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A framework for facilities management supply chain performance evaluation: case study of hotel buildings

FMSC
performance
evaluation
framework

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Abstract

Purpose – The performance of the facilities management supply chain (FMSC) in the hotel sector is challenged by the diverse nature of parties involved, their relationships and the flows of services and products. Although performance measurement systems have been endorsed by researchers worldwide as a mechanism to evaluate and improve performance, there seems lack of mechanisms to evaluate the FMSC performance in hotels. Hence, this paper aims to develop a framework that would enable to evaluate FMSC performance in hotels.

Design/methodology/approach – A case study strategy was used, where 3 five-star hotels in Sri Lanka were studied for the purpose. The data was collected through semi-structured interviews conducted with 21 professionals involved in FMSC and through document reviews. A content analysis was performed and the framework was developed. This was validated with 3 subject matter experts in the field.

Findings – The study findings revealed that the FMSC process is different from manufacturing and service supply chain (SC) processes as it comprises both product and service elements and incorporates internal, as well as external customers. The developed FMSC process comprises seven sub-processes as follows: delivery of products, delivery of services, sourcing, make/fulfil, delivery of FM services and products, receipt of FM services and receipt of products by customers. Based on the derived FMSC process and the key activities, 38 key performance indicators were developed and used in the framework to evaluate the performance of FMSC.

Originality/value – The developed performance evaluation framework is expected to facilitate performance measurement of the SC and enhance its performance. Further, it would enhance cooperation among FMSC partners and assist in achieving FMSC excellence.

Keywords Facilities management supply chain, Hotels, Facilities management supply chain processes, Performance evaluation

Paper type Research paper

1. Introduction

Facilities Management (FM) in a hotel refers to the process of managing built facilities and organisational assets to enhance their efficiency and thereby add value to their performance and services (Okoroh *et al.*, 2002). According to Adeyemi (2015), FM plays a major role in the hotel industry by meeting the necessities of various entities while keeping up with the competition, enhancing customer base, improving operational efficiency, maintaining a



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corporate image, upgrading the standards of the hotel and complying with new market trends, technology and government requirements. Among factors, such as life cycle costing, productivity and legislative changes that drive the implementation of FM in hotels, performance values play a prominent role (Durodola *et al.*, 2012). Moreover, to enhance the performance of hotels, the European and American industrial and commercial enterprises (including hotels) have embraced FM as a strategic management tool (Durodola *et al.*, 2012). In this context, a facilities manager in the hospitality business can play a significant role in determining the efficiency of the organisation's assets, as well as optimising the organisation's performance and the value of the services it delivers (Priyangika *et al.*, 2020).

However, Campbell and Finch (2004) questioned the ability of facilities managers to cater to multiple customer requirements in an environment with complex and dynamic requirements. Authors added on to the challenges that a facilities manager would have to meet on a day-to-day basis as matching space demand and supply; handling complications in renovation projects; coordination between outsourced and contracted services and dealing with the competing space and facilities demands of different departments. According to Vanichkobchinda (2010), the importance of managing Facilities Management Supply Chain (FMSC) emerges with the requirement of delivering a variety of services and materials among numerous parties. Yet, due to the development of alternative service options and the capabilities of service providers, complications in FMSC have increased (Pitt *et al.*, 2014). Increasing complexities of Supply Chains (SC) could eventually disrupt the relationships between SC parties due to unforeseen events (Braziotis *et al.*, 2013). Despite these complexities, hotels can only succeed by developing and providing superior value, which requires an understanding of consumers and the provision of core and relevant facilities (buildings, infrastructure and support services, for example) that are tailored to customer satisfaction (Ewurum *et al.*, 2015).

Mohd-Yusoff *et al.* (2016) stated that an effective SC performance could uplift the business performance, as well as assist in developing long-term relationships with suppliers, provide information on the company improvements, developing proper communication, and finally, lead to integration among SC members. However, many organisations have failed to reach the true potential of SC due to failure in developing performance measures and metrics by integrating the SC dimensions (Gunasekaran *et al.*, 2004). According to Akkarangoon (2010), the hotel industry specifically requires higher performance to survive in the competitive market. In such an environment, continuing the performance of FMSC is vital, and hence, a Performance Measurement System (PMS) could be used in FMSC to identify areas of underperformance and improve the hotel's overall performance.

SCPMS is one of the highly discussed topics in Research studies and many authors, such as Gunasekaran and Kobu (2007), Lima-Junior and Carpinetti (2019), Lapede (2000) and Olugu *et al.* (2011) have incorporated SC processes in developing SCPMSs as it facilitates in determining the potential key performance indicators (KPIs) that are absolutely necessary to evaluate the SC. Even though the SC process is highly referred to in the literature as a key necessity to be considered in developing PMS, the PMS for the health care sector facility services SC had used the traditional Balance Scorecard (BSC) approach (Toni and Montagner, 2009). However, the study had neither looked into the importance of FMSC processes and nor developed KPIs, which are paramount for seamless service delivery. Moreover, several PMSs have been developed for FM performance evaluation. For example, Amaratunga and Baldry (2000) developed a PMS to assess the performance of FM in higher education organisations and subsequently, for FM organisation performance evaluation (Amaratunga and Baldry, 2002). Similarly, Madritsch and Ebinger (2011) had developed a framework to assess the performance of FM functions, but not the performance of the entire

FMSC in hotels. Therefore, there exists a backdrop in the literature that prevails in terms of a framework for FMSC performance evaluations in hotels by providing due consideration to the nature of the FMSC process and KPIs. Hence, the key motive of this paper is to address the following research questions:

- RQ1. What are the sub-processes of FMSC and the respective key activities involved?
 - RQ2. What are the currently available practices in terms of different PMSs to evaluate FMSC performance?
 - RQ3. What are the KPIs that could be used to evaluate the FMSC performance?
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2. Literature review

2.1 Facilities management supply chain

The SC from the FM perspective is defined as “the system used in the delivery of services to support the business objectives of an organization” (Tucker and Pitt, 2009, p. 284). Kok *et al.* (2011) stated that FM is a coordinating mechanism that matches the demand and supply of various facility services to ensure effectiveness. In hotels, it is particularly crucial to handle their facilities well. This is because a hotel’s physical assets and atmosphere directly impact those who work in the company, and therefore, make up a large part of the sales product (Penny, 2007). Further to the author, this bundle of products involves tangible elements, such as the ground and cleanliness of the furniture and intangible elements such as the atmosphere or quality of the services. A hotel SC reflects a typical setting of a service SC as it is a network of organisations engaged in supplying different facilities and services to customers (Al-Aomar and Hussain, 2019). Without a doubt, if the quality of services and facilities of a hotel declines, demand will decline as well, causing considerable damage to a region’s tourism business (Sari and Suslu, 2018). However, issues pertaining to a service SC such as service implementation without clear service specifications, difficulty in developing service specifications, vague information and lack of professional management are common among FMSC (Nelson and Alexander, 2002). Moreover, the advanced FMSC is reflected by a network of structures as it signifies a complicated and nearly infinite number of interrelationships and variables (Pitt *et al.*, 2014). Further, this sophistication lies not only in the participation and integration of various facilities and parties in the FM function delivery process but also in the establishment of a common platform for strategic partners who share a shared vision, goal and goal for organisational sustainability (Tucker and Pitt, 2009). Hence, there is a requirement to align activities and processes of partners with strategic SC goals, which could be facilitated by supply chain performance measurement systems (SCPM) (Kurien and Qureshi, 2011). Moreover, among the SC members, SCPM will promote inter-understanding and integration, thereby making an important contribution to SCM decision-making, particularly in the re-design of business objectives, strategies and in the re-engineering of processes. According to Sari and Suslu (2018), hotels must govern their SC and manage processes that extend outside their organisational boundaries. Therefore, it is critical to track the performance of a variety of operations and manage the results using a set of metrics.

Hence, it is well understood that SCPM could play a vital role in overcoming the complexities pertaining to managing the FMSC. Yet, studies have failed to address the FMSC performance evaluation. Hence, this study would be using the existing literature on SCPM as a road map to develop a system to evaluate FMSC performance.

2.2 Supply chain performance measurement system

Maestrini *et al.* (2017) defined SCPMS as “a set of metrics used to quantify the efficiency and effectiveness of SC processes and relationships, spanning multiple organizational functions and multiple firms and enabling SC orchestration” (P. 7). The findings of Bauer (2004) revealed the existence of several KPIs (indicators that focus on the performance aspects that are more crucial for current and future success of the organisation) to measure SC performance (Bauer, 2004). Gunasekaran and Kobu (2007) carried out a review of articles published from 1995 to 2004 and offered 90 performance measures in SCM, of which, 65% were non-financial-related KPI measures while the remaining 35% was related to financial measures. KPIs recognised by Anand and Grover (2015) in their PMS are categorised under transport optimisation, information technology optimisation, inventory optimisation and resource optimisation specific to the retail sector. Moreover, Lapide (2000) had identified a plethora of indicators from different perspectives, such as manufacturing-related, customer services, purchasing-related, administrative related and process-based.

It is evident that these varieties of KPIs had been developed to suit different contexts (e.g. retail, manufacturing) and had used various categorisation, which makes it difficult for its application to other contexts such as FMSC. A similar view was provided by Chae (2009), in which the author noted that the wide range of KPIs available in the literature had made developing a PMS a daunting task. To handle the situation, the authors, such as Cai *et al.* (2009), Chae (2009) and McCormack *et al.* (2008) suggest that companies should look into KPIs, which are absolutely necessary to measure the SC process.

However, the current literature has a gap in developing KPIs which are specific to FMSC and the overabundance of indicators for generic SC had made it challenging to sieving the KPIs suitable for the FMSC context. Therefore, by applying the findings of Cai *et al.* (2009), Chae (2009) and McCormack *et al.* (2008), the authors decided to move forward with the study by considering the FMSC process for KPI development. Therefore, initially through a comprehensive review, the FMSC process was derived and a conceptual framework was designed to enable KPI identification under the main FMSC processes.

2.3 Supply chain operations reference model for performance measurement

The supply chain operations reference (SCOR) model provides a standard definition for the SC process, and it is the world's first reference model for SC management that has been accepted as a cross-industry standard (Ayyildiz and Gumus, 2021). It has been used for performance measurement ever since it was introduced in 1996 by SC Council (Kocaoğlu *et al.*, 2013; Sundarakani *et al.*, 2018). As Kocaoğlu *et al.* (2013) and Ren (2008) indicated, the model consists of the following five sub-processes:

- (1) Plan – involves the use of information generated internally and externally to balance demand and supply;
- (2) Source – includes the process of procuring goods and services required to meet the demand;
- (3) Make – the process that transforms the procured items to the final state of demand requirement;
- (4) Deliver – includes all the processes undertaken to provide the competed goods to satisfy the demand; and

- (5) Return – includes receiving of return goods from the customer and returning raw materials to the customer.

Several authors have highlighted the reasons behind the popularity of this model in the arena of performance measurement. According to [Cai et al. \(2009\)](#), the SCOR model has been widely acknowledged as a systematic technique for identifying, analysing and monitoring SC performance. It further provides a balanced performance assessment system at several levels, such as upstream, midstream and downstream. [McCormack et al. \(2008\)](#) stated that the SCOR model uses a scorecard approach for the development of performance measures. According to the author, it looks into different approaches initiating from plan to deliver and facilitate in identifying performance indicators throughout the process. [Kocaoglu et al. \(2013\)](#) further explained that the SCOR model meets the minimum requirements expected to be fulfilled by PMS through process-based activities at the executive and operational levels. It further aligns the overall business objectives while covering the performance of all SC processes in a company. The application of the SCOR model has been reported in many industries, such as tourism, ethanol and petroleum, construction, automotive, professional services and information technology ([Ntabe et al., 2015](#)). The positive attribute of SCOR had popularised its adaption in performance management literature and among various industries including hospitality.

2.4 Conceptual framework for performance evaluation

Given the significance of the SCOR model, this study adapted the SCOR model to develop the FMSC process. Based on the above review, a conceptual framework was developed to enable KPI identification for each sub-process during the empirical investigation. [Figure 1](#) depicts the conceptual framework developed based on the SCOR model.

A typical SC process comprises three distinctive levels such upstream, mid-stream and downstream ([Olugu et al., 2011](#)), as shown in [Figure 1](#). Generally, the upstream capture the process of “delivery” which refers to all aspects of suppliers. In the hotel industry, the delivery process of FMSC comprises both services and products ([Heijden, 2014](#)). Therefore, as depicted

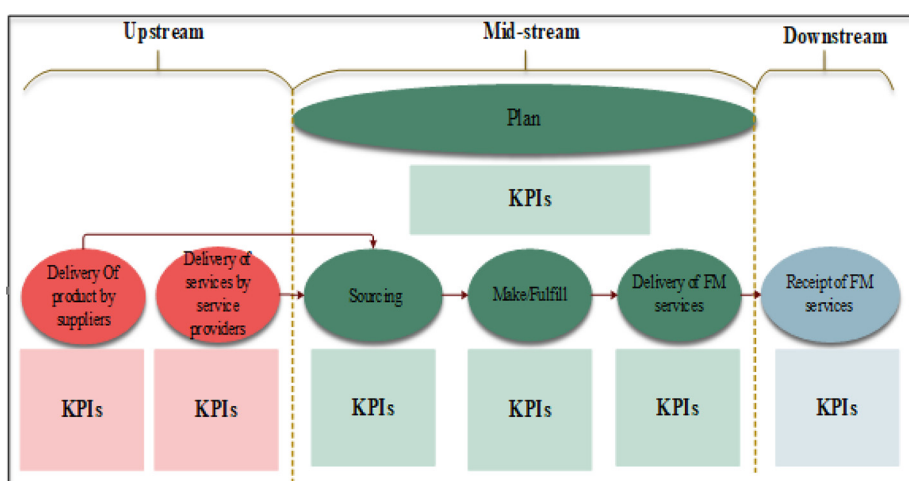


Figure 1.
Conceptual
framework of FMSC
performance
evaluation

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in Figure 1, sub-processes at upstream comprise “delivery of products” and “delivery of services” (Barnard, 2006; Heijden, 2014; Olugu *et al.*, 2011; Pasanen, 2015).

The mid-stream processes comprise all sub-processes internal to the organisation (Olugu *et al.*, 2011). Hence, in Figure 1, the sub-process “plan”, “source”, “make” and “delivery” are considered as processes internal to the organisation (Olugu *et al.*, 2011; Pasanen, 2015). According to Jones (2002), “planning” forms an integral part of FM and is not limited to the planning of cleaning services and maintenance of hotels. The decoration and redecoration of hotels entail the requirements of making flower arrangements, which imply the need for the sub-process of “make” (Jones, 2002). The sub-processes of “make” and “fulfil” correspond to product and service SC, respectively. However, in the FMSC these two sub-processes are represented by “make/fulfil”. According to Penny (2007), FM in the hotel industry is expected to fulfil many services, which include tangible elements, such as the ground and cleanliness of the furniture and intangible elements, such as the atmosphere or quality of the services. Therefore, the applicability of both “make” and “fulfil” sub-processes to the FMSC process was recognised. Subsequently, one of the core objectives of FM is to deliver effective and responsive services required to support the core business, which is hospitality (Heijden, 2014; Jones, 2002). Hence, the applicability of the sub-process “delivery” to the FMSC process was recognised. Therefore, as presented in Figure 1, the FMSC process comprises of “plan”, “source”, “make/fulfil” and “delivery” at the mid-stream.

The downstream considers all the aspects related to customers (Olugu *et al.*, 2011). As the end-user receives the FM services delivered by the FM team, the “receipt of FM services” is incorporated as a sub-process at downstream, where interactions with customers are maintained (Heijden, 2014).

3. Research methodology

A qualitative approach was adopted to explore in-depth insights about the FMSC process and KPIs that can be used for evaluating the performance of FMSC. Within this qualitative approach, a case study design was used, where three five-star rated hotels were selected and data collection was carried out using semi-structured interviews and document review.

The study was undertaken in five-star hotels as currently, the country has a high concentration of five-star rated establishments and the number of rooms available for accommodation in five-star hotels is higher than that of any other category of hotels in Sri Lanka (Sri Lanka Tourism Development Authority [SLTDA], 2018). This entails the existence of complex FM functions and facilities, which directly impact on providing an appealing service to customers. Hence, ensuring the seamlessness of FM service provision is mandatory to maintain performances at higher standards, which, in turn, requires a precise FMSC PMS for continuous performance monitoring, evaluation and feedback provision. Therefore, the study was based on three five-star hotels, which include major FM-related functions and complex facilities. The study is limited to three case studies where the number was supported by data saturation (Table 1).

Within these three hotels, interviews were conducted among a sample of 21 professionals (seven from each hotel) who specialised in FM-related functions and other disciplines, representing the entire FMSC. Participants were mainly selected to represent the core disciplines of FM within a hotel covering engineering, housekeeping, safety, security and transport functions. In addition, participants representing other main functions of the hotel were chosen to clearly define the interactions between FM-related disciplines and other core functions during daily operations. The demographic profiles based on the functions and experiences of the participants are shown in Figure 2.

FMSC performance evaluation framework

Criteria	Hotel A	Hotel B	Hotel C
Primary facilities	<ul style="list-style-type: none"> • 466 luxurious rooms • 41 serviced apartments 	<ul style="list-style-type: none"> • 229 luxurious rooms • 7 suites 	<ul style="list-style-type: none"> • 176 luxury apartments • 12 executive rooms
<i>Other facilities</i>			
• Restaurants and bar	✓	✓	✓
• Conference rooms	✓	✓	✓
• Banquet halls	✓	✓	✓
• Parking	✓	✓	✓
• Swimming pools	✓	✓	✓
• Laundry	✓	✓	✓
• Spa	✓	✓	✓
<i>FM functions performed</i>			
• Operation and maintenance	✓	✓	✓
• Housekeeping	✓	✓	✓
• Health and safety	✓	✓	✓
• Security and transport	✓	✓	✓
Number of employees	400	370	350
Standard compliance	BOI requirements	BOI requirements	BOI requirements

Table 1. Profile of the cases considered for the study

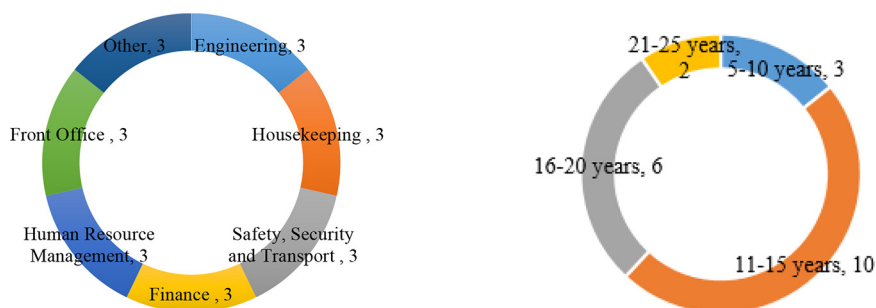


Figure 2. Demographic profiles of participants: functions performed and experience

During the data collection, the respondents were requested to provide answers to the below questions:

- What are the current practices followed in terms of FMSC performance measurement?
- What are the main interactions between FM-related functions and non-FM functions?
- What are the SC activities performed?
- What are the main SC processes?
- Who are the parties and organisations involved along with the SC?
- What are the KPIs that could be used to measure the performance of key activities under the FMSC process?

The conceptual framework was used to assist the participants in determining the suitability of the identified sub-processes based on the SCOR model and to propose KPIs which can be used to evaluate the SC performance. To increase the reliability and to ensure unbiasedness, the interviews were reordered and notes were taken. Views collected from the participants

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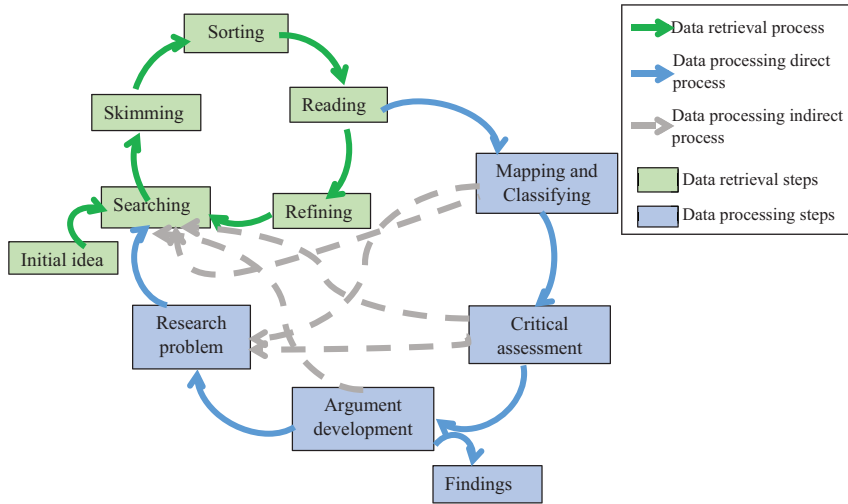


Figure 3.
Procedure for
document review

were analysed manually using content analysis. At the first stage of the content analysis, all data to be analysed were separately pre-processed. At the second stage, child nodes were created based on primary and secondary data and the frequency of occurrence was determined. Next, the coded data were assessed to ensure consistency. At the final stage, inferences were drawn based on the codes generated, through which relationships and undercover patterns were identified.

To support the study and to understand the current practices in terms of evaluating FMSC performance well, documents, such as financial reports, sustainability reports, sourcing policies, suppliers' code of conduct and complaint handling procedures were reviewed. The procedure followed in the document review is presented in [Figure 3](#).

The document review process consists of main two processes i.e. data retrieval and data processing. Green colour boxes present the steps involved in data retrieval. During, documents were searched, scanned, sorted, read and refined related to the initial idea and research question. The green arrows present the interconnection between these activities during the data retrieval process. Blue colour boxes present the steps involved in the data processing. During data processing, the information was mapped and classified, critically assessed and arguments were developed to arrive at the findings. The direct interconnection between the activities during this process is presented in blue arrows. However, this process is iterative, hence, comprises indirect relationships which are presented by ash-coloured arrows.

Based on the interviews and document review, the framework to evaluate FMSC performance was developed and subsequently validated and refined by three subject matter experts (SMEs) who represented three similar kinds of hotels of the case study buildings. The profile of the experts is presented in [Table 2](#).

4. Research findings

4.1 Facilities management supply chain process

As the primary step in developing the framework, the FMSC process was to be determined. The participants were presented with the conceptual framework and inquired on the

Table 2.
Profile of SMEs

Position of SMEs	Experience	Role
Chief Engineer	15 years	<ul style="list-style-type: none"> Experienced in all FM functions Track record for maintaining process efficiency and effectiveness on service provision
Deputy General Manager Engineering	20 years	<ul style="list-style-type: none"> Experienced in all FM functions Expert in managing supplier relationships and requirements necessary for a monitoring system to track supplier performance Involved in enhancing customer satisfaction through process improvements
General Manager Engineering	23 years	<ul style="list-style-type: none"> Experienced in all FM functions Involved in maintaining and enhancing the performance of the service delivery process

appropriateness of the identified sub-processes. In addition, the key activities involved in each sub-process were explored. Table 3 includes the sub-processes and the respective key activities. A graphical representation of the overall FMSC is given in Figure 4.

As expressed by the participants, the FMSC process consisted of seven sub-processes. According to the conceptual framework (refer to Figure 1), the processes identified through the literature review were further refined and all the participants from FM functional units agreed that the FMSC process comprises of delivery of products, delivery of services, source, make/fulfil, delivery of FM services and products, receipt of FM services and receipt of

Table 3.
FMSC process

FMSC process	Key activities	Views (Frequency out of 21)
1. Delivery of products	<ul style="list-style-type: none"> Delivery of products ordered 	21
2. Delivery of services	<ul style="list-style-type: none"> Carry out maintenance and repairs by service providers Provision of security service 	5 6
3. Source	<ul style="list-style-type: none"> Planning for service and product requirement Evaluate suppliers/service providers Supplier/service providers selection Renew service agreements and building service certificates Procure spare parts and chemicals Purchase and install energy-efficient and water-efficient equipment and system 	18 21 21 2 9 3
4. Make/fulfil	<ul style="list-style-type: none"> Planning resource requirements Supportive services provided by other departments to deliver FM services <ul style="list-style-type: none"> Provision of employees by HR Allocation of funds Carrying out internal audits Data sharing by other departments Requests made by other departments on FM services 	21 21 21
5. Delivery of FM services and products	<ul style="list-style-type: none"> Planning the process of delivery Provision of FM service Provision of amenities 	9 9 9
6. Receipt of FM services	<ul style="list-style-type: none"> Informing and provision service requirements 	11
7. Receipt of products	<ul style="list-style-type: none"> Informing and provision product requirements 	10

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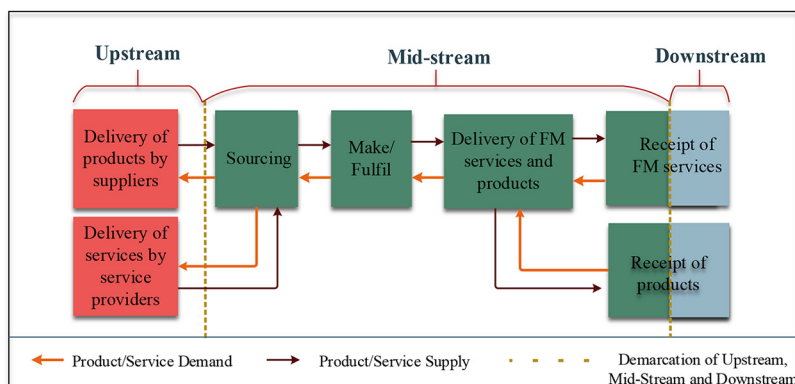


Figure 4.
FMSC process

products. By integrating the views of participants, the overall FMSC process was developed as presented in Figure 4. A detailed explanation of each sub-process is provided below.

Delivery of Products by Suppliers and Services by Service Providers: Participants representing engineering, housekeeping and health, safety and security (9 out of 21) departments of the three hotels agreed that delivery of products and services by suppliers happen at the upstream level of the FMSC process. Manufacturers and suppliers of machinery and equipment, building services, chemicals, spare parts, laundry chemicals and cleaning materials, security providers, suppliers of flower and room amenities engage during the process. While these 9 respondents provided their opinion in specific to FM, the rest of the respondents (11/21) agreed that general delivery of products and services occur in upstream of the process.

Sourcing: Almost two-thirds of the participants expressed that sourcing involves all the processes undertaken to purchase products and services. It was identified that purchasing division and stores as the main parties engaged in sourcing. At this process, most of the participants (15 out of 21) agreed that formal relationships among suppliers exist with purchasing division as contracts and agreements are formed between the suppliers and purchasing division as the following statement illustrates:

[...] we are required to follow the formal procedures in developing agreements between suppliers and service providers and we are the formal point of contact (Hotel A, Finance Manager).

Participants from FM functional units stressed that informal relationships exist among suppliers and FM functional units due to the necessity of maintaining communication between the parties. Therefore, it is evident that during the process of sourcing, formal and informal relationships are created between the parties.

Make/fulfil: The participants from finance-related disciplines of all three hotels expressed that once the product or service is received from the supplier, at certain instances the procured item should be converted to deliverable form to meet the demand requirements. The majority of participants from the FM functional units (7 out of 9) agreed with such a view. For example, a participant from housekeeping stated:

[...] we have to do decorations, flower arrangements and plantings according to the requirements specified by the organisation. Here, we would be purchasing required products separately but in a hotel, we will be combining them to meet final requirements (Hotel C, Housekeeping Manager).

Therefore, the applicability of make as a sub-process in the FMSC process was determined. However, all three participants from engineering disciplines stated that fulfilling service requirements form a major part of FM. With this regard, a participant from the engineering discipline stated:

[. . .] when a requirement rises such as in a case of uncomfortable lighting levels, the FM team should fulfil the customer expectations by providing adequate lighting levels (Hotel A, Chief Engineer).

Therefore, it can be concluded that both make and fulfil sub-processes form part of the FMSC process. Engineering, housekeeping and health, safety and security functional units were identified as the main parties involved in this stage.

Delivery of FM Services and Products to Internal and External Customers: According to the participants from FM functional units, the products and services requested by internal customers and guests, should be delivered to requested parties. However, when carrying out the delivery process, all the guest requirements are to be met through the front office, where formal relationships are created. A participant of the engineering division from Hotel C stated:

[. . .] even when internal divisions' requirements are met the most acute practice is to contact engineering department through the front office as it would enable them to maintain official records. However, this is not practiced to greater extent currently.

All participants (3 out of 21) while agreeing with the above opinion further pointed out that in many instances, informal relationships are created with guests and housekeeping staff due to familiarity and easiness in making a complaint, thereby the formal route of lodging complaints are neglected. In terms of the parties involved during the process, participants representing FM functional units, finance, human resources (HR), the front office had a common opinion that in delivering customer requirements the support of core business and other functional divisions are required.

Receipt of FM Services and Products: All the participants expressed that once the service is delivered, it would be received by internal departments and external customers. It was revealed that at this stage, amenities provided for office areas are to be used by internal departments while amenities in the common area and guest rooms are to be used by the guests. Participants from all the hotels agreed that this process is crucial as it has direct contact with customers.

4.2 Current practices of facilities management supply chain performance evaluation

The second research question intended to be addressed by the study was What are the currently available practices in terms of different PMSs to evaluate FMSC performance? While addressing the question it was revealed that a lack of a well-developed and precise framework for FMSC performance evaluation exists in the case study organisations. According to the participants from hotels A, B and C, the indicators; the number of jobs received, number of repeated jobs, number of pending jobs, the time allowed to rectify, time taken to rectify, timed out and negative comments generated in social media are tracked through four main systems, which are compliant monitoring systems, system to monitor performance of staff, job card system and system for guest feedback. Further, document reviews into case study buildings indicated that PMSs, such as BSC, Benchmarking and Questionnaire are practised to evaluate business performance. However, these systems fail to assess the overall performance of FMSC, and hence, several key components and requirements, such as the FMSC processes and key activities were lacking.

A benchmarking process was evident in all three hotels, in which certain indicators related to engineering (e.g. quality improvement, fire life safety, engineering compliance,

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talent development, environmental initiatives), security (e.g. security compliance, talent development, colleague engagement) and housekeeping (e.g. hotel market share, hotel financial results, quality improvements, colleague engagement, environmental initiatives) were identified. Though these indicators did not focus on the entire FMSC, certain indicators, such as quality, compliance and colleague engagement could be considered as indicators targeting the internal SC process. The supplier code of conduct and sourcing policies maintained by the case study organisations provided evidence on criteria based on which supplier selection is carried out. However, these are not monitored as KPIs of the FMSC but are considered as criteria for supplier selection. Nonetheless, carrying out such evaluations on time and having track of the policy requirement breached and met could be considered as a key indicator to assess a key component in the sourcing process. The availability of BSC to measure performance was identified during the document review process in hotel C. However, the BSC fails to focus on FMSC.

Overall, all the participants highlighted the necessity of having a specific framework to evaluate FMSC performance. Participants indicated that FM functions in hotels have a direct impact in ensuring customer satisfaction on overall hospitality received. Therefore, it is mandatory to have a defined set of KPIs to measure the performance of the overall process as it will facilitate in identifying areas of poor performance. To develop such a system, it is mandatory to ensure that crucial aspects of FMSC are covered and the developed indicators are critical for FMSC performance. The upcoming section addresses such concerns.

4.3 Proposed framework to evaluate facilities management supply chain performance

The third research question addressed by the study was; what are the KPIs that could be used to evaluate the FMSC performance? To address this question, the study initially developed a conceptual framework representing the FMSC process. During the empirical investigation, the process was revised in accordance with the main activities and interactions identified by the participants. The revised FMSC process along with key activities are presented in Section 4.1. Subsequently, participants were requested to propose KPIs for the key activities identified under the processes. [Table 4](#) presents the summarised version of the KPIs identified under each process.

At the upstream level of the FMSC process, products and services are being delivered by the suppliers and service providers to carry out FM functions. To measure the sub-process “product delivery by suppliers”, seven (07) KPIs were identified in relation to the main FMSC activities under the process. To provide FM services to internal and external customers, the need for outsourced services and consultation requirements arise. Therefore, four (04) KPIs for the sub-process “delivery of services by service providers” were proposed by the participants to monitor the performance of the process.

In the case of the sub-process “source”, six (06) key activities and six (06) KPIs were determined. The study findings revealed that FM functional units should engage in the sub-processes of “make/delivery”. Thus, to monitor the sub-process, eight (08) KPIs were derived. Following the process, the product or service would be delivered to internal and external customers. Hence, six (06) KPIs for the purpose of measuring the efficiency of the process “delivery of FM services and products” were identified.

Once the product or service is delivered, the product or service will be received by internal and external customers. Intending to measure the performance of sub-process, “receipt of FM services”, KPIs such as time taken to rectify the issue is within the allowed period, a number of complaints on the quality of service provided, cleanliness and environmental comfort were revealed. According to the chief engineer from hotel A:

FMSC
performance
evaluation
framework

Process	Key activities	KPIs	Frequency
Delivery of products by suppliers	<ul style="list-style-type: none"> • Delivery of products ordered 	• Number of quality products delivered	21
		• Temperature control during transportation	18
		• Number of urgent deliveries refused	18
		• Ontime delivery	18
		• Meeting specification requirements	17
		• Number of damaged free delivery of supplies	17
		• Number of products-returned	17
		• Number of services delivered on time	21
Delivery of services by service providers	<ul style="list-style-type: none"> • Provision of security service • Carry out maintenance and repairs by service providers 	• Effectiveness of service provided until next service period	20
		• Reliability of maintenance and security of service providers	20
		• Consistency of service provided	19
		• Requirements under supplier evaluation criteria breached by suppliers	18
Source	<ul style="list-style-type: none"> • Planning for service and product requirement • Evaluate suppliers • Supplier selection • Renew service agreements and building service certificates • Procure spare parts, products and chemicals • Purchase and install energy-efficient and water-efficient equipment and systems 	• Requirements under supplier evaluation criteria met by suppliers	18
		• Availability of agreements with service providers	17
		• Transparency of supplier selection process	15
		• Reliable communication and coordination between suppliers and departments	15
		• Forecast accuracy	20
		• Inventory planning accuracy	21
		• Number of available competent technicians	19
Make/fulfil	<ul style="list-style-type: none"> • Planning resource requirements • Supportive services provided by other departments to deliver FM services <ul style="list-style-type: none"> ◦ <i>Provision of employees by HR</i> ◦ <i>Allocation of funds</i> ◦ <i>Carrying out internal audits</i> ◦ <i>Data sharing by other departments</i> • Requests made by other departments on FM services 	• Labour efficiency	19
		• Sufficient budgetary allocation	17
		• Rate of return	15
		• Accuracy of audit investigating and compliances	15
		• Accuracy of information shared	14
		• On time provision of information	14

(continued)

Table 4.
KPIs to evaluate
FMSC performance

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Process	Key activities	KPIs	Frequency
Delivery of FM services and products	<ul style="list-style-type: none"> • Planning the process of delivery • Provision of FM service • Provision of room amenities 	• Responsiveness of FM functional units	18
		• Time taken to rectify service requirements	18
		• Number of repeated jobs	18
		• Degree of integration of IT system for complaints handling	15
		• Appropriate behaviour and attire from FM functional units	13
Receipt of FM services	<ul style="list-style-type: none"> • Informing and provision of service requirements 	• Nature of tangibles	12
		• On time delivery of service requirements	20
		• Number of complaints on quality of service provided	20
		• Cleanliness	18
Receipt of products	<ul style="list-style-type: none"> • Informing and provision of product requirements 	• Environmental comfort	13
		• On time delivery of room amenities	20
		• Availability of amenities in common area and office area	19
		• Number of complaints on quality of products	19

Table 4.

[...] facility manager should focus on satisfying both internal and external customers. However, a higher priority should be given to guest as hospitality industry depends on guest income.

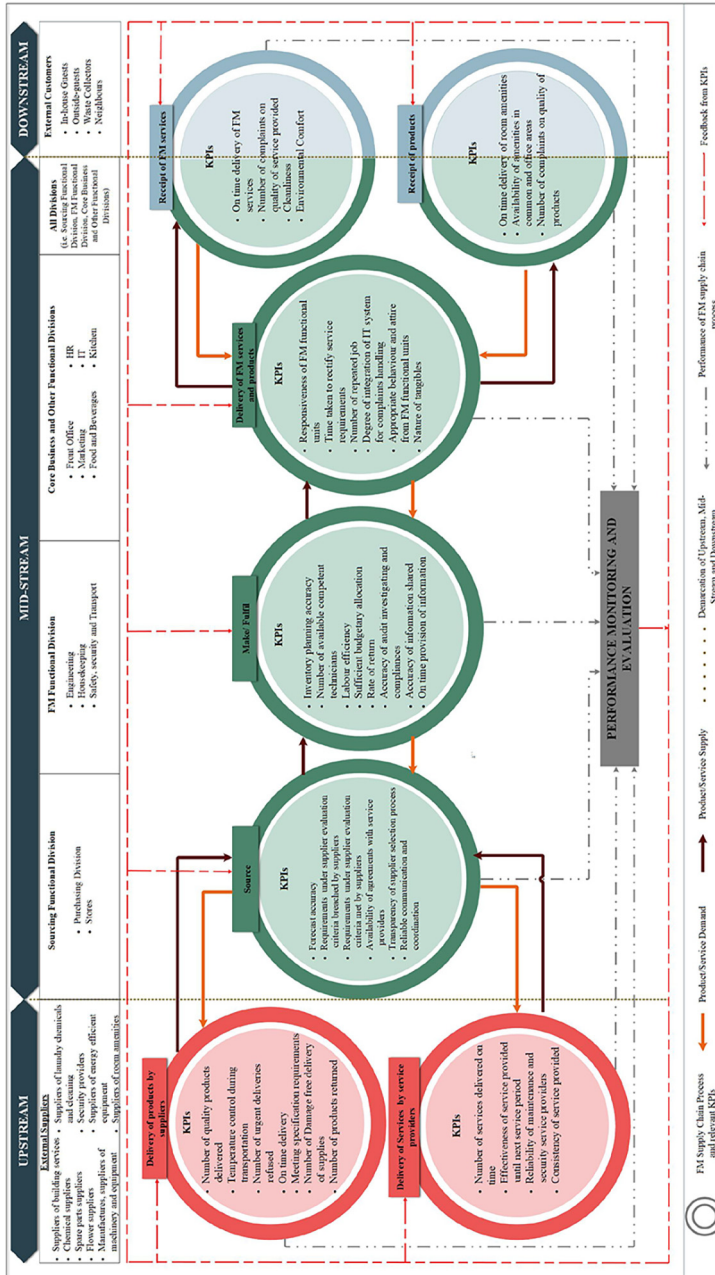
To evaluate the performance of the sub-process, “receipt of products”, KPIs, such as on-time delivery of room amenities, availability of amenities in the common area and office area and the number of complaints of quality of products were proposed by the respondents.

KPIs developed in the study have been initially identified against the key activities involved in the sub-process. Therefore, KPIs have been identified for every crucial activity by eliminating room for ignorance of critical activities and sub-processes. Through this process, the validity of the generated KPIs is confirmed, ensuring the reliability and accuracy of the results generated.

Finally, by incorporating all findings, the overall FMSC performance evaluation framework was developed and presented in [Figure 5](#).

The empirical investigation of the study led to the development of the conceptual framework (refer to [Figure 1](#)) into the final robust framework for FMSC performance evaluation (refer to [Figure 5](#)). [Figure 5](#) is an amalgamation of findings presented in Section 4.1 ([Table 3](#), [Figure 4](#)) and Section 4.3 ([Table 4](#)).

As evidenced in [Figure 5](#), the FMSC performance evaluation framework comprises of three sets of metrics where the set of metrics at upstream targets to measure the process, relationship and activities undertaken with external suppliers using a set of KPIs developed to measure the service and product delivery from the supplier’s end. Similarly, the mid-stream and down-stream incorporate KPIs to measure the performance of the internal SC process, relationships and activities undertaken with internal FM units and non-FM units and the process elements of receipt of FM services and products, respectively. The product/



FMSC performance evaluation framework

Figure 5. FMSC performance evaluation framework

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service demand and supply arrows in [Figure 5](#) present the flow of demand and supply between the sub-processes of the FMSC process. The set of metrics developed at mid-stream targets to measure the internal SC process, relationship and activities undertaken with internal FM units and non-FM units. The set of metrics has been developed by incorporating KPIs under the process elements of receipt of FM services and receipt of products.

5. Discussions

According to study findings, the FMSC process comprises seven (07) sub-processes, namely, delivery of products by suppliers, delivery of services by service providers, source, make/fulfil, delivery of FM services and products, receipt of FM services and receipt of products. However, previous studies ([Gunasekaran and Kobu, 2007](#); [Lapide \(2000\)](#) and [Olugu *et al.* \(2011\)](#)) had widely used the SCOR model, which includes a plan, source, make and delivery processes in SC performance evaluation. These processes explicitly focussed on the manufacturing environment. Therefore, authors, such as [Barnard \(2006\)](#) and [Weyers \(2017\)](#) had altered the manufacturing SC process to match the service SC requirements by introducing “request” and “fulfil” in place of “source” and “make”. While the mainstream literature had few disparities and arguments on such change to the process, the current study identified FMSC process comprises of delivery of products by suppliers, delivery of services by service providers, source, make/fulfil, delivery of FM services and products, receipt of FM services and receipt of product. In this study, planning was not identified as a separate sub-process but considered under source, make/fulfil and delivery. As FMSC involves both transferring procured items to meet customer requirements through the process make and fulfilling customers’ service requirements through fulfil, the sub-processes of make and fulfil were integrated and included in the FMSC process. Initially, the literature revealed that the sub-process of make is applicable to the product SC process and the sub-process of fulfil was replaced in the place of make in service SC process. However, in the FMSC process, both the terms were used due to the applicability in FMSC. Further, several other sub-processes, which are paramount to measure performance from supplier and customer ends were incorporated in the FMSC process. Therefore, at upstream, the two additional sub-processes incorporated into the FMSC process were product delivery and service delivery. In FMSC, the customer base is formed by internal customers (internal employees) and external customers. Therefore, the receipt of FM service and products added to the FMSC process is shared between mid-stream and downstream.

With respect to current practices followed in evaluating the FMSC performance, the study revealed that currently there is a lack of a framework to evaluate FMSC performance in Sri Lankan hotels. In this context, studies were carried out by [Cai *et al.* \(2009\)](#), [Chae \(2009\)](#) and [McCormack *et al.* \(2008\)](#) suggest that when measuring SC performance measurement, companies should look into indicators, which are absolutely necessary to measure the SC process. The study findings agree with such opinion and the framework developed to evaluate the performance of FMSC of hotels has considered the FMSC process. Although [Toni and Montagner \(2009\)](#) had made an effort in developing a PMS for facility service SC, the study failed to consider the overall FM domain but concentrated towards facility service and did not identify KPIs under the developed PMS. Hence, the current study developed a framework which incorporates KPIs to evaluate overall FMSC performance in hotels.

Even though KPIs to measure overall FMSC performance were not available in the literature, the applicability of several indicators developed for product SC and service SC to FMSC was witnessed. Such indicators include rate of return on investment, delivery speed, specification, information technique level, information accuracy, on-time information, number of complaints, service delivery time and forecast accuracy developed by [Chae](#)

(2009), Cho *et al.* (2012), Gong and Yan (2015). However, the developed framework to evaluate FMSC performance in hotels by this study incorporates 38 KPIs, developed specifically to suit the key activities under the key processes of FMSC by giving due consideration to process, activities and relationships developed between the parties.

6. Conclusions and recommendations

Developing a framework to evaluate FMSC performance is considered vital to ensure continuous service delivery to meet end-customer requirements. In an effort made to develop a framework for FMSC performance evaluation, the study identified the importance of determining the FMSC process to derive the KPIs. The study findings revealed that the FMSC process is distinctive from manufacturing and service SC processes as FMSC comprises both products and service elements. Unlike in a product only and service only SC process, the current study determined that the FMSC process incorporates customers internal to hotels and external to hotels. Hence, the sub-process receipts of products and services are shared between mid-stream and downstream of FMSC. Finally, based on the developed FMSC process and the activities incepted under the process the study identified KPIs to evaluate the performance of FMSC. Overall, 38 KPIs were identified through the study to evaluate delivery of products by suppliers (07), delivery of services by service providers (04), source (06), make/fulfil (08), delivery of FM services and products (06), receipt of FM services (04) and receipt of product (03). The study findings would make several contributions to both theory and practice.

The research adds to knowledge by providing an in-depth understanding of the FMSC process and the KPIs required to evaluate the overall FMSC. Previous studies on FMSC performance evaluation had overseen the importance of the SC process and precise KPIs necessary to evaluate the key activities within the process. Hence, this study complements the existing studies by providing additional insights on the above-discussed areas and finally developing a robust framework for FMSC performance evaluation.

The multi-disciplinary nature of FM has challenged practitioners in ensuring seamless delivery of FM services and maintaining the continuous performance of FMSC. The proposed FMSC performance evaluation framework provides a clear picture for performance evaluation that would assist FM practitioners and other professionals to improve cooperation among FMSC partners, raise FMSC integration and finally achieve FMSC excellence through FMSC performance monitoring, evaluation and feedback. The performance evaluation framework was developed by providing due consideration on the FMSC process and reflect parties involved at upstream, mid-stream and downstream of the SC. This facilitates in providing an overall understanding of the nature of the SC and required KPIs to evaluate the processes concerning the parties involved.

The current study was focussed on the hotel industry which has unique features, and hence, cannot be applied to other sectors. Further, the study was based in Sri Lanka, which limits the applicability to other developing and developed countries. The study considers 3 five-star hotels as case studies. Given the countries limited geographical spread, three large-scale leading five-star hotels were selected carefully based on the coverage of FM functions and standards maintained. These hotels follow the industry standards and best practices to a greater extent. Further, 21 semi-structured interviews and document reviews were carried out until the data saturation is reached. Hence, the findings of this study will be beneficial and applicable to the hotels in Sri Lanka, as well as the hotels in the developing countries, those who have shared the same kind of practices, standards and socio-economic, demographic or cultural traits.

Moreover, the study initially considered exploring the KPIs for FMSC of hotels through a qualitative approach, hence, there is a need to expand the sample to generalise to other

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empirical settings such as different sectors. A potential area for further research would be to prioritise the KPIs identified by the study. Further, a wide scope of a performance evaluation framework for FMSC could lead to research such as developing a performance evaluation framework to measure FM SC performance in other sectors and testing the suitability of the proposed framework for FM SC performance evaluation in other sectors.

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