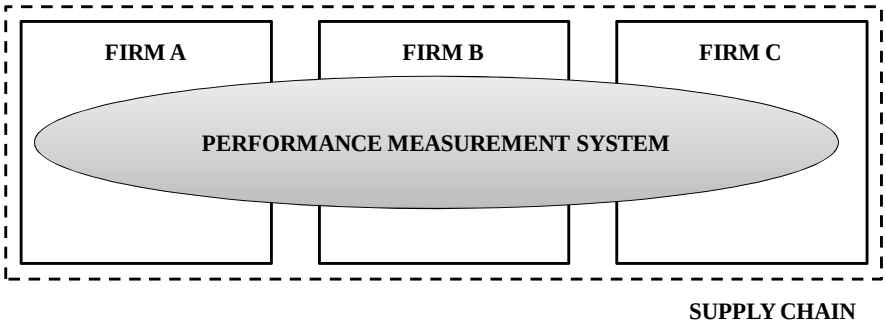


Figure 1 – Sharing PMS across the SC (Holmbert, 2000)

2.3. PMS for facility management

Performance measurement is a major topic in the literature on Facility Management (FM), referring as the profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process and technology (IFMA, 2008). A lot of studies regards the measurement of FM performance. The subject is actually the third most cited issue by FM scientific articles, following FM general and workplace management (Ventovuori et al., 2007). The rationale for its importance is that "performance measurement is really at the heart of good FM practice" (Amaratunga et al., 2000: 68). Performance measurement offers great opportunities, since it allows facility managers to control the service processes, to benchmark performance inside and outside, to identify the need for change and finally to make informed decisions (Kincaid, 1994). Other authors give a further explanation of the importance of measuring performance for FM. That is, facility managers face the challenge to prove to general management that FM contributes to the business results of firm, rather than FM is only a cost to minimize (Amaratunga and Baldry, 2003).

As regards performance measurement in FM, various authors (Tranfield and Akhlaghi, 1995;

Amaratunga et al., 2000; Brackertz and Kanley, 2002; Shaw and Haynes, 2004) agree on the myopia of traditional evaluations. They claim that facility managers often focused their attention to financial-only measures in the past. Typical examples of those measures are €/m^2 unit costs of maintenance or cleaning, occupancy cost to m^2, total revenue, total expenditure, etc. Those assessments are very restrictive because they give purely economical insights about FM performance, whereas they don't tell us anything about the value of FM for the core business or for the customer. Thus, FM researchers have begun to propose original measurement approaches in order to overcome this limit. Some authors (Brackertz and Kenley, 2002) suggest that facility managers should connect FM performance measures very closely with those indicators that top management uses to evaluate business results. Another group of researchers (Amaratunga et al., 2000; Loosemore and Hsin, 2001; Shaw and Haynes, 2004) proposes to adopt holistic approaches in which many measurement dimensions or perspectives are considered.

These demands for multi-dimensional measures have originated a new stream of publications concerning performance measurement models for FM. In this literature, the BSC has won great popularity (De Toni et al., 2007); it has been proposed as a solution to overcome financial-only measurements through diverse balancing perspectives. For example, the BSC model was applied in higher education (Coronel and Evans, 1999; Amaratunga and Baldry, 2000) and in the National Health Service (Amaratunga et al., 2002) to evaluate FM performance. Unfortunately, although BSC is mentioned in FM several times, we notice that applications of this model are still scarce.

Brackertz and Kenley (2002) propose a modified version of the BSC, the Service Balanced Scorecard (SBS), that they apply in a local government authority. Compared with the original BSC, the SBS has two news. The first one regards the balancing perspectives. The authors distinguish performance measures in: financial perspective, community/customer perspective, services perspective and building perspective. The financial perspective uses measures of costs and profits of business. The community/customer perspective comprises metrics of community access to services and level of community involvement in terms of volunteer contribution. The services perspective

measures both the quality of services provided and how services are in line with the customer's requirements. Finally, buildings' physical condition and their utilisation rate are the focus of the building perspective. But the major novelty introduced by the SBS concerns the stakeholder approach to PMS design. Indeed, the authors get the measures from the business strategy, but they also consider the needs and requirements of all stakeholders as:

- the customer management, who makes decisions about facilities and services and who is accountable to the community;
- the facilities manager, who is concerned with the coordination of services and who is accountable for the physical and financial condition of facilities;
- the service providers that manage and provide services;
- the community, the end user of the facility.

The involvement of many stakeholders in PMS design allows to have a wider look at FM objectives and to recognize diverging interests and knowledge as to what constitutes performance in FM (Brackertz and Kenley, 2002). There is a need for overcoming PMS tailored by single firms, e.g. by the service provider to measure the efficiency of its processes, by the customer to monitor the vendors and the service levels received. On the contrary, it is acknowledged that the measurement tools might offer many opportunities if they are shared among numerous stakeholders. This approach could stimulate stakeholders towards a fruitful collaboration and the attainment of mutually advantageous results. So it seems to be a fascinating issue to balance different views and involve many stakeholders to design PMS for FM (Figure 2).

3. A PMS FOR FACILITY SERVICES SUPPLY CHAIN

In order to develop a quality PMS for facility services supply chain, we believe it is be useful to collect insights into both SCM and FM perspectives of looking at performance measurement. The study of the two has pointed out some common features. We notice that in both FM and SCM literatures there is a call for a wider share of PMSs. In SCM, some authors highlight the importance

of thinking at SC as a single entity which makes use of an inter-organizational measurement system. It is hypothesized a new approach to performance measurement for SCM, that is to drop single-company PMSs and to design models, measures and measurement criteria shared across the SC. In doing so, the objectives and the needs of all companies must be considered and the PMS have not to come out into a tool of power to the major company for monitoring the others. Responsibility for results must be divided both among SC firms and inside companies. Thus, measures should reflect the ability of everybody to influence results.

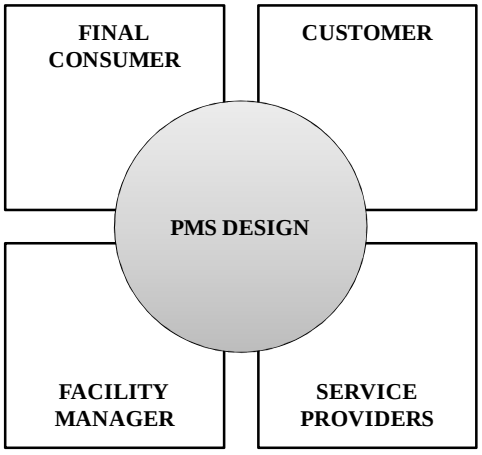


Figure 2 – Involving different actors in PMS design

Sharing the measurement system is receiving attention in literature on FM, as well. It is emphasized here the importance of involving diverse stakeholders (management, facility manager, service providers and community) in PMS design. The balance of different points of view on FM performance supports companies to found a win-win situation.

Therefore, the issue of PMS sharing has significance both in SCM and FM. Next we follow up the discussion about sharing the measurement tool across facility services supply chains. We prompt that sharing the PMS concerns four aspects, namely: 1) sharing performance objectives, 2) sharing performance measures, 3) sharing information systems and admitting to private data, 4) sharing performance results and creating a common place where to discuss service improvements. But let's

describe the framework supporting the shared PMS first. Here also we have recognized a common point between the two literatures, i.e. the BSC model.

3.1. The framework

The proposed framework for facility services supply chain founds itself on two architectures, the balanced and the vertical. Indeed, we agree with authors in FM (Amaratunga et al., 2000; Loosemore and Hsin, 2001; Shaw and Haynes, 2004) that financial-only measures offer a modest evaluation, whilst it would be more appropriate to adopt a multi-dimensional approach. In this regard, models with a balanced architecture are the best solution and the BSC is the reference model certainly. In confirmation of this, we quote the large diffusion of BSC both in practice and research and the interest it has received in SCM and FM contexts.

But we deem it is also indispensable to turn the whole SC towards the same direction in order to pursuit excellence. We consider essential to cascade down measures from strategy to different levels of SC management. Here, we agree with those authors in SCM (Gunasekaran et al., 2001; Bullinger et al., 2002; Supply-Chain Council, 2006) that distinguish the performance measures in diverse levels. Thus, models with a vertical or hierarchical architecture have also to be considered.

On the contrary, we renounce the horizontal architecture. The distinction by plan, source, make, deliver, and return/customer satisfaction processes seems very difficult. The heterogeneity of FM services (cleaning, maintenance, reception, catering, etc.) causes processes diverse by structure, as a consequence the established activities might be much different amongst services. Then, it might be hazardous to develop a common PMS if service processes are not homogeneous. Large criticalities could arise with this approach as we run the risk to separate processes depending on service distinction, thus coming to a differentiation of measures by companies and declining the idea of sharing the PMS.

Then, the proposed framework draws on the BSC model and uses different levels of measurement and responsibility. In a previous work (De Toni et al., 2007) we have developed a BSC for FM that

adopts the following points of view:

1. *Financial perspective* that looks at FM through the lens of economic gains and expenses;
2. *Final consumer/customer perspective* which evaluates FM performance from the points of view of actors receiving the services;
3. *Facilities perspective* that analyses the effectiveness and efficiency of FM services operations;
4. *Learning and growth perspective* which considers those factors necessary to manage and improve FM services provision.

Perspectives help SC firms to clarify and share the strategic objectives, which are the starting points to measures selection and improvements definition. Some objectives might be common across the SC, while others may be firm specific. Anyhow, the objectives – common or specific – should be shared among companies in order to found mutual advantageous relationships.

Three levels are provided to objectives measurement: strategic, tactical and operational. On the strategic level, measures assess if objectives have been achieved or are being achieved, but they don't communicate what to do to improve the performance. The measures of this level offer an indication about what it is actually happening without saying why it is happening. Kaplan and Norton (1996) name these measures lagging indicators as they result for past performances. Responsibility for results at the strategic level goes to senior management of companies. Indeed, these managers are accountable to stakeholders for attaining ultimate goals.

On the contrary, those measures focusing on operational performance drive the company's efforts towards the activities which allow greater improvements. These measures are leading (Kaplan and Norton, 1996) and they are generally thought to be the drivers of future performance. Leading measures people the tactical level and the operational one. The first one considers measures – connected to strategic objectives – which fall under the competence of figures managing the contract, i.e. the facility manager and who supports him in planning activities and service improvements. We stress that responsibility might be inter-organizational on this level, just as on the strategic level. Although the facility manager belongs to one company of SC, also mid-level

managers of other companies might have the task of planning service provision. These managers must collaborate each other in order to achieve the objectives, then they share the responsibility for performance results on this level.

The measure to assess activities of single companies are on the operational level, instead. The accountability for results goes to the actors which can influence service levels through operations under their sole control. The measures specify to companies where to focus improvements for achieving the strategic objectives. However, SC actors share performance results on this level because of two reasons. First, SC firms may establish a cross-evaluation that stimulates the others in search for a better performance. Second, this facilitates companies to identify synergies in order to pursuit SC excellence. Figure 3 reports a summary of the PMS for facility services supply chain.

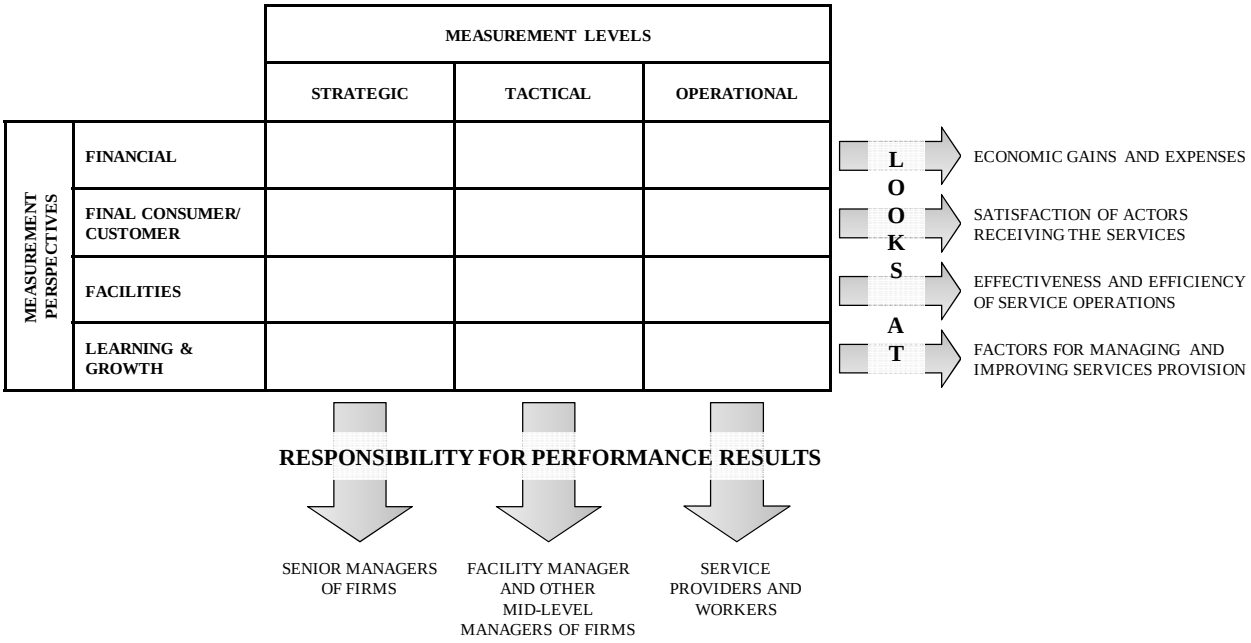


Figure 3 – The PMS for facility services supply chain

3.2. Sharing the PMS

The above mentioned framework suggests how to place performance measures along the SC and across the diverse organizational levels of companies. It recommends SC firms where

(measurement perspective) and on which level (measurement level) to intervene with improvements for attaining the ultimate goals. The framework is the basis of the shared PMS, but we stress that the pure tool sharing emerges during its implementation and utilization. In fact, the PMS sharing doesn't stop with the framework adoption, rather we believe that SC companies should also comply with the following requirements: 1) sharing performance objectives, 2) sharing performance measures, 3) sharing information systems and admitting to private data, 4) sharing performance results and creating a common place where to discuss service improvements. The reason behind these "sharing" stands in the pursuit of overall SC excellence. Reporting the words of Busi and Bititci (2006), "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" (2004: 15).

Sharing performance objectives is a main point. This does not imply only that companies have to identify common purposes – faster service provision, lower service costs, etc. – but also that every single firm submits its goals to the counterpart. On the one hand, it is prompted that partners define and manage common goals and objectives in order to start a fruitful collaboration (Busi and Bititci, 2006). But, on the other, SC partners must also explain their objectives among themselves and realize how much these are converging and diverging (Brewer and Speh, 2001). For example, in a dyadic relation the customer may look for a reduction in unit costs while at the same time the provider may pursuit higher turnover. These two objectives seem to be conflicting, but they both could be attained if contractors realize economies of scale or scope. Objectives sharing allows SC companies to start a mutual balancing of advantages and disadvantages and then to make compromises to create win-win situations (Kleijnen and Smits, 2003).

The involvement of diverse actors in measures selection is also very important to build a shared PMS. Since SC companies will have to share the measures, it would be right that firms agree upon them. So, it is better to avoid measures being chosen by one participant unilaterally, whereas SC companies should get the consensus.

The third requirement for PMS sharing relates to data feeding indicators. SC companies should

open their archives to the others and provide information needed to performance evaluation (Busi and Bititci, 2006). This does not mean admitting the access to all their own data, but favouring the collection of required information. Sharing data sets some problems, however. How do SC companies ensure completeness and integrity of data coming from different sources? Who is in charge of acquiring, selecting and processing data and spreading results? Who assumes the costs of measurement? Or how do SC firms divide costs? To overcome these problems, it is useful to employ a common Information System (IS) along the SC. In the running phase, IS collects data methodically and spreads the results to SC companies automatically. Besides, the costs of IS implementation could be divided among firms proportionally. However, the introduction of such IS in SC contexts might prove difficult and costly as companies should replace or revise their computer systems, computer software and database structures (Holmberg, 2000).

Finally, SC actors share performance results. The outcome of measurement should be placed on the "tables of the companies" so that everybody could assess its performance and monitor the others. For example, GlaxoSmithKline (GSK) uses its corporate intranet as platform where to share performance results with the suppliers. These ones can look at information, verify their contribution to common objectives and benchmark their performance with the other in every moment. Results sharing in GSK has allowed partners to understand (Romano and Danese, 2006):

- which performance has been obtained, in comparison with the other members of the network;
- what has caused such a results;
- which supplier should improve;
- how partners have succeed in satisfying the final consumer.

Another step towards the full PMS sharing is to create a common place where to discuss performance results and service improvements. SC companies meet here with the aim of arguing about service provided and the related performance levels. This is the place where participants identify and agree on service improvement opportunities, recognize synergies to put into practice and change strategic objectives in case of need (new final consumer requirements, new SC

companies needs, new technologies to adopt, etc.).

4. A CASE STUDY IN THE HEALTHCARE SECTOR

The above described shared PMS has been adopted in a case study. The considered case is the contract between Azienda Sanitaria of Trieste (ASS1, customer) and Consorzio Nazionale Servizi (CNS, provider). ASS1 is an Italian medical service authority which supplies citizens with sanitary services as rehabilitation services, health education, alcoholism and drug addiction treatment, etc. To realize these aims, it makes use of about 60 facilities (over 200.000 m^3). ASS1 contracted out facilities management to a single provider in 2003. The contract established both hard facility services (real estate register, plants and buildings maintenance, energy management) and soft ones (cleaning and sterilization, catering, laundry, logistics). CNS is responsible for managing and coordinating the facility services, but it doesn't supply services directly. In order to provide these, CNS identified five suppliers with which it has formed a consortia. Thus, a three tier supply chain is established to satisfy final consumer (Figure 4): the customer, the prime contractor and the subcontracting companies.

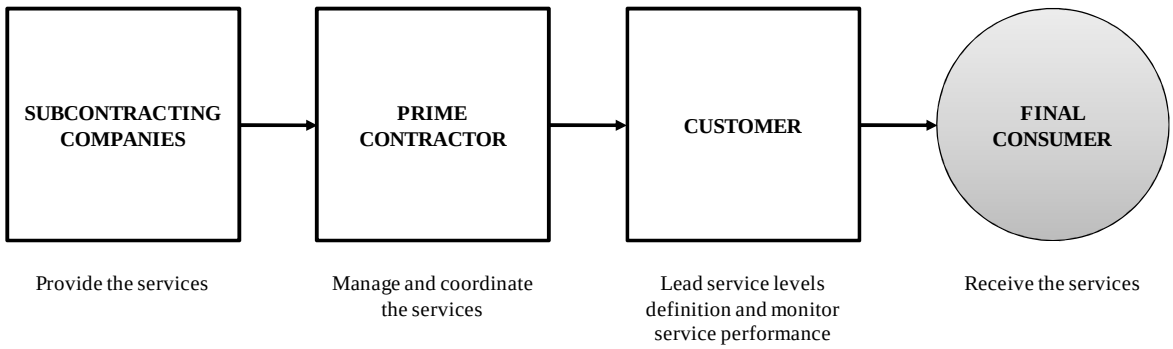


Figure 4 – The facility services supply chain

The group of stakeholders is much heterogeneous. Senior managers of all SC companies are concerned with the contract. As regards the subcontracting companies and the prime contractor, senior managers' ultimate goal is to attain high returns. On the contrary, customer senior

management has to balance reduction in expenses and satisfactory service quality to final consumer. Other major stakeholders are the foremen and workers of subcontracting companies and the facility manager of the prime contractor. Looking at the customer we find different corporate functions dealing with facilities (administration, real estate, information system, quality, purchasing, etc.), moreover nearly one hundred of ASS1 employees are placed in the facilities with the aim to monitor service provision. Finally, three typologies of final consumers receive the services: patients, ASS1 attendants and the body of citizens.

The case study proved to be suited for our research. In fact, a previous study (De Toni et al., 2007) has highlighted the lack of common information about service performance across the considered SC. This deficiency contributed to rise conflicts among companies that, as a result, caused the provision of unsatisfactory services to final consumers. Thus, we thought it right to implement the shared PMS in this case study. Moreover, Schmitz and Platts (2004) report that using a PMS for the entire SC seems to be reasonable when:

- for each company in the supply chain, this particular chain is sufficient priority;
- there are appropriate levels of trust and co-operation in the supply chain;
- processes are in place to share the profits or costs savings that come from increasing overall supply chain performance.

Except for the latter point, the first two ones are true in the considered case. Then, we though appropriate this case study for also these considerations.

4.1. Method

As a principal activity, a team in charge of the tool implementation was formed. The team included the authors, the administrative manager of the customer and the facility manager of the prime contractor. The two latter ones are the main managers in the considered SC: they both are the ultimate responsible for managing the SC and for keeping relations among the companies. The mixed team proved to be essential to assure the implementation success. Indeed, the administration

manager and facility manager stimulated SC actors to join in the tool development and in its utilization. On the contrary, researchers looked after objectives definition and measures selection with the aim of stopping unilateral decisions.

Implementation took place in the 2006-2008 period. Five activities were realized by the team: 1) it established a place where SC companies could meet, 2) it created agreement upon strategic objectives, 3) it created agreement upon performance measures, 4) it defined the mechanisms for data collection, 5) it gathered information and presented the measurement results to the SC partners.

The first step was to create a common place where the SC companies could share information about services, service levels, technical and organizational contract issues and improvement actions. The team called it Partnership Table (PT) (De Toni and Montagner, 2008) and defined a regulation to settle its structure, purposes, tasks and power (resolution n. 191/2006 by the ASS1 general manager). The firms discuss SC problems and share solutions during the PT meetings.

Next, the implementation team identified the strategic objectives. A long process was established to this aim. An early list of objectives was defined starting from FM literature and three workshops with major managers of companies (De Toni et al., 2008). Priorities of companies senior managers and mid-level managers were fixed with a questionnaire subsequently. Then, survey results were shared among companies and the list of strategic objectives were refined during two PT meetings.

Strategic objectives guided the definition of performance measures. Authors listed a set of measures gained from literature, while the administration manager and facility manager specified which data were available and which one were difficult to collect. Measures were shared with the companies that suggested limits and potential for improvements.

Finally, data were collected. Fortunately the considered SC case was already in possession of a common information system; it acted as a precious source of data in our research. The team integrated data coming from the information system with questionnaires and researches in the archives of companies.

4.2. Performance measures

Table 2 reports the strategic objectives and the related performance measures that were developed in the case study. The objective "qualifying the expenses for facility services" is peculiar to ASS1. From the financial perspective, the customer does not demand for a *lower* expenditure – which is established in the annual budget – but for a *better* expenditure, instead. That is, ASS1 wants higher service quality under the same costs.

Table 2 – The performance measures

STRATEGIC OBJECTIVES	**PERFORMANCE MEASURES**		
	STRATEGIC LEVEL	**TACTICAL LEVEL**	**OPERATIONAL LEVEL**
FINANCIAL PERSPECTIVE			
Qualifying the expenses for facility services	• Service quality/cost ratio • Buildings availability/cost ratio (for maintenance only)	• No. of initiatives for costs reduction	• Unit prices
Increasing in sales	• Sales growth (%) • Customer's share supplied	• Amount from new services • Amount from extraordinary activities	• Quantities supplied
FINAL CONSUMER/CUSTOMER PERSPECTIVE			
Increasing final consumer satisfaction	• Patients satisfied (%) • ASS1 attendants satisfied (%) • Citizens satisfied (%)	• No. of facilities having unsatisfactory results	• No. of service components having unsatisfactory results
Increasing ASS1 satisfaction	• ASS1 managers satisfied (%)	• Amount of penalties for non-performance of the contract	• No. of remainders for slow service provision
FACILITIES PERSPECTIVE			
Augmenting service quality	• Perceived service quality by ASS1 managers	• No. of initiatives for service improvement • No. of initiatives for assuring service effectiveness	• Rate of activities execution (%) • No. of service failures
Augmenting building availability	• Buildings availability	• No. of reactive maintenance per m^3 • Mean time between maintenance • No. of initiatives for maintenance improvement	• Mean repair time
LEARNING AND GROWTH PERSPECTIVE			
Augmenting problem solving capacity	• ASS1 managers satisfied by the problem solving capacity (%) • Providers managers satisfied by the problem solving capacity (%)	• Problem solving effectiveness • Problem solving quickness • No. of actors invited at the Partnership Table	• Rate of absenteeism at the Partnership Table (%)

On the other hand, the prime contractor and the subcontracting companies pursue the objectives "increasing in sales" and "raising ASS1 satisfaction". These companies search for both economic gains by the contract and customer loyalty. The remainder of the objectives are common across the

SC. All in all, the objectives are placed in the four perspectives; this kind of distribution stresses that SC companies must consider diverse performance dimensions rather than focus on financial-only measures.

The objectives are measured through three levels of indicators. On the strategic level, lag measures quantify how much the objectives are obtained. The responsible for results on this level are the customer's, prime contractors' and subcontracting companies' senior managers. These use measures to evaluate the overall performance of SC.

Tactical measures assess the contribution to goal by who manages the contract: the facility manager of the prime contractor, the administration manager of the customer and the companies mid-level managers involved in managing the facilities. These people coincide with who sits at the partnership table to plan activities, discuss problems and define service improvements.

Finally, on the operational level, measures for single companies and service teams are defined. Results lead companies and foremen where to concentrate improvement efforts. Generally, responsibility is to single providers, but "rate of absenteeism at the PT" considers also the customer.

We give an example of performance results in Figure 5. Only the objective "augmenting building availability" is reported; results responsibilities and data sources are clearly defined.

4.3. Success factors and major difficulties in the tool implementation

Next, we will mention the success factors that favoured the tool adoption and the problems that the team had to solve. As regards the success factors, the sponsorship of companies' senior managers had an essential role. Their strong will to succeed in the development of a common measurement system led ASS1, CNS and the other companies to push for the tool adoption.

Second, the established team for PMS development assured the implementation success. The presence of the customer's administration manager and the prime contractor's facility manager as members of the team induced the parties to share plans, objectives and results of the tool implementation. Moreover, they assured the admission to information that authors could not obtain

by themselves. Third, the existing information system had a strong impact on the implementation success. The continuity and constancy of data collected for the beginning of the contract allowed longitudinal benchmarking as regards some SC performance.

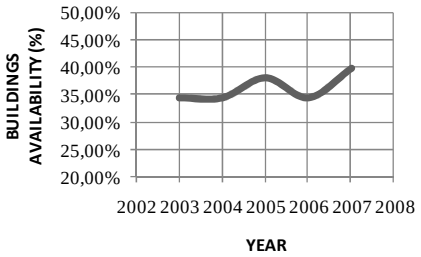
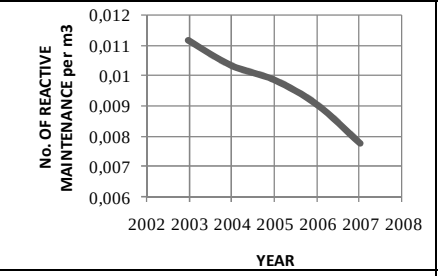
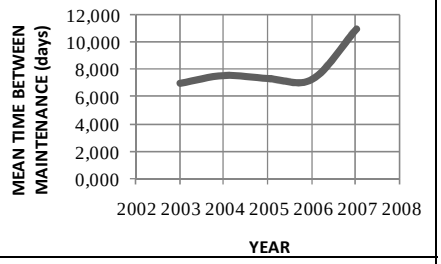
<table>
<tr><th>LEVEL</th><th>MEASURE</th><th>RESPONSIBLE</th><th>DATA SOURCE</th><th>PERFORMANCE RESULTS</th></tr>
<tr><td>STRATEGIC</td><td>Buildings availability</td><td>Customer's, prime contractor's and maintenance company's senior managers</td><td>Common information system</td><td> 
</td></tr>
<tr><td rowspan="3">TACTICAL</td><td>No. of reactive maintenance per m³</td><td>Facility manager and customer's and companies' managers supervising maintenance</td><td>Common information system</td><td> 
</td></tr>
<tr><td>Mean time between maintenance</td><td>Facility manager and customer's and companies' managers supervising maintenance</td><td>Common information system</td><td> 
</td></tr>
<tr><td>No. of initiatives for maintenances improvement</td><td>Facility manager and customer's and companies' managers supervising maintenance</td><td>Minutes of the Partnership Table</td><td>2006: 1
To develop staff of maintenance company.
2007: 1
To simplify procedures for works below 500,00€.</td></tr>
<tr><td>OPERATIONAL</td><td>Mean repair time</td><td>Foremen of maintenance teams</td><td>Common information system</td><td>
<table>
<tr><th rowspan="2">MAINTENANCE TEAMS</th><th colspan="5">Mean repair time (days)</th></tr>
<tr><th>2003</th><th>2004</th><th>2005</th><th>2006</th><th>2007</th></tr>
<tr><td>Lift attendants</td><td>5,553</td><td>2,055</td><td>0,359</td><td>4,972</td><td>0,905</td></tr>
<tr><td>Building attendants</td><td>11,660</td><td>15,426</td><td>9,389</td><td>6,500</td><td>7,667</td></tr>
<tr><td>Electricians</td><td>3,458</td><td>3,510</td><td>3,731</td><td>4,887</td><td>3,854</td></tr>
<tr><td>Smiths</td><td>4,887</td><td>4,023</td><td>4,295</td><td>5,540</td><td>4,981</td></tr>
<tr><td>Joiners</td><td>6,660</td><td>6,291</td><td>4,194</td><td>7,949</td><td>4,845</td></tr>
<tr><td>Gardener</td><td>9,125</td><td>16,731</td><td>6,364</td><td>9,545</td><td>7,292</td></tr>
<tr><td>Plumbers</td><td>2,917</td><td>4,731</td><td>4,670</td><td>5,278</td><td>3,829</td></tr>
<tr><td>Sewerage attendants</td><td>1,200</td><td>3,556</td><td>4,536</td><td>3,750</td><td>1,200</td></tr>
<tr><td>Phone attendants</td><td>3,340</td><td>2,751</td><td>2,938</td><td>2,260</td><td>2,886</td></tr>
<tr><td>Curtains attendants</td><td>6,724</td><td>3,923</td><td>7,304</td><td>7,750</td><td>6,828</td></tr>
<tr><td>Glaziers</td><td>3,311</td><td>2,406</td><td>2,600</td><td>3,459</td><td>3,345</td></tr>
</table>
</td></tr>
</table>

Figure 5 – Performance measures and results for the objective "Raising buildings availability"

On the opposite, the team had to overcome two major difficulties during the implementation. First,

it was hard to collect information about service levels because of the customer's organization complexity and the great number of facilities. For example, the final consumer satisfaction survey was much costly as it was necessary to question over 250 people placed throughout Trieste city. Second, although the information system resulted to be very useful, it could not offer all data needed to assess SC performance. Then, it was indispensable to search elsewhere for such information, that is in the archives of companies and through questionnaires. This kind of search was complicated by information dispersion so that the team had to define mechanisms for collecting data systematically. Anyway, SC companies are expanding the information system in order to enrich database and to cut down future measurement efforts.

5. CONCLUSIONS AND IMPLICATIONS

In sum, the shared PMS considers a balanced evaluation of SC performance. Measures are distributed in different perspectives (financial, customer/final consumer, facilities, learning and growth) and in diverse organizational levels (senior management, mid-level management, low-level management and workers). The tool development implicates all SC companies have a role, as they participate in PMS implementation (sharing strategic objectives and selecting measures) and in its utilization (providing data continuously and assessing everyone's contribution to objectives achievement). Thus, it is possible to coordinate and to align everyone's activities towards common or personal objectives. Such an information sharing is pivotal to realize a fruitful collaboration across SC companies and improve overall performance (Kanter, 1994; De Toni, 2007).

5.1. Contributions for practice

FM professionals suffering a lack of communication along the SC have the chance to adopt tools, as the mentioned shared PMS. The PMS allows to overcome shortage of information across SC, thus providing common news to manage and improve services.

We have discovered that the lack of common information about SC performance contributed

towards a conflicting relationship between ASS1 and the remaining companies. On the contrary, the utilization of the shared PMS reduced the gap among actors' perceptions of service levels and limited the lack of understanding among them. Indeed, the tool gave SC companies the same information to assess services performance and to define improvements. It emphasized where to improve service effectiveness and efficiency and which might be the opportunities for service development.

But the capacity of such PMS goes further. The shared PMS helps SC companies to build a strong partnership. During the development of such a system, all the firms share their own objectives. This is a main point as partners should pursue a mutual profitable exchange to create a relation that holds out long (Gunasekaran et al., 2004). Companies of the case study used the tool to get better relations as well.

We also stress that the tool might be the basis for Service Level Agreements (SLA). In the considered case the parties chose the measures "ASS1 attendants satisfied (%)" and "mean repair time" as criteria for SLA, then they defined targets to get by the end of the year.

However, professionals aiming at PMS adoption must consider that the implementation process may be very difficult. We report the problems restricting tool development in the above section. The customer's organization complexity and the high dispersion of information made data collection difficult, thus resulting in greater time and costs. On the opposite, we verify that companies and people commitment, on the same line as the existing information system, encouraged PMS implementation. Despite supply chains might be very different among them, we think these remarks could be considered by practitioners before implementing a shared PMS.

5.2. Contribution for research

This paper offers investigations on performance measurement in facility services SC. We propose a measurement model that combines major contributions in SCM and FM literatures. The study founds on the need for shared measurement systems that we discover in both literatures. SC authors

prompt to look at SC performance from an holistic perspective, that is to adopt a PMS which considers the SC as a sole entity (Handfield and Nichols, 1999; Holmberg, 2000; Gunasekaran et al., 2001; Chan and Qi, 2003b). Then, some authors (Holmberg, 2000; Kleijnen and Smits, 2003; Cuthberson and Piotrowicz, 2008) call for shared models, metrics and measurement methods across the SC. On the other hand, Brackertz and Kenley (2002) suggest to share the definition of measures with many FM stakeholders. The balancing of different points of view concerning FM performance is a necessary condition to build a win-win situation.

We judge tool sharing as the principle in our study, and we define four kinds of "sharing": 1) sharing performance objectives, 2) sharing performance measures, 3) sharing information systems and admitting to private data, 4) sharing performance results and creating a common place where to discuss service improvements. These have been performed in the case study.

The main contributions of this work is to propose a solution to the following problems with PMS for SCM (Holmberg, 2000; Chan and Qi, 2003b; Chan et al., 2003; Shepherd and Gunter, 2006):

- Lack of connection with strategy. The shared PMS assumes that strategic objectives are clearly defined from the very beginning of tool implementation. Performance measures connect objectives to the activities of SC companies and people on different levels.
- Lack of a balanced approach, that is biased focus on financial measures. The model adopts a balanced architecture that allows companies to look at SC performance from different perspectives. Only one perspective considers financial measures, while the others require diverse points of view: customer/final consumer, facilities and learning and growth.
- Lack of system thinking. The involvement of many companies in PMS design and utilization implies the measurement system span the entire SC. Companies share objectives and responsibilities in order to attain mutual benefits and overall performance.

This work makes other contributions to SCM literature. First, we add a case study as regards performance measurement for SCM. Indeed, some SC researchers (Gunasekaran et al., 2004; Cuthberson and Piotrowicz, 2008) verify that there is a lack of fieldworks and case studies on this

topic. Second, we increase knowledge about PMS design and development in supply chains. According to Beamon (1999), on the same line as Schmitz and Platts (2004), literature that deals with measurement system design and measures selection in SC is still poor. Third, we draw attention to success factors and problems in model implementation. These issues are rarely debated in literature (Shepherd and Gunter, 2006).

Our research contributes also to FM literature. Current papers about FM use a normative approach mainly, whereas there is a need for empirical researches (Ventovuori et al., 2007). Moreover some authors (Chotipanich, 2004; McLennan, 2004) guess the opportunity to borrow conceptual models, techniques and tools from other disciplines in order to develop FM theory. The main reason behind these lacks is probably that FM is an emerging area of research. However, the present study contributes to the two above mentioned calls: in fact, we borrow concepts from SCM and PMS literature in FM and, on the other hand, we offer the empirical evidence of the model usability.

5.3. Limitations and further research

Future studies in performance measurement for SCM and FM can base on insights we outline in the background section of this paper. If someone would study in depth the sharing of PMS in SC contexts, we suggest three possible research streams.

Firstly, we build the shared PMS on SCM and FM literature. The application of the model to FM sector is the main limitation of our work, but it is also the principal opportunity for further research. More studies might test the model for generalization, thus applying it to both manufacturing and other service industries.

Secondly, there is a need for further research concerning the involvement of final consumer to design the shared PMS. In our study we avoid to involve the final consumer in order to reduce system implementation complexity. We prefer to develop an early PMS starting from the needs of SC companies only. At present, the implementation team of the considered case is studying how to engage the final consumers (by some consumers' association or spokesmen) in order to adjust PMS

to their needs as well. Companies can get better information about service levels and improvements required through a major consumer involvement.

Finally, it is intriguing to further develop the tool through measures for assessing final consumers' contribution to service outcomes. According to Atkinson and colleagues (1997) a quality PMS should tell the company if it is receiving an adequate support by all the stakeholders (employees, suppliers, customers). Also Neely and colleagues (2002) state the importance of stakeholders contribution. In their model, the Performance Prism, they use a new measurement perspective to assess the performance of suppliers, customers, employees, alliances, investors, and the local community. Other authors (Lee et al., 2003) recognize that performance of the companies now depends on the performance of its partners in the value chain, in addition to the performance within the enterprise. Going further, we say that performance of the companies may depend on the performance of final consumer at times. Emerging theories on value co-creation by service customers (Pralahad and Ramaswamy, 2004; Lusch and Vargo, 2006) support this final remark. Thus, we believe the shared PMS can be further extended by evaluations of consumer contribution to value creation.

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