Chapter 3

Performance Measurement System Based on Supply Chain Operations Reference Model: Review and Proposal

Tálita Floriano dos Santos and
Maria Silene Alexandre Leite

Additional information is available at the end of the chapter

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Abstract

Current study provides a performance measurement system (PMS) based on Supply Chain Operations Reference (SCOR) adapted for the service sector. A systematic literature review was conducted on 16 performance measurement systems, which included 44 performance indicators and various performance metrics. Performance indicators and metrics were sorted according to conceptual similarities and then related to the five management processes intrinsic to SCOR model (plan, source, make, deliver and return). Indicators researched in a review of the literature were classified into six groups, namely, financial, velocity, sustainability, quality, resource utilization and customer services. The proposed PMS fills a gap in literature by forwarding a tool for the evaluation of the supply chain performance within the service sector.

Keywords: literature review, performance indicators, performance measurement system, supply chain management

1. Introduction

Although the supply chain (SC) is viewed as an extension of a company, several organizations do not evaluate any effective performance to integrate their supply chain members. The evaluation of supply chain performance is quite crucial for the company's operations since the primary aim of the supply chain is to maximize the generated overall value [1].

The evaluation of performance does not merely select but also assesses indicators to provide an appraisal of the company's situation and identify possible improvements [2]. Supply chain performance is mainly related to the functioning of the company under analysis, with special focus on its core processes interconnected to other supply chain members [3].

After the selection of a set of indicators that may be used to manage organizations, a performance measurement system (PMS) is established to assess improvement opportunities for the organization. Conceptually, the performance measurement system is defined as a set of metrics used to quantify the efficiency and effectiveness of actions [4].

Consequently, the design of an effective PMS is basic since its usability is crucial for controlling the company's operation processes [2, 5–7].

Despite the current importance given to performance measurement systems, several shortcomings are still extant, such as those related to non-financial indicators and to the behavior of organization members who fail to make the system function properly [2]. PMS is a widely discussed topic, albeit rarely defined. It may be casually defined as the process of quantifying action in which measurement comprises the process of quantification and action leading toward performance [8].

The study of performance measurement systems is challenging since it is still unclear how they enhance the effectiveness of an organization [9]. Moreover, when it comes to the service sector, there is a major gap in the supply chain field and the literature on this topic is still scarce [7, 10], similar to what happens with the evaluation of performance [11].

Service supply chain is a broad concept that encompasses companies dealing with spare parts supply, outsourcing, finance, insurance, retails and government services. Due to the service sector's several peculiarities and the gaps previously mentioned, there is a need for better understanding what exactly makes service performance measurement problematic [12].

Supply Chain Operations Reference (SCOR) is a model which supports a PMS development, since it is not only able to measure and improve the company's internal and external business processes [13], but also presents a cross-functional framework which integrates business processes re-engineering, benchmarking and performance measurement [14].

Owing to the lack of research publications related to service supply chain management (SCM) and performance measurement, the chapter structures a Performance Measurement System based on the SCOR model to assist the service sector's supply chain management, especially at the operational level. Even though specialized literature presents a framework for measuring the supply chain performance [11], there is only a dearth of studies that associate performance indicators to every process of the SCM model. Consequently, a theoretical framework on supply chain management and performance measurement system is presented foremost. Secondly, we establish the methodological procedures and the results achieved by the proposed PMS, followed by the concluding remarks on the overall topic. The chapter foregrounds the theoretical constructs developed in the dissertation by [15]. Furthermore, the literature presents a practical application of the PMS in a service company, ratifying the feasibility of the proposed PMS [16].

2. Supply chain management

The supply chain is a continuous process—ranging from the purchase of raw material up to the final product—with several functions, such as sales forecasting, purchasing, manufacturing, distribution, sales and marketing [17–19], with three major flows, namely, materials, information and money [20]. Supply chain management has represented a new frontier to obtain competitive advantages [21].

Mentzer et al. [22] define supply chain as the systemic and strategic coordination of traditional business functions and the tactics across the latter within a particular company and across businesses within the supply chain, to improve the long-term performance of individual companies and the supply chain as a whole.

Even though most of the definitions involving supply chain refer to the traditional concept (physical SC), there are some implications which differentiate physical SC from service SC. This is precisely the aim of the chapter. Ellram et al. [23] define service supply chain as the management of capacity, demand, customer relationship, supplier relationship, service delivery, cash flow and information flow. Moreover, the efficiency of a service SC depends on how to handle the items previously presented, whilst traditional SC demands more process standardization [23, 24].

Due to its dynamism, supply chain management requires mandatory decisions to improve its performance [25], framed into three categories or levels: strategic, tactical and operational. At the strategic level, it must be decided how to structure the chain, its configuration and the processes that will accompany each stage. Decisions made during this phase are also known as strategic decisions [26].

At the tactical level, planning includes decisions about which markets and locations must be supplied, the construction of inventories, outsourced manufacturing, policies of refueling and storage and frequency and size of marketing campaigns. Tactical-level measures include time efficiency of purchase order cycle, reserve procedures, quality assurance methodology and flexibility of capacity. Furthermore, the tactical level assures the achievement of specifications made at the strategic level [27].

Periodicity is weekly or daily at the operational level and during this phase firms make decisions on customers' individual orders. The supply chain settings are fixed at this phase and planning policies should be already defined. Operations aim at implementing operational policies in the best suitable way, or rather, with a reduction of uncertainty and the optimization of performance, while constraints set by configuration and by planning policies are taken into account. Measures at the operational level comprise day-to-day capacity, ability to perform failure-free deliveries and the capacity to avoid complaints [26].

Despite advances in SCM and improvement in organizational effectiveness and efficiency, some challenges still need to be coped with, among which functional integration, collaboration with suppliers and, particularly, the alignment of a performance measurement system, may be mentioned. In fact, most organizations will never achieve an effective improvement without such alignment [28].

In the case of the alignment mentioned above, the concept of supply chain integration (SCI) must be introduced. According to Flynn et al. [29], SCI is the degree of collaboration among manufacturers and their partners to achieve effectiveness and efficiency on the flow of materials and information, including money and goods. Silvestro and Lustrato [30] underscore the importance of integrating financial supply chain and physical supply chain, due to the complexity of current supply chain networks. Furthermore, the highly complex supply chain networks tend to improve their performance as long as they are integrated, corroborating the benefits of SCI [31].

Besides the SCI issue, sustainability is also the chapter's main topic. Green supply chain management (GSCM) is increasingly becoming an important strategy for the sustainable development of enterprises, since it is a sort of modern management method on environmental protection [13]. GSCM consists of social responsibility, from purchasing, manufacturing, distribution and marketing to reverse logistics [32, 33], which is an extended concept of SC [34]. Consequently, its aims toward a decrease in negative impacts, such as energy consumption, emissions and solid wastes [35].

In order to cope with such complexity, specific models are extant to assist the three management levels. According to the literature, there are two main models for managing a supply chain, namely, the Supply Chain Operations Reference (SCOR), developed by the Supply Chain Council, and the Global Supply Chain Forum (GSCF), developed by [36].

SCOR is the first reference model which has been built to describe, communicate, evaluate and identify opportunities for the improvement of work and information flow. Since the model uses standard measures for processes and activities, the former may be measured, managed, controlled and redesigned to achieve a certain purpose [37]. In the case of GSCF, it presents a more systemic view, highlighting the importance of balancing, physically aligning and managing technical aspects within the administrative management for a successful SCM [38].

The SCOR model provides a framework that relates performance metrics, processes, best practices and human labor within a single structure that enhances better communication among SC members and increases its efficiency, as well as promoting improved technology. Since the chapter aims at proposing a measurement system for service supply chain, SCOR has been preferred to GSCF due to its focus on performance metrics.

SCOR is actually more suitable for measuring service supply chain because of the relevance of human labor's impact on its performance. Since it is somewhat complicated to control human performance in service operations, the employment of a measurement system for controlling human performance will contribute significantly to service SC.

Consequently, SCOR is a useful tool to ensure, document, communicate, integrate and manage key business processes along the SC, helping companies to conduct a systematic analysis and promoting communication among members at the firms′ internal and external milieu [39].

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After foregrounding the supply chain management, that is, service supply chain and models of managing SC, it is important to investigate the concept of the performance measurement systems and their importance for the supply chain management.

3. Performance measurement system

Wong and Wong [40] discuss the importance of evaluating the supply chain's performance to achieve adequate efficiency by providing the best possible usage of combined resources among chain members and by offering products at competitive prices. Performance evaluation is thus an important tool for managing supply chains [41, 42], since organizational performance always exercises a considerable influence on the companies' activities [43].

Discussion on performance evaluation started in the late 1970s due to dissatisfaction with traditional accounting systems. Henceforth, this field of study has been developing in the literature [44], in terms of supporting its implementation and monitoring strategic levels [17], as well as identifying deficiencies and pointing toward pre-established goals [45]. Currently, the issue is widespread in the industrial and service sectors [46].

Regarding the supply chain, performance assessment has become increasingly important, especially in the manner the benefits of integration with suppliers improve performance [47, 48]. Furthermore, Cousins et al. [49] state that close contact with suppliers and customers are increasingly mentioned as a differentiating factor in the performance of supply chains. In fact, Gunasekaran et al. [50] highlight information sharing, communication and trust as being the essential factors to improve the performance of companies and integrated supply chains.

According to Gunasekaran et al. [27], although they have been in the limelight, measurement and performance metrics pertaining to the supply chain management are not receiving adequate attention in the literature due to lack of empirical findings and case studies on measures of performance metrics within the supply chain.

According to Kuo et al. [5], in general, if the measurement system is applied to distribution centers, six categories have to be considered, namely, financial, operational, quality, safety, employee and customer satisfaction. However, these categories may be generalized for several different scenarios. In addition to the criteria of cost and quality, Chan [51] insists that other performance measures may be used, such as resource utilization, flexibility, visibility, reliability and innovation. Moreover, Gunasekaran et al. [26] suggest that the performance measurement system may either be classified according to company levels (strategic, tactical and operational) or classified as financial and non-financial.

Among the researched papers (by Otto and Kotzab [52], Lohman et al. [47], Schmitz and Platts [53], Bremser and Chung [54], Folan and Browne [43], Rao [41], Giannakis [55], Bhagwat and Sharma [56], Gaiardelli et al. [57], Akyuz and Erkan [58], Naini et al. [59]), it has been noted that the Balanced Scorecard (BSC) is a state-of-the-art model, with widespread usage.

Balanced Scorecard combines financial and non-financial metrics. Objectives and metrics hail from the company's strategy and vision, focused on four perspectives, namely, finance, customer, internal business processes and learning/growth [60]. Further, Tezza et al. [61] presented 140 approaches on performance measurement systems for the 1980–2007 period and papers were divided into four classifications: corporate, supply chain, service and individual.

The following section tackles the methodology used, especially with regard to papers' selection and research on performance indicators.

4. Methodology

So that the proposed objective could be accomplished, the following steps were established: (1) definition of the theoretical conceptual framework; (2) indicators survey (compilation) and performance metrics; (3) definition of performance indicators; (4) definition of performance metrics; and (5) proposal of a PMS directed toward the service sector. **Figure 1** details all the methodological steps used in the current study.

4.1. Definition of the theoretical conceptual framework

The steps for defining the theoretical conceptual framework are (1) definition of the topic under analysis, or rather, the supply chain associated with the evaluation of performance; (2) database selection, or rather, choosing a relevant database within the academic environment; (3) selection of keywords for searching articles; (4) selection of articles in scientific journals, excluding articles from conferences and patents; (5) analysis of abstracts to identify research problem and work justification, methodology used and results; and (6) defining texts that will foreground the review of the literature.

The *Web of Science* (ISI) has been adopted for its journals' impact factor, presenting important papers in terms of their topics and being academically relevant for the purpose. In fact, this database indexes the most important literature in the world [62].

So that a systematic review of the literature could be undertaken, keywords were defined and software Endnote® was used to support the entire process. The papers were sorted according to the following keywords: Performance Measurement, Supply Chain, Supply Chain Performance, Service, Performance and Supply Chain Service. Repeated papers, books, book sections and patents were excluded and only articles from scientific journals remained, particularly from the *International Journal of Operations & Production Management*.

4.2. Indicators research and performance metrics

Based on the articles defined in the previous section, indicators and performance metrics that compose a PMS service sector were highlighted. Fourteen approaches related to performance evaluation were found, plus two relevant applications, resulting in 16 approaches, as shown in **Table 1**.

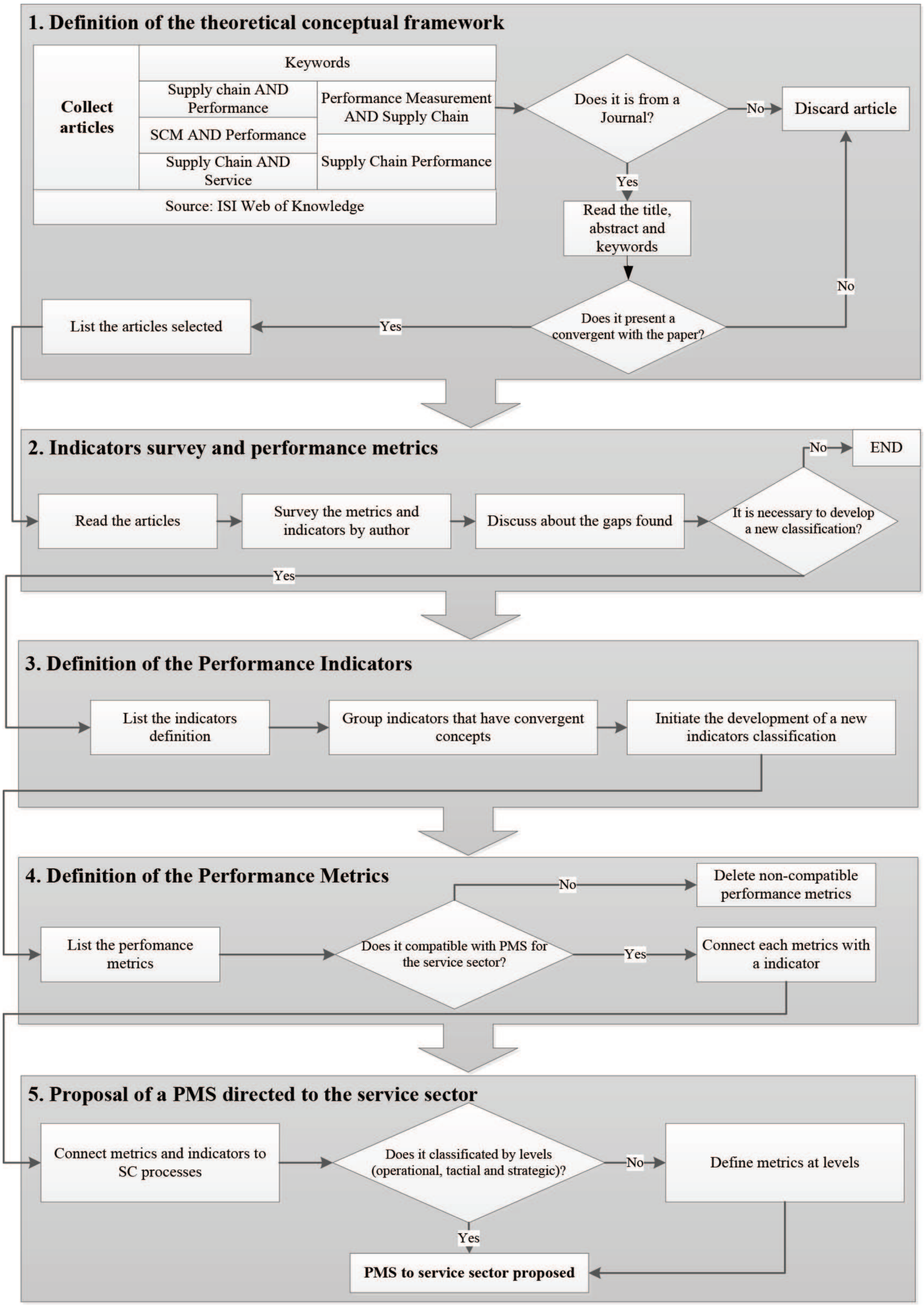

Figure 1. Methodology for a performance measurement system in a service supply chain.

4.3. Definition of the performance indicators

Indicators and metrics were defined for each basic process of the SCOR model (planning, supply, make, deliver and return) so that a PMS could be prepared. All indicators retrieved from the review of the literature were listed and separated by author. Forty-four indicators were provided. A respective concept was tagged to each indicator, according to the authors. Based on their definitions, a group was formed as **Table 1** reveals (Section 5.1).

The above step has been necessary: a PMS requires various approaches from different authors. Although these authors use different tags for the same indicators, their definitions converge and thus a grouping process is required.

A few examples may be required. Since the indicators 'Assets' and 'Sales' are somewhat related to the cash flow of the company or of the supply chain, a group tagged 'Financial' was proposed for indicators with the same relationships (cash flow).

The group 'velocity' was related to the timing of the supply chain for fulfilling market or corporate demands upstream or downstream. 'Sustainability' was related to supply chain environmental issues; 'quality' was related to the fulfillment of norms, meeting customers'

Groups	Associate indicator	Justification	Authors
Financial	Asset/asset management, sales, contribution margin, costs, financial profitability, costs of return, logistics costs	Corporate financial related to performance.	L, H, SCC, Ch, L, L, Ho, L, Bi, SG, SM, Ch, SCC, Ch, BB, C, BS, SM, S
Velocity	Punctuality, Compliance, Delivery Performance, Time, Speed, Lead time, Responsiveness, Flexibility	Measure related to supply chain timing for fulfilling market or corporate demands, upstream or downstream	SM, Pa, S, Bi, SG, H, SM, Ho, P, Bi, SSC, Ch, S, BB, B, Bi, SG, SM, Ch
Sustainability	Environmental ethics, recyclability, return of items	Related to supply chain environmental issues	SM
Quality	Reliability, quality, legal compliance, availability system, outputs, trust, service	Related to fulfillment of norms; related to meeting customers' needs	SCC, CHO, SG, SM, SM, PA, B, P, CH, H
Resources utilization	Resource utilization, inventory, transport measurements, logistics measurements, processes, internal processes, resources	Related to use of physical resources needed to serve customers	Bb, Ch, Ho, V, SM, C, BS, B
Customer services	Empathy, privacy, security, growth and learning, innovation, measurement and customization production, efficiency, tangibility.	Related to customer service itself and to the factors affecting this service	Pa, Ch, P, C, BS, BB, SG, V, Pa, Ch

Caption for 16 authors: P: Parasuraman et al. [63], S: Stewart [64], BB: Brignall and Ballatine [65], B: Beamon [66], C: Cravens et al. [67], Ho: Holmberg [68], L: Lambert and Pohlen [69], V: van Hoek [70], H: Hausman [71], Bi: Bititci et al. [72], Pa: Parasunaran et al. [73], SG: Shepherd and Günter [74], SM: Sellitto and Mendes [75], BS: Bhagwat and Sharma [56], SCC: Supply Chain Council (2010) and Ch: Cho et al. [11].

Table 1. Summary of indicators, their respective definitions and suggested indicator.

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needs; 'resource utilization' was related to the actual use of physical resources needed to serve customers; and 'costumer service' was related to the customer service itself and the factors affecting this service.

In other words, the procedure unified the indicators found in the literature. Only six groups were formed, namely: financial, quality, velocity, resource utilization, sustainability and customer service.

4.4. Definition of performance metrics

Metrics for the selected indicators were developed for performance according to the basic processes of the supply chain. The step involves the consolidation of a measurement system suited to the needs of the company's performance. These metrics were focused on the service sector, foregrounded on the review of the literature.

Similarly, all metrics/measures have been surveyed according to the review of the literature. Separated by supply chain processes (plan, source, make, deliver and return), metrics were classified according to the most appropriate indicator (defined in the previous step), based on the definition of each.

For instance, the metric "full time cash flow" was related to the indicator on the Financial Planning process, since all metrics related to the financial indicators are somehow related to costs. In fact, "total time cash flow" represents somewhat the planning of the supply chain. The above scheme was undertaken for each metric discussed.

In addition, all metrics were divided into strategic, tactical and operational levels. Some of the metrics have been classified in the work of Gunasekaran et al. [26]. Metrics with no level definition were classified and justified into each level.

Another example is the 'Inventory Costs' metric related to the Financial indicator and directed to the 'source' process. The item 'Inventory Costs' was classified at the operational level since cost information may be obtained in a shorter period of time and such information reflects what has already been planned, where operating policies have already been defined at strategic or tactical levels.

Since the main goal of the current research is the construction of a PMS at the operational level, the metrics classified at strategic and tactical levels were disregarded, and only metrics were taken into account for the operational level.

4.5. Proposal of a PMS for the service sector

Since indicators were placed in groups (defined in the previous step), the metrics were separated into each process (plan, source, make, deliver and return). Separated into processes, the metrics were classified according to the most appropriate indicator (defined in the previous step), based on the proposed definition of each indicator. Subsequently, the metrics with no definition of levels (strategic, tactical and operational) arranged in the literature were classified and justified for each level. The metrics classified at strategic and tactical levels were disregarded, that is, only metrics for the operational level were taken into account for the consolidation of PMS.

5. Proposal of a PMS directed to the service sector

This proposal includes the following sequential steps.

5.1. Research of performance indicators

Table 1 shows indicators separated by authors, their definition as stated in the literature and the basis or justification for grouping them into one of the six proposed groups (financial, velocity, sustainability, quality, utilization and customer service)

The next section discusses the construction of a system of performance measurement focused on the service sector.

5.2. Definition of a PMS for the service sector

Figure 2 presents the metrics sorted by indicators focusing on the operational level for each SCOR process. Further, five metrics were excluded—percentage of manufacturing of main product costs (F), economic order quantity (F), percentage of erroneous artifacts (Q), percentage of manufacturing orders in US dollars fulfilled within the deadline (V), percentage of manufacturing orders in units (tons, parts, etc.) within deadline (V)—due to their non-applicability to the service sector. In fact, there were mostly related to manufacturing.

Finally, **Figure 3** shows the metrics defined for the PMS according to the proposed model and to the following criteria: (F) financial, (Q) quality, (V) velocity, (U) utilization service, customer service (C) and (St) sustainability.

The article "Performance measurement system in supply chain management: application in the service sector" [16] is an application that presents a practical application of the PMS in a service company, using the Analytic hierarchy process (AHP) that indicates which metrics is more important to the supply chain in service sector.

The PMS proposed has as one of the objectives measuring the importance of processes and metrics established. For this, the Expert Choice software was used. Two research instruments were developed. The first aims at comparing the processes and the second compares performance metrics. To synthesize the processes weights, an arithmetic mean of responses between the focus-firm and suppliers was calculated resulting in the **Table 2**.

Table 2 shows that the most important process between the two firms is source. It is the process in which the focus-firm receives supplies from supplier, to supply the firm focus needs good planning of its inputs. The second most important is the plan process: the focus firm, this process consists of planning to meet the demand in convergence with the supplier; on the other hand, in the supplier it consists of planning the purchase of inputs to meet the clients, including the focus-firm.

PLAN

Finance	All metrics related to the financial indicators are related to costs, investment values and cash flow in the planning stage of the supply chain.
Quality	These metrics are related to the quality indicator, because they scale the ability to meet customer expectations, to perform the promised service in a reliable way (trust) and also measure responsiveness (outputs) and also meet the standards and legal requirements of SC operations.
Velocity	All metrics related to the velocity indicator, refer in one way or another to the estimated time required for planning, and that's why it was framed in this indicator.

SOURCE

Finance	All metrics related to the financial indicators are related to costs, investment values and cash flow in the supply process.
Quality	Metrics related to the quality indicator relate to meeting the specifications, delivery as expected, assistance provided by the supplier and the ability to solve problems of mutual form in SC.
Velocity	All metrics related to the velocity indicator refer to the time of supply in the supply chain.

MAKE

Finance	The financial indicator in the "MAKE" process is mainly related to the production costs involved in the process, and it is also related to inventory levels, where the capital of the company is tied up.
Quality	Metrics relate to Quality, as they are designed to verify the degree of customer satisfaction.
Customer Service	The metrics are related to customer service as it reflects the process of "production" of the service.
Resource Utilization	The use of resources in the process "MAKE" reflects the need for machinery, equipment and capacity utilization
Velocity	Related metrics over time, flexibility and delivery due date are placed on the speedometer.

DELIVER

Finance	The financial indicator in the process "Deliver" is related, in a general way, with logistics costs.
Quality	The metrics are related to the quality indicator since they verify the conformity of "delivering" process.
Customer Service	The metrics are related to the customer service level.
Resource Utilization	The metrics are related to how the available resources are being used and if they are used correctly.
Velocity	The metrics are related to time, flexibility and responsiveness, so were classified into the "velocity" group

RETURN

Finance	Metrics are related to costs which may affect the return process, so they were related to the financial indicator.
Quality	The quality indicator relates to the metrics as they relate to the problems that can occur during return.
Customer Service	This metric reflects the need of service systems to meet customer needs. The metrics are related to the customer service level no ato da entrega do serviço
Sustainability	The metrics are related o environmental issues in the return process, so the most appropriate indicator was "Sustainability".
Velocity	The metric is related to the time and so was classified into the "velocity" group.

Figure 2. Indicators related to SCOR processes.

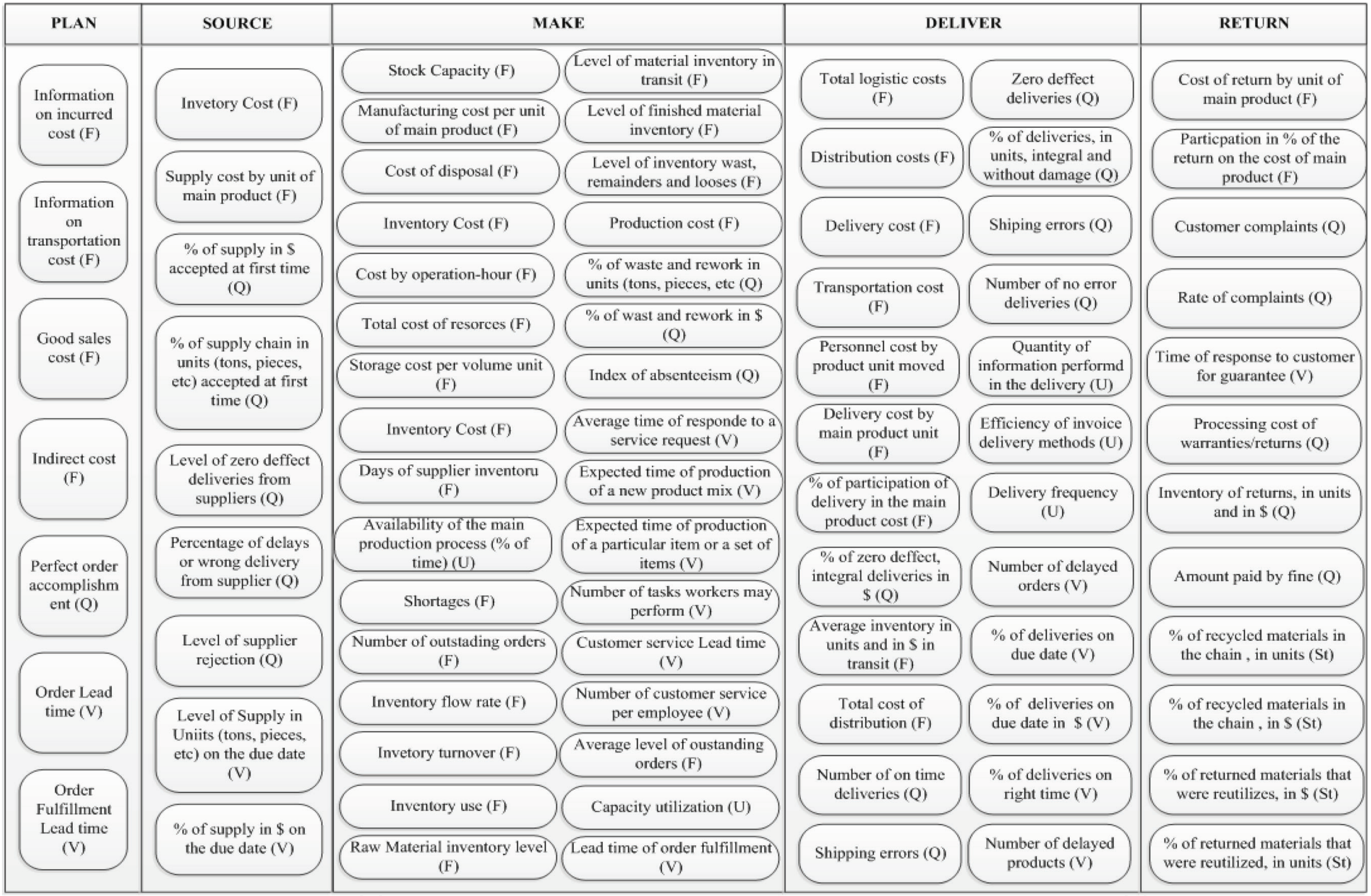

Figure 3. Performance measurement system at operational level in the service sector.

Order	Process	Degree of importance (%)
1	Source	25.29
2	Plan	21.55
3	Deliver	19.50
4	Make	17.20
5	Return	16.47
Total		100

Table 2. Mean for processes importance degree.

The third most important process between companies is delivering. In the focus firm consists of the customer contact to deliver products/services. On the other hand, in the supplier, the "delivery" process is the action of delivering the products required to the supplier firm. The fourth most important process is make, which is associated with tender care to the client in focus firm to understand its needs, while the supplier (for being an importer/distributor) consists of the charge separation step. Finally, there is the return process.

The second part of the ranking is to sort the PMS metrics. Thus, **Table 3** lists the metrics by order of the processes and in descending order by degree of importance.

According to **Table 3**, the most relevant indicator in the planning process is the fulfillment of perfect order, which indicates if what was planned to meet the demand was executed on the purchase orders, that is, if the expected was achieved, being a quality indicator with 38.5%, followed by the metrics on cost information (financial) with 32.08% and lead time order (speed) with 29.40%.

In the source process, metrics were prioritized in this order: stock costs (financial) percentage of supply in dollars on the due date (speed), percentage of deliveries in units on the due date (speed), percentage of deliveries in units accepted on the first time (quality) and percentage of deliveries in dollars accepted on the first time (quality). the stock cost is the amount one incurs to have goods in stock, involves storage costs, opportunity cost, cost of capital employed, cost of obsolescence and others. Despite being focused company and supplier of services, they need equipment to perform such services and also supplies to sell to customers.

The make process has the metrics "Average response time to a request for service" as the most important in this process, related to the speed indicator. It is related to the average time needed to answer a request from a client, after it has already been answered.

In the deliver process, the metric "Detect-free Deliveries" was listed as most important, followed by the "cost of delivery" and finally, "the number of deliveries at the right time." The metrics "Detect-free Deliveries" is related to the quality indicator and means the number of deliveries in which the product or service were delivered as expected by the client.

In the return process, the metric of customer complaint was considered the most important. This metric is an indicator of quality that can express customer satisfaction with the company.

Process	Indicator related	Metrics	Degree of importance (%)
Plan	Quality	Fulfillment of perfect order	38.50
	Financial	Cost information	32.08
	Speed	Lead time of order	29.40
Source	Financial	Stock costs	30.73
	Speed	Percentage of deliveries in dollars on the due date	25.03
	Speed	Percentage of deliveries in units (tons, parts, etc.) on the due date	19.03
	Quality	Percentage of deliveries in units (tons, parts, etc.) accepted on the first time	15.03
	Quality	Percentage of supplies in dollars accepted on the first time	10.18
Make	Speed	Average response time to a service request	31.88
	Financial	Number of pending orders	18.78
	Customer service	Number of services per employee	16.38
	Customer service	Lead time of customer service	17.28
	Financial	Production cost	15.68
Deliver	Quality	Deliveries without defects	45.05
	Financial	Delivery costs	28.15
	Quality	Number of deliveries on time	26.75
Return	Quality	Customer complaints	30.18
	Sustainability	Percentage of recycled materials returned, in units	26.53
	Speed	Response time to customer for warranty	24.08
	Sustainability	Percentage of recycled materials returned in dollars	19.20

Table 3. Summary of the degree of importance of metrics.

According to the results, it is possible to settle the most important metrics between focal company and supplier, expecting the relationship's performance to be improved.

6. Conclusion

Theoretical research on the evaluation of performance reveals that, although the topic has been researched for years, yet there is no consensus in the literature on its application. One approach on the evaluation of performance is related to the performance measurement system. Consequently, a review of the literature based on the supply chain and on the service sector was performed to elucidate this gap. performance measurement systems under analysis demonstrated lack of consensus on the topic, especially with regard to indicators. Among the 16 approaches, 44 indicators were raised, reduced to six groups on account of their definition and application, namely, financial, velocity, sustainability, quality, resource utilization and customer services.

SCOR comprises planning, supplying, making, delivering and returning. Based on a systematic review of the literature, a performance measurement system was proposed, taking into consideration the supply chain management through the basic processes identified in the SCOR model. This model was considered feasible according to [16] in terms of its practical applicability.

The theoretical contribution is related either to the unification of the existing literature based on various authors or to the performance measurement system proposed in supply chain management processes, presenting a framework of relevant indicators associated to the SCOR model. In other words, a better perspective of Supply Chain Management in the service sector through unification is suggested, in which the proposed PMS approaches the state-of-the-art in terms of supply chain performance measurement.

Among service companies, the nomenclature 'make' would not be the most appropriate. Thereby, future studies following current line of research would possibly replace the term 'make' by 'attend' or join it to the 'source' process, depending on the type of company.

As the main practical result, this chapter obtained the prioritization of the most relevant processes and metrics for clipping the SC under study. Another important result found was the separation of activities occurring in the focus firm on basic processes suggested by the SCOR model.

Based on the review of the literature and even with advances in research on performance measurement in supply chains, many companies are still immature on integration and sharing of information. Therefore, lack of collaboration between the focused firm and suppliers or between the focused firm and customers impair such relationship.

6.1. Directions for future researches

It may be suggested that, in future studies, the integration of enterprises should be observed. In fact, their relationship may be improved due to integration. The chain will turn out to be more responsive. While working with integration among members to reach a perfect order, risks involving supply chain management should be explored. Consequently, research works on SCM that measure chain risks and find ways or methodologies to lessen them are strongly suggested.

Since the relationship between suppliers should be collaborative, suppliers must be chosen not only for reasons based on costs or time, but also on their willingness to help the focused company so that both would be able to satisfy their customers in a sustainable manner.

The limitation of current research is due to the emphasis on a specific sector (service) and a validation has not been done yet. Other results for PMS may be acquired depending on companies and parts involved.

Therefore, future research work may be replicated in practical examples of supply chains so that differences, similarities and particularities of each application may be noted and, consequently, the proposed PMS may be adapted to different situations.

In addition, a PMS validation and verification should be made considering the condition of the supply chain, the particularities of the sector (service or industry), observing which processes and metrics are most important for each case.

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Author details

Tálita Floriano dos Santos[1]* and Maria Silene Alexandre Leite[2]

*Address all correspondence to: talitafloriano@pet.coppe.ufrj.br

1 Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

2 Federal University of Paraiba, João Pessoa, Brazil

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