DEVELOPING A FRAMEWORK FOR FACILITIES MANAGEMENT SUPPLY CHAIN PERFORMANCE EVALUATION IN HOTELS

Fathima Nishara Abdeen

(188046H)

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Department of Building Economics

University of Moratuwa

Sri Lanka

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ABSTRACT

Facilities Management Supply Chain (FMSC) encompasses multi-disciplinary activities, and thus have extensive requirement for multiple party interactions. Moreover, FMSC is characterised with complexities due to the network structure, availability of conflicting relationships and involvement of multiple parties resulting in deprived performance levels. Performance measurement and Performance Measurement System (PMS) have been endorsed by many researches worldwide as a mechanism to upsurge supply chain performance levels by evaluating performance and determining future courses of actions. However, performance measurement and metrics pertaining to FMSC have not received adequate attention from researchers or practitioners of Facilities Management (FM). This research therefore, sets out to develop a PMS to evaluate FMSC performance in hotels.

The study primarily carried out an extensive literature review. Subsequently, under qualitative approach and case study strategy, data was collected through document review and 21 semi-structured interviews in three (03) case studies of five-star hotels in Sri Lanka. The collected data were analysed using manual code base content analysis and QSR N-Vivo 10 Software. The study initially conducted an in-depth investigation to determine the nature of FMSC and revealed that FMSC comprises upstream, mid-stream and downstream processes and activities carried out by internal and external parties together with bidirectional information, product and finance flow and unidirectional service flow. The seven (07) key FMSC processes identified by the study were delivery of product by suppliers, delivery of services by service providers, sourcing, make/ fulfil, delivery of FM services and products, receipt of FM services and receipt of products by customers. Empirical findings revealed that FMSC undergoes several challenges faced mainly from supplier, internal and customer perspectives. Lack of reliable suppliers, lack of information and inconsistent quality from supplier's end formed the top most challenges in FMSC. These challenges possess threats on FMSC performance in short term and long term. Hence, the necessity of monitoring and evaluating FMSC performance through a systematic PMS is indispensable. Therefore, based on the derived FMSC process and key activities, 38 key performance indicators were developed for all seven (07) key sub-processes. By integrating the key performance indicators, the overall performance measurement system for FMSC was developed to improve cooperation among FMSC partners, to raise FMSC integration and finally to pursuit FMSC excellence through FMSC performance monitoring, evaluation and feedback. The developed Framework was validated by three (03) subject matter experts in hotel industry. The FMSC performance measurement system developed by this study would assist FM practitioners to contribute towards overall hotel performance by ensuring both internal and external customer satisfaction

Key Words: *Facilities Management Supply Chain, Performance Measurement System, Facilities Management Supply Chain Performance Measurement System*

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ABBREVIATIONS

BEM	Business Excellence Model
BIFM	British Institute of Facilities Management
BOI	Board of Investment
BSC	Balance Score Card
CSCMP	Council of Supply Chain Management Professionals
FM	Facilities Management
FMSC	Facilities Management Supply Chain
IFC	International Finance Corporation
IFMA	International Facility Management Association
KPI	Key Performance Indicator
PMQ	Performance Measurement Questionnaire
PMS	Performance Measurement Systems
SC	Supply Chain
SCM	Supply Chain Management
SCOR	Supply Chain Performance References
SMART	Strategic Measurement Analysis and Reporting Technique

CHAPTER ONE

1 INTRODUCTION

1.1 Background

The prosperity of tourism industry in Sri Lanka has impacted in an increased hotel demand and has been a dynamic source for accelerating economic climate (Turner & Freiermuth, 2017; International Finance Corporation [IFC], 2013). While continuing to prosper in the global economy, rivalry among hotel chains both at domestic and international arena has been triggered (Tsai, Song, & Wong, 2009). According to Bagur-Femenías, Perramon and Villanueva (2019), Lee and Cheng (2018) and Ngan, Yu-Chen Lan and Vinh (2016), service quality is a strategic weapon in ensuring competitive advantage over the rivals in hotel industry. Further, service quality has a direct impact on customer satisfaction (Shabbir & Shabbir, 2016). In order to realize customer satisfaction and customer relationships, global hospitality brands had turn to Facilities Management (FM) and this integration has been in forefront of a global transformation (Adeyemi, 2015). Okoroh, Jones and Ilozor (2002) stress that even though many hotels implement FM practices, they are usually referred through alternative terms such as hospitality management, accommodation management or hotel management.

Okoroh, Jones and Ilozor (2002) define FM in hotels as the process of managing built facility and organisational assets in order to enhance efficiency and thereby add value to facility and assets. According to Adeyemi (2015), FM plays a major role in hotel industry by supporting to upkeep with competition, enhancing customer base, improving operational efficiency, maintaining corporate image, upgrading the standards of the hotel and complying with new market trends, technology and government requirements. The quality of FM implementation starting from asset maintenance, building services such as air conditioning, plumbing, lifts, lighting to guest services such as security, janitorial service, room service in hotels has led towards the final benchmark of five star experience in hospitality (Chauhan, 2017). However, according to Heijden (2014), the most significant FM functions in hotel industry are front desk, cleaning, catering, maintenance (building, electricity service), decorating and communication.

The growth of FM market has resulted in a competitive market place comprising of several parties such as FM contractors, in-house FM teams, FM suppliers, FM consultants and professional FM institutions (Kindcaid, 1996). In addition, a survey carried out by Houston-based International Facility Management Association revealed that Facilities Managers are required to deal with at least 20 vendors on average during managing the facility (McEntee, 2000). According to Coenen and Felten (2014), with the involvement of multiple parties, several factors such as the customer's ability to communicate the needs and the service provider's ability to satisfy the needs, challenge the perceived quality of FM service delivery. Further, the authors' stressed on the requirement of Facilities Mangers to muddle through fluctuating demand created by clients, customers and users and find mechanism to cater the demand. According to Coenen and Felten (2014), Facilities Managers should be able to manage the process that links the service delivery and customer. In addition, FM team and service providers are required to blend together and work with synergy in order to maintain a seamless experience for end users (Chauhan, 2017). This emphasizes the need of a Facilities Manager to manage multiple relationships and processes that enables seamless delivery of FM functions. The systematic process, which enables opportunity to capture synergies between multiple integrations, is considered as Supply Chain Management (SCM) (Mohd- Yusoff, Ashari, & Salleh, 2016). According to Maestrini, Luzzini, Maccarrone and Caniato (2017), SCM assists in creating a seamlessly coordinated Supply Chain (SC) between internal and external linkages.

Facilities Management Supply Chain (FMSC) is made out of demand side parties and parties engaged in providing FM services (Nelson & Alexander, 2002). Haas and Hansen (2010) highlighted on the importance of managing FM service delivery, while arguing the importance of meeting both the facility owners and ultimate customer's expectation. According to Terrantroy (2017), in an environment of multiple party involvement, sharing information among the parties has become a biggest concern in FM. Vanichkobchinda (2010) stated that with the variety of service level and material supply, the importance SCM in FM is inevitable. Further, Shi and Liao (2013) stated that hotels are required to collaborate with various suppliers during procurement of goods and services and manage relationships between the parties, which has turned out to be a major issue.

The multiple parties, information, service and material flows involved in managing facilities of hotels entail the requirement of managing FMSC smoothly. Yet, due to the development of alternative service options and the capabilities of service providers, complications in FMSC has increased (Pitt, Chotipanich, Amin, & Issarasak, 2014). Further, the increasing complexities in SC can lead in destroying relationships eventually due to unseen or unexpected causes (Braziotis, Bourlakis, Rogers & Tannock, 2013). According to Flynn, Huo and Zhao (2010), the lack of integration in the SC would impact organisational performance.

Among the wide range of facets by which FM can contribute to the performance of organisation, SCM forms an important element (Amaratunga and Baldry, 2003). By incorporating SC performance initiatives, a more integrated SC could be developed (Gunasekaran, Patel, & McGaughey, 2004). According to Mohd-Yusoff, Ashari and Salleh (2016), an effective SC performance could uplift the business performance in one hand and on the other, it could assist in developing long term relationships with suppliers, provide information on the company improvements, develop proper communication and finally lead towards integration among SC members. Many organisations had fail to reach the true potential of SC due to failure in developing performance measures and matrixes to integrate the SC (Gunasekaran et al., 2004). Gunasekaran et al. (2004) suggest on developing SC performance measurement framework in order to yield potential benefits of SCM and to improve SC performance.

PMS of SC is referred by Maestcrini, Luzzini, Maccarrone and Caniato (2017), as a set of metric used to assess the efficiency and effectiveness of SC process and relationships across multiple organisations. Many researches in to SC performance measurement such as Gunasekaran et al. (2001), Gunasekaran and Kobu (2007), Lapide (2000) and Olugu et al. (2011) had utilised Supply Chain Performance References (SCOR) model, which reflects the SC process in developing PMS. SCOR Model has been widely used in researches performance measurement ever since it was introduced in 1996 by Supply Chain Council (Kocaoglu, Gulsun, & Tanyas, 2013). From FM perspective, Toni and Montagner (2009), argue that when measuring FMSC performance a multi-dimensional approach is more suitable than focusing on finance measures.

According to Heijden (2014), FM functions create a major impact on hotel's core business by creating an appealing customer service. Hence, collaborating with SC members and maintaining the performance of FMSC in hotels is crucial for the smooth operation of the business. Yet, the challenging nature of FMSC due to the network structure, availability of conflicting relationships and involvement of multiple parties result in poor performance in the FMSC. According to Chan et al. (2003), many researches have revealed that performance measurement in SC assist in integrating SC members. Further, the authors highlighted the need of precise KPIs in SC than range of cumbersome indicators. Bhagwat and Sharma (2007) in their research on performance measurement of SC highlighted that PMS have been successfully implemented in SC in order to overcome unsatisfactory performance levels. Therefore, to realise the long-term benefits of facilities management supply chain, the performance of the FMSC need to be assessed using a PMS. This emphasises the need to have a robust performance measurement system to evaluate performance of facilities management supply chain in order to optimise hotel performance.

1.2 Research Problem

Neglecting of SC resulting of cost additions, poor contactor relationships, issues with service scope and content, lack of conditions in contract and lack of performance measures are few challenges faced by organisation during managing facilities (Kamarazaly, 2014). According to Weerasinghe and Sandanayake (2017), FM involves several interactions with various parties and has moved from operating isolated to working collaboratively with internal units, competitors, contactors neighbours and other parties creating numerous challenges on expected performance. Further to Akkaranggoon (2010), hotel industry in specific is required of higher performance in order to survive in the competitive market. In such an environment, continuing performance of FMSC is vital and hence, PMS could be utilised FMSC in order to identify areas of underperformance and improve hotel's overall performance.

SC performance measurement systems are one of the highly discussed topic in researches (Maestrini et al., 2017). However, in developing a PMS for SC, many authors such as Gunasekaran and Kobu, (2007), Junior and Carpinetti (2019), Lapide (2000), Olugu, Wong, and Shaharoun (2011) had incorporated the SC process. Further, Chae (2009)

highlights that due to the availability of a plethora of performance indicators for SC, it is crucial to consider on Key Performance Indicators (KPIs) that would ensure performance of SC process. Yet, the PMS for facility services SC developed by Toni and Montagner (2009) had utilised the traditional BSC approach and had based on health care sector. The study had overlooked the importance of FMSC process and neglected developing KPIs, which are paramount for a seamless service delivery.

FM plays a major role in achieving customer satisfaction and in return ensuring long terms competitive advantage in hotel industry. Therefore, developing a PMS in order to assess the performance of FMSC is paramount given the importance of maintaining a seamless service delivery process to ensure customer satisfaction in hotels. Despite the necessity, there is a lack of study on developing a PMS to assess FMSC in hotels. Further, a backdrop in literature prevail in terms of determining a PMS for FMSC in hotels by providing due consideration to the nature of FMSC in terms of its participants, flows, activities, relationships, process and challenges. Therefore, there is a necessity of developing a framework for facilities management supply chain performance evaluation by considering the nature of FMSC and incorporating key performance indicators necessary to enhance FMSC performance in hotels.

1.3 Aim and Objectives

The aim of the study is to develop a framework for facilities management supply chain performance evaluation in hotels.

The above aim is achieved through following objectives.

1. Review the concepts of facilities management supply chain performance measurement.
2. Investigate the nature of facilities management supply chain in terms of its participants, flows, activities, relationships, process and challenges.
3. Determine the extent to which established performance measurement systems are used to measure performance of facilities management supply chain in Sri Lankan hotels.

4. Propose a Framework with key performance indicators to evaluate performance of facilities management supply chain in Sri Lankan hotels.

1.4 Research Methodology

Research design of this study consisted a qualitative research approach following a comprehensive literature review. A critical review of literature was carried out to review concepts of FM, SCM, performance management and FMSC performance measurement by collaborating the key concepts. Subsequently, three (03) case studies were carried out in three (03) five-star hotels to determine the FMSC in terms of its participants, flows, activities and relationships, to identify the challenges in FMSC, to develop the FMSC process, to identify the extent to which established PMSs are used to measure performance of FMSC in Sri Lankan hotels and to investigate the KPIs that could be used to evaluate FMSC performance in Sri Lankan hotels. The main data collection methods deployed in case studies were semi-structured interviews and document review. For this 21 number of semi-structured interviews were carried out in three (03) five-star hotels and documents such as agreements, policies, procedures and code of conduct were reviewed. Collected data were analysed using manual code based content analysis and QSR N-Vivo 10 software. The PMS developed to evaluate FMSC performance was finally validated through interviews with three (03) subject matter experts from another three (03) five-star hotels. Based on their opinion a refined PMS for FMSC performance measurement was developed.

1.5 Scope and Limitations

The scope of study was narrowed to investigating performance of FMSC within Sri Lankan context. Hotel industry is one of the major contributors to Sri Lankan economy. Hence, the study was focused on Sri Lankan hotel industry and the data collection was limited to five-star hotels in Colombo, Sri Lanka.

1.6 Chapter Breakdown

The chapter breakdown of the study is presented in Figure 1.1. Further, the objectives under each chapter and the techniques utilised in achieving the objectives is presented in Figure 1.1.

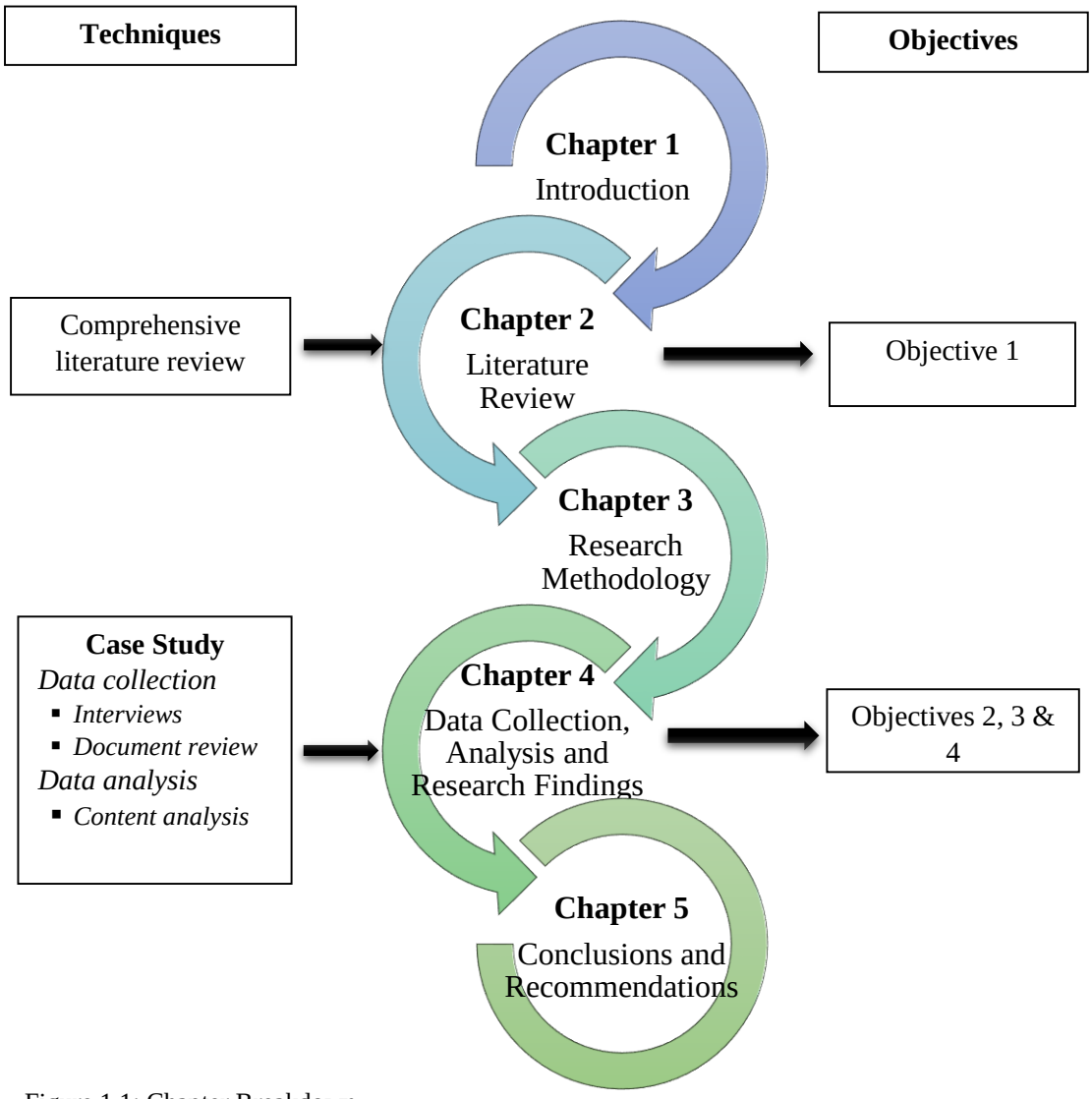


Figure 1.1: Chapter Breakdown

1.7 Chapter Summary

This chapter outlined the research study on developing a PMS for FMSC. The chapter began with presenting the background of the study followed by research problem aiming at evaluating performance of FMSC using a framework. Based on the problem statement, the aim of developing a framework for evaluating FMSC performance in Sri Lankan hotel industry was derived. Qualitative research approach was selected to carry out the study using case study strategy. Further, the PMS developed was validated using expert interviews. Finally, a guide to upcoming chapters was presented under chapter breakdown.

2 LITERATURE REVIEW

2.1 Introduction

This chapter provides a comprehensive review on literature on the concepts of FM, SCM, performance management and supply chain performance measurement. The chapter begins by giving an in-depth understanding on FM and its functions. In order to carry out the research, an understanding on FMSC and performance measurement of SCs are essential. In order to achieve this, an analysis on prevailing PMS for SCs is presented.

2.2 Facilities Management

Business assets and facilities have been widely acknowledge now than ever, not merely as cost centres but as a major contributor to strategic vision, FM relevant to businesses in operational and strategic ways (Waheed, 2018). According to Gllmer (2017), FM has been evolved over decades and the responsibilities under FM has been gradually increased. Currently, FM function has been recognized as a key player in service sector and FM services are been customizing to meet the requirements of diverse end user base generated from different countries and cultures (Nardelli & Rajala, 2018). The American view of FM is that it is a coordinated and planned activity, whereas the British view is providing quality work environment and effective support services (Nor, Mohammed, & Alias, 2014). As of Sri Lanka, the need for FM is predominant (Karunasena, Vijerathne, & Muthmala, 2018). According to Weerasinghe, Disanayake and Andarawera (2016), Sri Lanka has a niche market for FM services and it is still in its infancy stage. De Silva (2011) had supported this opinion and added that with the increased developments, the demand for FM is accelerating in Sri Lankan context.

International Facility Management Association (IFMA, 2019) defines FM as a profession of multiple disciplines, which focus on confirming the functionality of built environment by assimilating people, place, process and technology. According to European Facility Management Network (EuroFM, 2019), "FM is a multi-disciplinary field that covers a wide range of processes, services, activities and facilities which requires integration between people, place, process and technology". Mohamat-Nor (2014) stated that the FM definitions has been evolved over a period and mainly reflect the originator's taste,

settings and demographics at that point of time. Moreover, Tucker and Masuri (2016) stressed that FM definitions has been evolved with regard to the challenges that organisations had to face in terms of technological change and cultural management. Nevertheless, the range of definitions finally concludes that FM focuses on creating the environment required to support the main business of an entity.

2.3 Facilities Management Functions

Thomson (1990) elaborated the development of FM from looking in to merely hard aspects, which include real estate and building construction, buildings operations and maintenance to soft aspects, which include facility planning and general office services. According to Arayici, Onyenobi and Egbu (2012), FM support the core business of an organisation by managing all the services in a building. A facilities manager's job responsibility ranges from operations, maintenance and repairs of building, managing infrastructure and systems, ensuring health and safety of occupants and when required, crisis management (Arayici et al., 2012). Hajdukova and Figuli (2013) identified facilities manager's responsibility by clustering in to three levels as:

- Operational level - *date collection and recording, monitoring and evaluating and services coordination of cleaning, catering, helpdesk requirements, security, maintenance and operation of equipment*,
- Tactical level - *contract management, management FM teams, evaluating equipment performance, acquisition of equipment and FM services, standards management and change management*, and
- Strategic level - *identifying equipment needs, developing FM strategy, risk management, compliance with corporate strategy and changes, strategic planning, external contracts management, investment and strategic projects*.

According to Vanichkobchinda (2010), FM responsibilities include provision of janitorial and maintenance services, security, engineering services, and managing information and telecommunication systems. Further, author specifies that implementation of FM functions could be undertaken covering a wide range of facilities such as sports complexes, hospitals, hotels and retail establishments. According to Cheng, Gan, Imrie, and Mansori (2019), unlike any other industries, hotel industry prospers through customer

retention for which customer satisfaction is prominent. Authors further stressed that customer dissatisfaction is mainly caused by offering low quality products and services to customers. In order to realize customer satisfaction and customer relationships, global hospitality brands had started to focus on FM at an improved rate (Adeyemi, 2015).

In a hotel environment, the final product given for the customer includes a package of tangible elements such as ground and cleanliness and intangible elements of service efficiency and ambient environments (Penny, 2007). Hence, facilities take a major part of the product finally delivered to the customer and their by management of them is crucial in a hotel environment (Penny, 2007). Beauge, Verginis and Woord (2008) had discussed FM in hotels in relation to outsourcing and had stated that there is a negative perception on FM outsourcing in hotels where the customer satisfaction would be at stake. Reception work, cleanliness, catering, building maintenance, maintenance of heating, electric service maintenance, decorating and communication are considered as the most significant FM elements in UK hotels (Jones, 2002). Fallon and Rutherford (2010) in their study presenting an organisation structure of a hotel, had identified the similar functions discussed by the aforementioned authors under several departments such as engineering, housekeeping, security and front office. According to Kumar (2018), FM departments in hotels are more concerned on giving a good experience for customer and employees in the facility. However, authors such as Campbell and Finch (2004) questioned the ability of Facility Mangers to cater multiple customer requirements in an environment with turbulence and fluctuating requirements. The leading network of procurement consultants in UK and Ireland, Expense Reduction Analysts (UK) Ltd. points out that the relationships between FMSC partners are becoming complex and down the line the process of managing contracts had become tough (Expense Reduction Analysts (UK) LTD., 2013). According to Noor and Pitt (2009), managing service delivery issues prevailing in SC could make a positive contribution to organisational supply. Given the importance of SC for FM, the upcoming section would provide an in-depth review on SC.

2.4 Supply Chain in Hotels

In today's competitive economy, hotels focus on delivering value to customers at lowest possible cost (Odoom, 2012). Hotel industry has already made several cost cutting initiatives, for instance; MGM Resort International, which barely escaped from been declared bankruptcy was able to propagate and grow to been the largest hotel chains in Las Vegas (Odoom, 2012). According to the author, one of the remaining cost cutting initiatives for hotels are on SC operations. A heavy integration and collaboration with various suppliers for purchase of drinks, foods, linen items and other requirements are involved in order to achieve business excellence through seamless service delivery in hotels (Shi & Liao, 2013). Joseph Acura, the President of a SCM consultancy firm, Ridgewood, New Jersey, adds that hospitality industry has started to awaken on the value of SC (Shi & Liao, 2013).

SC involves movement of goods and information among different stakeholders who include customers, retailers, distributors, manufacturer and raw material suppliers (Bawa, 2014). A typical hotel SC proposed by Kothari et al., (2005) is depicted in Figure 2.1.

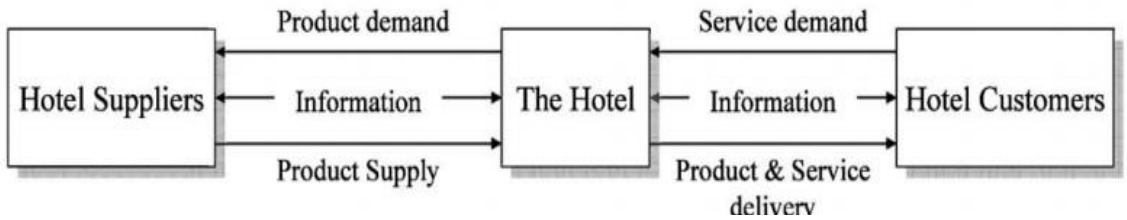


Figure 2.1: Hotel Supply Chain
Source: (Adapted from Kothari et al., 2005)

According to Afolayan, White and Mason-Jones (2016), the chain of networks, which links several players such as suppliers, retailers, distributors and manufacturing sites is considered as a SC. In a tourism SC in which the hotel SC is a part, when looking from customer perspective who are at downstream, first tier suppliers include accommodation and transport providers and second tier suppliers include providers of input such as equipment, waste management, energy management and furniture (Piboonrungroj & Disney, 2015). The goal of a service provider would be to provide quality service, enhance customer satisfaction and in return relish the sustainable profits gained, for which managing the entire SC from upstream to downstream be essential (Kazemi & Sanaei, 2014). According to the authors, hotels as a provider of services should ensure

management of SCs in order to satisfy customers, gain repeated business and thereby ensure long term profits. The success of an organisation would depend on the other firms in the SC as the firms forms a contractual relationship in order to supply goods and services necessary for the organization's persistence (Vencataya, Seebaluck, & Doorga, 2016).

2.4.1 Relationships in Supply Chain

Mentzer et al. (2001) identfied that a generic SC could be divided to three categories as direct SC, extended SC and ultimate SC, based on the channel relationship. According to Felea and Albastroiu (2013), direct SC includes the supplier, organisation and the customer. SCs, which extend up to supplier's supplier and customer's customer is considered as extended SC (McCormack & Johnson, 2016). The final category of ultimate SC include all the organisations at upstream and downstream level involved in delivering product, service, finance and information flow (Mentzer et al., 2001). Figure 2.2 is one of the most cited models in past literature depicting the nature of direct SC, extended SC and ultimate SC based on channel relationships.

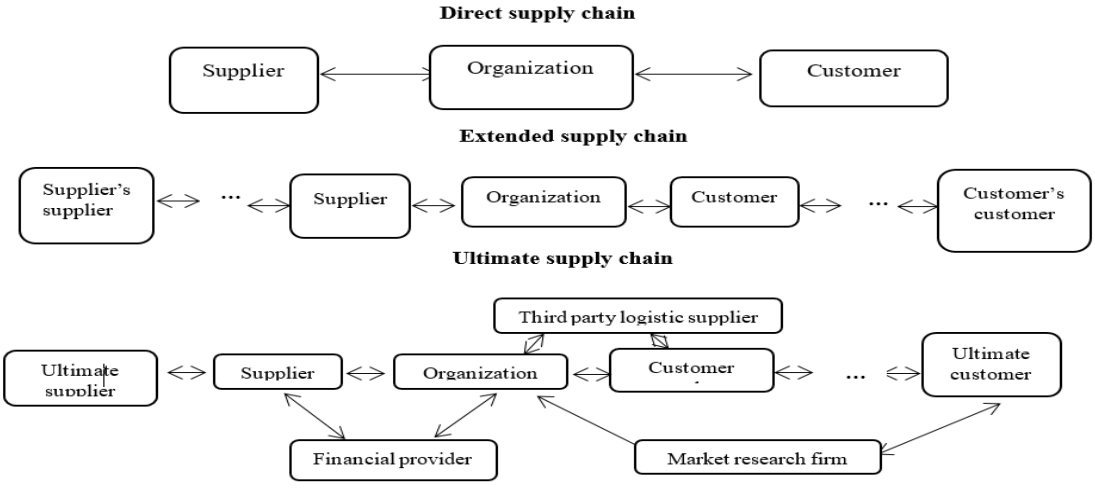


Figure 2.2: Categories of Supply Chain
Source: (Mentzer et al., 2001)

Formal relationships and informal relationships are common among SC partners in a basic SC (Lu, Potter, Sanchez Rodrigues & Walker, 2015). According to Geringer and Hebert, (1989), formal relationships involves contractual devices developed to reduce the unscrupulous behaviours of partners and risks involved. Papadonikolaki, Verbraeck and Wamelink (2017) identified agreements, hierarchies and contracts as formal relationships. Lu, Potter, Sanchez Rodrigues and Walker (2015) perceive informal

relationships as an invisible hand that influence on social and business activities whereas, Herndon (2008) refers it to personal relationships. Favour and trust were identified as key criteria that give rise to informal relationships by Lu, Potter, Sanchez Rodrigues and Walker (2015). Papadonikolaki, Verbraeck and Wamelink (2017) stated that informal relationship includes day to day communications and knowledge sharing. However, Mentzer et al. (2001) identified that trust prevailing among SC partners gives rise to direct and indirect relationship. Further, the authors stated that commitment and interdependence between SC partners as ingredients required for long term relationships. Authors identified close relationships developed as a result of cooperation that occur at different management levels and various SC partners in order to deliver a singular outcome. Therefore, it is evident from the discussion that various relationships among several parties build up a SC.

2.4.2 Supply Chain Process

Lambert and Cooper (2000) identified SC business process as to processes that should be linked with key SC members. Croxton, Garcia-Dastugue, Lambert and Rogers (2001) stated that in order to build this link between SC units, it is vital to implement a standard set of SC process. Elgazzar, Tipi, Hubbard, and Leach (2012) refer Supply Chain Operations Reference (SCOR) for a standard definition on SC process. SCOR model has been widely used in researches ever since it was introduced in 1996 by Supply Chain Council (Kocaoglu, Gulsun, & Tanyas, 2013). According to the authors, the model contains five sub-processes: plan, source, make, deliver, and return. Figure 2.3 presents the SCOR model developed by Supply Chain Council.

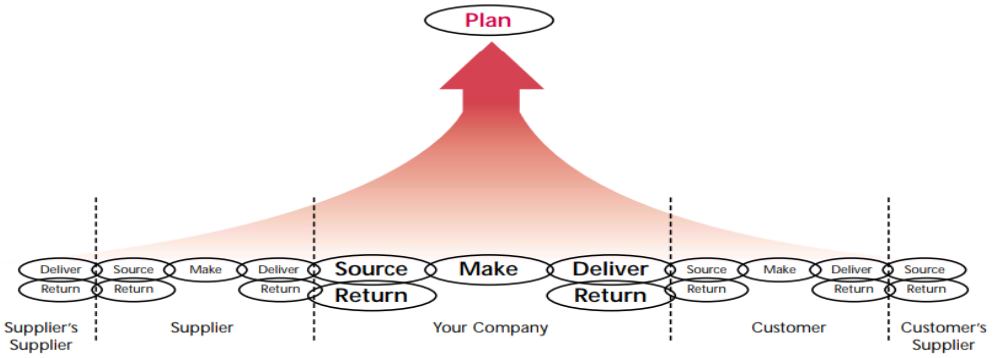


Figure 2.3: SCOR Model

Source: (Ellram, Tate, & Billington, 2004)

The model had incorporated processes that is undertaken within the boundaries of the company and extended towards suppliers and customers. Wang, Huang and Dismukes (2004) described the process from plan to deliver. According to Ren (2008):

- Plan - *involves the use of information generated internally and external to balance demand and supply*,
- Source - *includes the process of procuring good and services required to meet the demand*,
- Make - *the process that transforms the procured items to final state of demand requirement*,
- Deliver - *includes all the process undertook to provide the competed goods to satisfy the demand*, and
- Return - *includes receiving of return goods from customer and returning raw materials to customer.*

The model comprise planning activities, sourcing activities, make activities, delivery activities and return activities (Ren, 2008). Maestrini et al. (2017) stated that the internal SC focuses on source, make and deliver process, whereas, the external SC considers external suppliers and customers. Gunasekaran et al. (2001) in their study, identified customer satisfaction and service as sub-process of the SC process in addition to the main SCOR process. Moreover, Olugu et al. (2011) had identified three (03) main elements of SC process as:

- Upstream - Considers all the aspects related to suppliers,
- Midstream - Considers internal SC of the organisation, and
- Downstream - Considers all the aspects related to customers.

According to Pasanen (2015), internal SC focuses on all the other process excluding raw material procurements and process after product delivery. Harland (1996), pointing a similar view noted that the internal SC process includes the integration of business functions involved in the flow of materials and information from upstream to downstream.

Several studies have developed SC process for services incorporating the essence of SCOR model. However, the direct application of SCOR model in service SC has been in

questioned by researches such as Georgise, Thoben and Seifert (2012). According to the author, even though the SCOR model comprise return flow, in service SC, return of service is unlikely to occur as once the service is delivered it is consumed.

However, Weyers (2017) questions that rationale of totally ignoring the return process as several services such as back office service, which comprise maintenance, compliance and other comprises a return flow. Ellram et al. (2004) stated that make and delivery is a single process in service SC as the service is created and consumed as a part of delivery process. In contrary, Barnard (2006) has kept the two processes separately stating that the value will be created by keeping the steps separate. Figure 2.4 presents a service SC process develop by Barnard (2006).

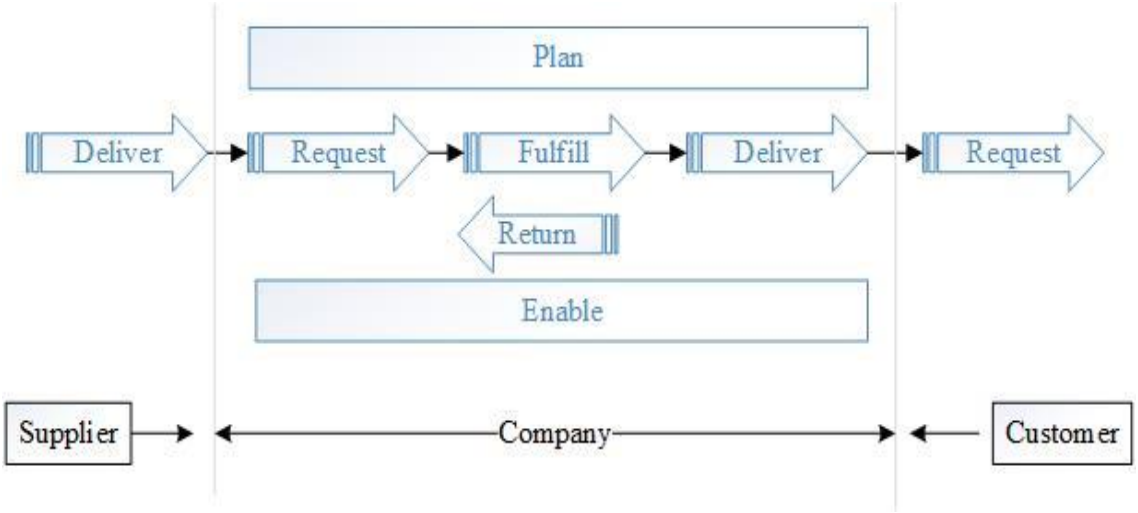


Figure 2.4: Service Supply Chain Process
Source: (Barnard, 2006)

Several disparities in terminologies used in product SC process (Figure 2.3) and service SC process (Figure 2.4) are evident. The term source in product SC process has been replaced by request in service model. According to Weyers (2017), the idea here is that the process of service provision initiates with a request made by supplier. In addition, the process of make in product SC is replaced by fulfil in service SC process. According to Weyers (2017), the terms fulfil is more suitable for service SC process than term make as fulfil is applicable for service language. However, based on the range of studies undertaken it is evident that SC process plays a key role in both service and manufacturing environments, hence should be properly managed.

2.5 Supply Chain Management Concept

The term SCM has been embedded within the society and academia for more than 30 years (Ellram & Cooper, 2014). According to Ballou (2007), logistics and distribution had been emerged around 1960s and SCM has been widely used as a synonym for logistic. However, SCM is related to three dimensions such as activity and process administration, inter functional coordination, and inter organizational coordination. According to Felea and Albastroiu (2013), the concept of SCM has been introduced in 1980s and had been subjected to several changes ever since. The concept SCM has been emerged due to the requirements of managing the flows of information, product and service along the network of customers, suppliers and SC partners (Russell & Taylor-Iii, 2008).

SCM can be defined as "the integration of trading partners' key business processes from initial raw material extraction to the final or end customer, including all intermediate processing, transportation and storage activities and final sale to the end product customer" (Wisner, Tan, & Leong, 2014, p.24). Eric (2011), stresses that definitions on SCM varies in accordance to focus, perspective and scope. The analysis of several SCM definitions by Felea and Albastroiu (2013) had brought the authors into conclusion that SCM represents an holistic approach for the operation of organisation for practitioners and for theorists. Organizations such as Walmart and Amazon are continuing to grow by the use of effective SCM to reduce product cost and in turn provide customers with product and services at a lower price (Bonney, 2012). SCM is said to support organisational competitive strategy (Ellram & Cooper, 2014). According to the authors, the common principles that encourages the adoption of SCM are information transparency, dissection of supplier, customer service, lean principles, quality, improved communication, segmentation and stock management, which may apply in different industries based in their competitive strategies.

Harewood (2008) highlights that the concept of SCM is relevant to hotel industry as SC is formed with combination of different functions, businesses and interested parties (as cited in Kazemi & Sanaei, 2014). The pertaining competition in the hotel sector had forced organisation to focus in the entire SC rather than focusing on individual companies (Hatamifar, Darban Astane, & Rezvani, 2018). According to Odoom (2012), the

application of SCM and logistic practices in hotel industry would benefit the hotel industry through reliable high quality service and optimum cost. The author had recognized several SCM practices prevailing in high end hotels in USA. Accordingly, hotels such as Venetian/Palazzo and Four Queens adapt practices such as using procurement software for procurement management, utilizing in-house property warehouses as distribution centres to manage the distribution process, using vendor compliance programs for logistic management and developing green SCs. Christopher Nassetta, the CEO of Hilton Worldwide emphasized that the revolution of SCM with the chain over the past five years had accelerated the growth, customer relationship, financial outcomes, diversity, sustainability, leadership, and community outreach of Hilton worldwide (Handfield, 2015). SCM has been applied by several hotel chains globally as a means of cost cutting strategy and to provide customers with an appealing service. Yet, in order to manage SCs effectively setting performance measurements in SC is crucial (Gunasekaran & Kobu, 2007). Therefore, the upcoming sections would analyse the prevailing literature on performance measurement in general and SC context.

2.6 Introduction to Performance Measurement

Performance measurement has become crucial with globalization and fierce competition among businesses (Babar, 2016). The challenge of how performance need to be assessed has been a major problem among management practitioners (Kennerley & Neely, 2002). According to Wongrassamee, Simmons and Gardiner (2003), performance measurement is high on agenda for many organizations around the globe and more focus had been put forward to adopt an approach that will bring the highest yield. Some countries and cities had put more effort towards performance measurement (Ammons & Roenigk, 2015). Many authors highlight on the necessity of performance measurement tools for organisation to become competitive in global market place while referring performance measurement as a compass that can provide direction on areas requiring improvements (White, 1996). Several definitions on performance measurement were evident in the literature and are presented in Table 2.1.

Table 2.1: Definitions on Performance Measurement

Authors	Definitions
Performance Measurement	
(*Lebas, 1995)*	"Performance measurement is the system that supports a performance management philosophy" (p.34).
(Babar, 2016)	"Performance measurement includes development of strategies or objectives, and the taking of actions to improve performance based on the insight provided by the performance measures" (p.7).
(Neely, Mills, & Platts, 2000)	"Performance measurement refers to the use of a multi-dimensional set of performance measures" (p.3).
(Lohman, Fortuin, & Wouters, 2004)	"Performance measurement is an activity that managers perform in order to reach predefined goals that are derived from the company's strategic objectives" (p.1).
(Moullin, 2007)	"Performance measurement provides the information needed to assess the extent to which an organisation delivers value and achieves excellence" (p.182).

Neely, Gregory, and Platts (2005) and Neely, Gregory and Platts (1995) had defined performance measurement as the process of quantifying the efficiency and effectiveness of an action. According to Neely, Mills, Platts, Gregory and Richards (1994), performance measure is a metric used to quantify the efficiency and/or effectiveness of an action. This comprise three main features such as (1) a verifiable quantitative or qualitative measure that assess what is happening, (2) in order to assess, a target value is referred, and (3) the consequence would be assessed, if the value is below or above the target (Maestrini et al., 2017). Melnyk, Stewart and Swink (2004) had define metric to be a verifiable measure mentioned in quantitative and qualitative forms making reference to a particular target.

Melnyk, Stewart and Swink (2004) stated that metrics are referred through three different ideas: the individual metrics, the metric sets and overall performance measurement system. According to the authors, individual metric lies at the bottom and forms the basis

and when individual metrics are aggregated it forms a metric set. Nevertheless, according to Franceschini, Galetto and Maisano (2007), metrics and performance indicators are used as synonyms. Bauer (2004) identified performance indicator as a measure that is applicable to a team or a cluster of teams working closely towards a common purpose. Moreover, performance indicators contribute towards KPIs and lies below KPIs. KPIs are the indicators that focus on the performance aspects that are more crucial for current and future success of the organisation (Bauer, 2004). Melnyk, Stewart and Swink (2004) stated that PMS lies at a higher level where metrics across individual functions are coordinated in order to align metrics from strategic level to operational level. Moreover, multiple metrics can be developed and implemented for every activity, function, product or relationship.

2.7 Introduction to Performance Measurement System

A performance measurement system is defined as "the set of metrics used to quantify both the efficiency and effectiveness of actions" (as cited in Neely, Gregory & Platts 2005, p. 1229). A range of definitions prevails on PMS. Table 2.2 provides an overview on PMS definitions.

Table 2.2: Definitions on Performance Measurement System

Performance Measurement Systems	
(Bititci, Carrie, & McDevitt, 1997)	"The performance measurement system is seen as the information system which, enables the performance management process to function effectively and efficiently" (p.3).
(Forza & Salvador, 2000)	"PMS feed forwards the various process owners with goals they have to meet on the other it give them feedback on the outcome of their activities and therefore on their progress towards the goal set" (p.359).
(Ahmad & Zabri, 2016)	"Performance measurement systems is a set of measures that help organisations to run business operations effectively and efficiently in accomplishing goals" (p.1).
(Moullin, 2002)	"PMS Evaluates how well organisations are managed and the value they deliver for customers and other stakeholders" (p.188).

David and Jenson Joseph (2014) highlighted the reasons behind several definitions prevailing on PMS. According to the authors, diverse literature on performance measurement and the requirement of developing PMSs had led in emerging numerous definitions. Further, the authors highlighted that there is little consensus on the main characteristics of PMSs. However, each definition aims at furthering organisational goals and objectives through implementing a systematic measurement tool, which would enable organisations to acquire required information. Neely et al., (2002) stated that PMS should evolved and nurtured over time. Therefore, it could be further argued that the evolution of PMSs in various context would have resulted in emergence of diverse literature and thereby lead in developing definitions. Due to the prevalence of a number of PMSs emerged as a result of evolution, the following section provides an in-depth review on performance measurement evolution.

2.7.1 Evolution of Performance Measurement Systems

PMS can generally be divided in to financial and non-financial measures (Ahmad & Zabri, 2016). According to Ghalayini and Noble (1996), literature on performance measurement can be classified under two phase in which the first phase began on 1880s where financial measures were the concern and the second phase took place during 1980s where the limitations of traditional performance measurement was discovered and development of new PMS was required. Traditionally, organizations had focused more on financial based measure such as cash flows, profit and return on investments (Said, Hassab-Elnaby, & Wier, 2003; Kennerley & Neely, 2002). However, the traditional accounting based performance approach was criticized by many authors, and Johnson and Kaplan (1987) were among first authors to criticize accounting based approach (Gomes, Yasin, & Lisboa, 2004). According to literature, traditional approach:

- Has insufficient measures as it does not highlight what to manage in order to make profit (Bruns, 1998),
- It provide historic view leading to short termism (Bank & Wheelwright, 1983; Bruns, 1998; Hayes & Abernathy, 2007; mcnair, Lynch, & Cross, 1990),
- Does not provide proper strategic orientation (Neely et al., 1995),
- More internalized and minimum external focus (Porter, 1992), and
- Focuses more on minimizing variances from standard (Schmenner, 1988).

The dissatisfactions on PMSs cascaded over time led in developing a balance or multi-dimensional measurement frameworks, which focused on non-financial, external and future oriented measures (Bourne, Mills, Wilcox, Neely, & Platts, 2000). A similar opinion was provided by Gomes et al. (2004), where the authors stated that the criticisms on traditional performance measures led in developing many PMSs. The following section provides an overview on different PMSs developed overtime.

2.7.2 Performance Measurement Systems

Due to the criticisms in traditional performance measures, many performance measurement frameworks came to light such as performance measurement matrix proposed by Keegan, Eiler, and Jones (1989), the SMART (Strategic Measurement and Reporting Technique) pyramid developed by Wang Laboratories (Brignall, Fitzgerald, Johnston & Silvestro, 1991), the Result and Determinant Framework developed by Brown (1996) and Balance Score Card (BSC) developed by Kaplan and Norton (1996). The most cited PMSs are SMART, performance measurement matrix, the BSC and the integrated dynamic PMS (Gomes et al., 2004).

The BSC approach has been classified by Neely, Marr, Roos, Pike and Gupta (2003) under first generation measurement systems, which emerged to complement traditional financial based measures with non-financial measure. In addition, Skandia's navigator and performance prism were classified under first generation measures. Jack (2002) identified balance, multidimensional, comprehensive and integrated as the main criteria of PMSs. However, the above criteria are failed to be captured by first generation measures as a whole, which lead towards the development of second generation measures (Jack, 2002). Strategy maps, success and risk maps and IC-navigator model were classified under second generation measurement approaches by Neely et al. (2003). The following sub sections provide an insight on the wide range of PMSs developed overtime.

2.7.2.1 Performance Measurement Matrix

The performance matrix was introduced by Keegan, Eiler and Jones (1989) for the first time and it comprised different performance dimensions (Babar, 2016). According Keegan et al. (1989), it was the first balanced and integrated framework developed in order to measure the performance of businesses. Performance measures are classified

under internal, external, cost and non-cost dimensions in the framework (Khan & Shah, 2011). According to Neely et al. (2000), one of the strength of the performance matrix is that it integrates different classes of performance measures such as financial, non-financial, internal and external. The authors further argue that the matrix does not explicitly demonstrates the link between different financial performances as in BSC.

2.7.2.2 Performance Measurement Questionnaire

The performance measurement questionnaire (PMQ) was presented by Dixon (1990) (Khan & Shah, 2011). According to the authors, it assists managers to identify the current improvement requirements, establishes the extent of the support given by the existing performance measurement and determines future performance measure improvements. The first part of the questionnaire collect general data about the company, in the second part, data is collected on the important improvement areas in comparison to the existing performance measures to evaluate, the third part is on performance indicators and the final part requires employees to suggest performance measures to evaluate their own performance (Khan & Shah, 2011).

2.7.2.3 Result and Determinant Framework

Brignall, Fitzgerald, Johnston and Silvestro (1991) had used six generic performance dimensions such as competiveness, financial, quality, flexibility, resource utilisation, and innovation in developing result and determinant framework. According to the authors, these dimensions falls in to two conceptually different categories, competiveness and financial measures reflect the success of a strategy (results), whereas, other four factors determine the competitive success (determinants). Result and determinant framework has been designed to overcome the criticisms of performance measurement matrix such as not demonstrating the links between measures explicitly (Neely et al., 2000).

2.7.2.4 Performance Pyramid

A clear link between performance measures among different hierarchical levels in order to ensure goal congruence is one of a requirement of PMS (Tangen, 2004). According to the author, performance pyramid had been introduced by McNair, Lynch and Cross (1990) is an example of a measurement system that meets such requirement. According

to Bititci (2015), the performance pyramid is also known as SMART. The framework had been introduced based on the concept called total quality management (Babar, 2016). Performance pyramid is criticised for not providing means to identify KPIs and not encouraging continuous improvement (Kurien & Qureshi, 2011). Yet, the approach integrates strategic objectives and operational dimensions through four level structure (Bititci, 2015).

2.7.2.5 Performance Prism

Adams and Neely (2000) introduced performance prism as an approach to measure organisational performance. According to Neely, Adams and Paul (2001), the framework include five interrelated aspects, Stakeholder Satisfaction, Strategies, Processes, Capabilities and Stakeholder Contribution. The performance prism ensures that performance measures are derived through a strong foundation by first questioning the company strategy before setting performance measurements (Kurien & Qureshi, 2011). According to Najmi, Etebari and Emami (2000), the framework is more suitable for organisation, which provides high priority for stakeholder value creation. Further, the framework accounts for new stakeholders when forming performance measurements. Kurien and Qureshi (2011), further discussed on the weakness of the framework and added that lack of guidance on realising performance measures and neglecting current performance measures as issues in performance prism.

2.7.2.6 Strategy Maps

A strategy elaborates how organisations create continuous value for its shareholders, customers and communities (Kaplan, Norton, & Davenport, 2004). According to the authors, strategy map is a visual framework of the cause and effect relationship amongst elements of organisation's strategy in which the four BSC perspective is used. Kaplan & Norton (2000) stated that strategy map has been developed as an execution model for BSC strategy under the four perspective of BSC. According to the authors, the strategy map defines the strategy of the organisation and put the goals under the four perspective and show the interrelationships among them.

2.7.2.7 Success and Risk Maps

Success map is considered as a technique, which would assist in aligning strategies, processes and capabilities while delivering stakeholder satisfaction and contribution (Neely et al., 2002). Failure or risk map is the reverse of success map, which can be used to check whether all the requirements of performance measurements has been properly accounted (Neely et al., 2002). According to Neely et al. (2003), this map identify the failures of the organisations, which would lead towards risks if not monitored properly.

2.7.2.8 IC- Navigator Model

The IC- Navigator map was created by Stewar (1998) in a form of radar to envisage intangibles in the company (Kaufmann & Schneider, 2004). According to Neely et al. (2003), IC Navigator act as a conceptual map, which depicts tangible and intangible resources and the conversion of the resources in accordance to achieve organisational strategic intent. The approach is criticised for its temporal orientation, where the capital report is a historic document, disregard of financial measure such as revenue, expenses, profit, and return on assets, provide more concern on stock measures and lack of evidence on performance improvement (Roos, Fernstrom, & Pike, 2004). Despite the weaknesses, the approach has an advantage of enabling comparisons between other companies (Kaufmann & Schneider, 2004). According to Roos et al. (2004), the approach takes in to account financial, customer and operational concerns similar to BSC approach.

2.7.2.9 Balance Scorecard

The BSC was proposed by Kaplan and Norton (1992) in order to evaluate performance under four perspectives as financial, internal business process, customer and learning and growth perspectives (Bhagwat & Sharma, 2007). BSC approach provides a multifaceted view in which financial measures are balanced with operational measures such as customer satisfaction, internal process and learning and growth (Atkinson & Brander Brown, 2001). Under the four perspectives of BSC, business process perspective refers to the internal process of the business (Sharma, 2009). In customer perspective managers are required to identify the market segments, which they are targeting to compete and develop measures to measure the segment's performance (Kaplan & Norton, 1996). Financial perspective defines long term objectives of the business, which are profitability

objectives most of the time (Kaplan & Norton, 1996). The organizational learning and growth perspective involves the changes and improvements that is required to be carried out by the organisation in order to implement the organisational vision (Akkermans & Van-Oorschot, 2018).

2.8 Facilities Management Supply Chain Management

FM service has been grown to be recognized as key service sector in the current context (Nardelli & Rajala, 2018). Cardellino and Finch (2006) and Kindcaid (1996) stated that the sector comprises of highly competitive market place of FM providers, in-house FM units and FM consultants. However, large organisations are required of formal units known as internal FM unit to oversee the FM provision and to manage relationships with external service providers in an outsourcing context (Nardelli & Rajala, 2018). Further to the authors, the FM unit plays a dual role as the service provider for internal employees and as a customer for external service providers.

The demand actors involved in FM can be categorised as (a) client: the organisation, which specifies the requirements, (b) customer: an organisational unit, which specify and orders the delivery of facility services and (c) end user: person who is receiving facility services permanent or temporarily (Heijden, 2014). For instance, in a FM company that delivers cleaning service to bank, client is the bank as a whole, customer is the internal FM unit of the bank, internal end user is the employees of the bank and external end user is the bank's customers (Heijden, 2014). However, in hotels, customer become the end user as well as the paying actor, which relates to a client characteristic (Heijden, 2014). According to Varcoe (1993), the supply actors involved in provision of FM services can be identified as total facilities management suppliers: companies facilitate with one stop solution in which management and operational services needs are offered, FM companies: organisation from management or consultancy background who provide management expertise and service suppliers: specialist service suppliers. According to the author, the FM market comprise of in-house FM resources, total facilities management suppliers, FM companies, service suppliers (individual and bundled), niche suppliers and niche consultants. Based on the above discussion, FMSC can be considered as the system, which facilitate customer demands through the involvement of various

supply sources. Moreover, Noor and Pitt, (2009) perceived FMSC "as the system used in the delivery of services to support the business objectives of an organisation" (p.284).

Product, service, information and finance flows are considered as important elements of a SC (Felea & Albastroiu, 2013). According to Tan, Zaman, and Sutrisna (2018), various information flows are involved among the parties such as contactors, consultant, suppliers and sub-contractors in managing facilities. Noor and Pitt (2009) stresses that two-way information sharing is an important element in FMSC in order to ensure effectiveness in service delivery and such information should be systematic and open. Facilities Managers should be informed on daily expenses, have the latest financial readings and manage the overheads to reduce cost (Jeffries, 2016). In order to carry out such task, managing the finance flow is crucial. According to Brochner, Haugen and Lindkvist (2019) and Jeffries (2016), service quality of FM is a major indicator, which drives towards customer satisfaction. Hence, managing service flow is crucial in FM context. Indeed, FMSC is made out of multiple parties who facilitate the demand and supply process with relevant information, service/ product and information flows.

The relationship between FMSC partners had become more complex with the difficulties in managing several contracts (Expense Reduction Analysts (UK) LTD., 2013). The increase level of service supplied by same service providers and outscoring strategically important services had increased the need of trust and commitment between SC partners (Lehtonen, 2004). Further, with the increase of intelligent buildings, the management of such buildings would require several supplier relationships with various complexities (Haas & Hansen, 2010). According to the authors, facilities owners often seek towards cost cutting initiatives with regard to FM service delivery and at the same time service expectations of customers and end user would have to be met. Hence, managing facilities is a complex task and SCM could be utilized as a managerial framework for FM service delivery and straighten the issues in FMSC (Haas & Hansen, 2010).

Abdeen and Sandanayake (2018) defined FM supply chain management as "a process of managing upstream and downstream FMSC processes, services, activities and facilities by coordinating material, information and finance flows in order to achieve sustainable competitive advantage and optimise customer value" (p.1106). According to Noor and Pitt (2009), the implementation of SCM could ease the service delivery issues pertaining

in FMSC and contribute to the organisation SC as a whole. Further, logistic and SCM remains a key technique to enhance the efficiency of FM due to the involvement of various service levels, material supply and suppliers (Vanichkobchinda, 2010). According to the author, SCM can applied in the area of FM for facility assortment and acquisition, building services, information systems, communications, fleet management, safety and health and physical security.

Implementing SCM in FM is a challenging task according to the several findings of Noor and Pitt (2009). Accordingly, due to the perception of FM as a supportive service, the application of the concept strategic purchasing in procuring facility services is a challenge. However, the application of SCM in FM would enable better information sharing, assist in supply base reduction, enhance competiveness of internal FM unit, assist in establishing long term contracts, save frequent procurement related costs, heighten in house FM team's proficiencies, manage buyer supplier relationship and encourage innovation from FM suppliers, enhance supplier involvement, enhance cross function interactions and trust and commitment. Many authors including Horvath (2001) and Li, Ragu-Nathan, Ragu-Nathan and Rao (2006), perceive competitive advantage as a derived benefit of effective management of SC. The implementation of SCM in FM will therefore assist organisations specially hotels who are in the run to grasp competitive edge to benefit from competitive advantage through customer satisfaction over other players. However, in order to sustain the competitive advantages derived through SC, it is necessary to improve the performance of SC (Cai, Liu, Xiao, & Liu, 2009).

2.9 Supply Chain Performance Measurement Systems

SC performance measurement is a process of quantifying the efficiency and effectiveness of the SC (Sillanpaa, 2015). Deshpande (2012, p.4) defined SC performance measurement system as "multiple measures of performance developed by an organization to gauge the ability of a SC to meet an organization's long-term and short-term objectives". Mohd-Yusoff, Ashari and Salleh (2016) referred PMS of SC as "a measuring tool to ensure the process of delivering products is effective and efficient" (p.102). According to Chae (2009), PMS developed for SC includes a matric or system used to evaluate the accuracy of planning and results of execution. Maestcrini, Luzzini, Maccarrone and Caniato (2017) defined SC performance measurement system 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). Gunasekaran et al. (2001) stated that performance metrics in a SC is required in order ensure that the material, cash and information flow are streamlined, create the decisions making process straightforward and remove non-value adding activities. According to Cho, Lee, Ahn and Hwang (2012), the main objective of a PMS developed for SC is to assess the effectiveness of key SC activities under various performance scopes. Therefore, it is evident that authors had defined SC performance measurement systems from several perspectives, and a high importance had been given to SC process, relationships and activities in their explanations. Therefore, by considering the prevailing literature and definitions given by several studies, this study defined SC performance measurement system as:

> "A *set of metrics*, used to quantify the efficiency and effectiveness of *supply chain processes, relationships and activities* spanning multiple organizational functions and multiple firms in order to streamline the product/service, finance and information flows".

Kurien and Qureshi (2011) stated that an effective, integrated and balance SC performance measurement systems can be used as a vehicle for change in organizations and facilitate inter-understanding and integration among SC partners. Although the traditional performance evaluation is limited to a company, from SCM perspective, it is required to expand the concept beyond company boundaries involving all the SC players (Pires & Aravechia, 2001). According to Holmberg (2000), policies, routine works, lack of system thinking and involvement of multiple organisations with various cultures challenge SC performance measurement. Author further adds that in SC performance measurement, measures are not connected and properties are neglected. Further, due to the concentration on single firms performance measurement, organisations are missing an opportunity to add value to the whole SC (Holmberg, 2000). According to Beyer (2010), the main reason for managers to focus on single firm is the incentive systems at organisational level, which will lead towards individual behaviour. Neglecting the customer focus in a pull SC where the customer is at the beginning of the SC is another major issue in SC performance measurement (Beyer, 2010). According to Chia, Goh and

Hum (2009), the result of a survey carried out among 113 respondent had derived that firms are yet focusing on traditional measures such as gross revenue, profit before tax and cost reductions. Authors further stated that non-tangible performance indicators from SC perspective, are neglected.

PMSs for SC are required to ensure better decision making and to communicate across the SC (Branice, 2013). Moreover, SC performance measurement would provide organisation with timely feedback information to improve the processes in SC. However, in order to optimize SC performance, the measurements need to be shared among all the SC members and work together (Cho et al., 2012). According to Chan, Qi, Chan, Lau and Ip (2003), a SC is not a single one to one firm rather it involves several integration and linkages with various parties forming complex relationships in an interrelated network. Further, the authors added that a firm will be required to get involved in many SCs but it is unlikely that all the divisions and departments of a firm would get involved in a SC in order to ensure integration. According to Gunasekaran and Kobu (2007), SC performance measurements and matrixes should be set in order to manage SC effectively. Hence, there is a need of an effective performance measurement system to evaluate performance of SC. The following section provides a comprehensive review on existing supply chain performance measurement system.

2.9.1 Supply Chain Performance Measurement Frameworks

When measuring SC performance, main question raise is the possibility of using traditional performance measures and if so which system should be given priority and considered in the current environment (Gunasekaran & Kobu, 2007). According to the authors, traditional measures and matrixes may not match the current environment due to heterogeneous activities. Yet, it is critical to measure SC performance for the successful operation of organisations (Gunasekaran & Kobu, 2007). However, several authors had used different approaches to measure SC performance in different industries. Traditionally, SC performance measurement had taken the form of financial measures such as return on investment, net present value, internal rate of return and payback but they are not suitable for modern SCM applications (Kocaoglu et al., 2013). Cho, Lee, Ahn and Hwang (2012), proposed a framework for service SC performance measurement of hotel industry. Authors had considered the three perspective such as service SC

operation, customer service and corporate management. Further, authors' stress on the importance of implementing PMSs in hotel's SC. Weighted Additive Model of SC performance was another system introduced by Theeranuphattana, Tang, and Khang, (2012) in which the authors had developed SC performance index, which range between the values of 0 to 10. Yet, the process looks to be complicated with the necessity of identifying swing weights, the partial value functions, and the current performance data of SC measures in order to compute the performance index. A theoretical framework had been developed by Sillanpaa (2015) mainly containing time, profitability, order book analysis and managerial analysis and had tested in a case of steel service centre. Gunasekaran and Kobu (2007), carried out a review based on articles published during the period of 1995-2004. The review findings revealed 90 performance measures in SCM out of which, non-financial measures comprise 65% of KPI and financial measures 35%.

The literature findings revealed the existences of numerous KPIs to measure SC performance. Gunasekaran and Kobu (2007) identified over 30 KPIs, Chae (2009) identified 15 KPIs, Anand and Grover (2015) identified over 90 KPIs and Lapide, (2000) identified around 100 KPIs. Therefore, developing a PMS is a daunting task considering the wide range of KPIs available in literature (Chae, 2009). In order to handle the situation, the authors such as Cai et al. (2009), Chae (2009) and McCormack, Ladeira, and Oliveira (2008) suggest that companies should look in to indicators, which are absolutely necessary to measure SC process. In terms of SC process, SCOR Model has been widely used in researches on performance measurement ever since it was introduced in 1996 by Supply Chain Council (Kocaoglu, Gulsun, & Tanyas, 2013). Several authors have highlighted the reasons behind the popularity of this model. Cai et al. (2009) stated that when key indicators are align against SCOR, it assists in determining performance and ensuring resource allocation. According to McCormack, Ladeira and Oliveira (2008), SCOR framework provide a scorecard approach for development of performance measures. Kocaoğlu et al. (2013) stated that SCOR process covers all the basic aspects requires to be demonstrated by PMS developed for SC. According to the authors, it is a process oriented, defined at executive and operational level, align to overall business objectives, could coves performance of overall SC process and could be used cross enterprise. According to Lockamy and McCormack (2004), the key process of SCOR contribute by greater extent to SC performance. Junior and Carpinetti (2019) stated that

utilisation of SCOR model enables global benchmarking of SC performance. Due to the popularity of SCOR model and supply chain process in SC performance related literature, the study subjected several studies undertook on supply chain performance measurement system based on SCOR model and supply chain process in to discussion.

2.9.2 Supply Chain Process Based Performance Measurement Systems for Supply Chain Performance Measurement

Utilizing KPIs in measuring SC performance enables a firm to identify the gap between the planned and actual performance during execution (Chae, 2009). The author further insists that SC process enables organizations to determining potential KPIs and had developed a set of KPIs for SC performance measurement under the categories of plan, source, production and delivery of SCOR, which reflects the SC process. The system developed by the author is presented in Figure 2.5.

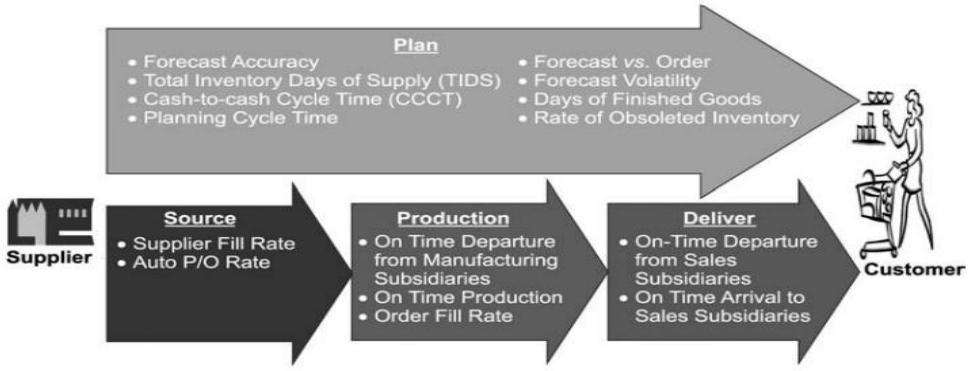


Figure 2.5: SCOR Model Based PMS
Source: (Chae, 2009)

Gunasekaran and Kobu (2007) had initially carried out an extensive literature review on available KPIs and concluded that 61% of the KPIs used in measuring SC performance are function based and only 42% of them are value based. The study had applied the identified KPIs to SC processes of SCOR, which were similar to the processes used by Chae (2009). However, the particular study had categorised the identified KPIs under financial and non-financial basis and findings are shown in Table 2.3.

Table 2.3: Supply Chain PMS Using SCOR Model

Phases in supply chain	Financial	Nonfinancial
Plan	Return on investment, selling price	Labor efficiency, perceived value of product, product development cycle time, bidding management cycle time, compliance to regulations, forecasting accuracy, perceived value of product, supply chain response time
Source	Scrap/obsolescence cost, inventory cost, selling price of goods and service	Labor efficiency, product development time, lead time for procurement including supplier development time, delivery reliability, product and service variety
Make	Scrap/obsolescence cost, overhead cost, inventory cost, selling price of goods/services, value added	Labor efficiency, Conformance to specifications, capacity utilization, lead-time for manufacturing, production flexibility, process cycle time, accuracy of scheduling, product and service variety, value added
Deliver	Overhead cost, value added, inventory cost, stock-out cost, transportation cost and warranty cost	Labor efficiency, Delivery reliability, perceived value of product, value added, product and service variety, perceived quality

Source: (Gunasekaran & Kobu, 2007)

Gunasekaran et al. (2001) identified key performance metrics in relation to SC process. The study had been based on literature review and the authors had identified KPIs to match five main sub-process of SC. The performance indicators had been developed for plan, make, source, deliver and customer satisfaction.

Olugu et al. (2011) mainly categorised the SC in to 3 distinctive categories as upstream, which focus on suppliers, midstream, which included the internal SC and downstream focusing on the customer. Based on the categorisation key performance measures had been developed in order to ensure seamless SC.

Maestcrini, Luzzini, Maccarrone, and Caniato (2017) concluded that SC performance measurement system could be developed under two categories of internal and external

SC. The author further divided external SC performance measurement system in to supplier performance measurement system, customers performance measurement system and many to many SC performance measurement system. However, by means of defining SC performance measurement system, the authors had looked in processes and relationships of internal SC and external SC.

Anand and Grover (2015) identified KPIs under resource optimization, transport optimization, inventory optimization and information technology. Although the study had not been extensively concentrated in SC process, it is evident that in literature a high degree of importance has been given to SC process in deriving the KPIs.

In terms of service SC perfromance measuremnt systems, Gong and Yan (2015) and Cho et al. (2012) had carried out studies on determining performance measures for service SC. Although these studies had not targeted on SCOR model as a process, consideration had been given to external process elements which comprise suppliers and customers and internal process. The indicators dveloped by Gong and Yan (2015) and Cho et al. (2012) on service SC has been summerised in Table 2.4.

Table 2.4: Service Supply Chain Performance Indicators

References / Component	Gong and Yan (2015)	Cho et al. (2012)
Corporate Management	• Average customer spend per visit per store • Total service delivery cost • Supplier pricing against market • Supplier cost saving initiatives • Rate of return on investment • Total cash flow time • Capacity utilization • Total cycle time • Productivity • Effectiveness of scheduling techniques	• Risk sharing • risk capacity • Information sharing level • The platform of information build level • Information technique level • Information accuracy • On-time information • Profit growth rate • Profit sharing level • Market share • Total logistics service cost • Pricing comparison
Service Supply Chain operation	• Service delivery • Customer query time • Flexibility (volume, delivery speed, specification) • Quality of service • Employee loyalty • Buyer–supplier partnership level	• Service delivery time • Customer query time • Ability to flexibly deal with orders • Quantity of logistics • service Employee loyalty

	• Quality of supplier's service level • The service order entry method • The customer service order path • Accuracy of forecasting techniques • Supporting service delivery lead time • Service order lead time	• Punctual completing rate of logistics • service Ability of logistics • after-sales Accuracy • forecasting techniques • Damage frequency • Level of logistics service
Customer Service	• Range of services • Customer satisfaction • Service capacity • Customer retention/loyalty • Customer relationship	• Range of services • Logistics service capacity • Customer satisfaction/loyalty • Rate of customer complaints • Customer relationship

2.9.3 Requirements in Forming Supply Chain Performance Measurement Systems

In developing PMS for SC, Kurien and Qureshi (2011), suggest to have a balance between the measures in the performance system. According to Tangen (2004), PMS developed should be derived from the company objectives for appropriate organisational directions. Kurien and Qureshi (2011) arrived at a list of characteristics that effect SC performance measurement. Balance between various performance measurements, focusing on long term and short term results, considering performance from various perspective at different organisational level are several such characteristics. In SC performance measurement, it is required to go beyond a single company and consider multiple entities and should serve the purpose of several firms including customer and suppliers (Maestrini et al., 2017). The system develop require data from several source, common performance measurement platform, sharing information among SC partners and collaborating strategies (Mokhtar, Genovese, Brint, & Kumar, 2019). Kocaoglu, Gulsun and Tanyas, (2013) identified few requirements of SC performance measurement matrixes. According to the authors, matrixes need to be process based, defined at executive and operational level, align to overall business strategies, cover the performance of entire SC process of the organisation and capable of using across enterprises. According to Gunasekaran and Kobu (2007), the measurement system should be balance, classified under strategic, tactical and operational levels and consider financial and non-financial measures. In contrary, Morgan (2007) discusses the barriers of effective SC performance measurement as "preoccupation with dyadic relationships and a lack of supply network focus and strategy, an inability of many organisations to create supply network visibility because of

technical and system problems, poor connections between marketing and supply network activities, and a general lack of managerial awareness of the need to engage the organisation's performance measurement system as a vehicle for organisational change (p.263)".

2.10 Importance of Facilities Management Supply Chain Performance Measurement Systems

Facilities Managers are under immense pressure to improve organisational performance in order to validate their success to wide-ranging stakeholder base (Kulatunga, Amaratunga, Haigh, & Baldry, 2005). According to Amaratunga, Baldry and Sarshar, (2000), the budgetary allocation for FM is around 30% to 40%, second in cost for payroll, which necessities the expected high performance from Facilities Managers. This view was further supported by Amaratunga and Baldry (2000) stating that performance measurement has become a regular and formal part of FM, given the substantial amount of assets and their operational costs. Facilities Manager could contribute to the performance of the organisation through strategy, culture, SCM and several other means (Amaratunga & Baldry, 2003). Thus, the need for a performance management in FM context is paramount (Amaratunga & Baldry, 2003). According to Kulatunga, Liyanage and Amaratunga (2010), performance measurement and management is a major tool that supports FM in meeting expectations of the organization. Further, when determining performance measurement for FM, it is important to view FM strategically, in which FM is allied to support the core objective of the business (Pitt & Tucker, 2008). According to the authors, performance measurement indicators developed for reception desk service in three facilities such as telecommunication, international bank and government security agency would vary based on the core objective. However, in order to satisfy various customers' needs of FM, it is paramount identify and measure KPIs (Amaratunga & Baldry, 2002). Currently, several PMSs had been developed in diverse fields by assimilating several concepts.

In a study carried out by Meng and Minogue (2011) on determining the most effective performance models to measure performance of FM, the authors concluded that KPI, BSC and the Business Excellence Model (BEM) are more suitable for FM performance measurements. Amaratunga and Baldry (2000) had developed a PMS to assess

performance of FM in higher educational organisation based on BSC approach. A performance measurement framework for FM organisation had been developed by integrating BSC approach by Amaratunga and Baldry (2002). Authors stress that the BSC approach had been able to merge FM performance indicators together with organisational performance spheres there by become an appropriate concept for FM. Madritsch and Ebinger (2011), developed a Built Environment Management Maturity Model by using the concept of capability maturity model in order to assess the performance of FM functions. The framework developed by Amaratunga, Haigh, Sarshar and Baldry (2002) to assess the FM performance in National Health Service in UK, had utilized BSC approach. The facilities management balance scorecard developed by Toni, Fornasier, Montagner and Nonino (2007) has taken an integrated form in which the concept of BSC and the service balance scorecard had been integrated to assess performance of FM in a medical service authority. It is evident that among the PMSs, which has been developed for FM, an integration between other approaches prevails.

When developing PMS in order to measure the performance of facility service SC, a multi-dimensional approach was recommended by Toni and Montagner (2009). The model developed by the authors reflect a balance architecture comprising financial and non-financial measures and had been utilised the BSC approach. The model had encompassed three level of measurements such as operational, tactical, and strategic levels. The model had incorporated the involvement and collaboration of the actors of the SC in enhancing performance and direct the actors towards a common objective (Toni & Montagner, 2009). The study of Toni and Montagner (2009), however, had not considered the overall FM domain but concentrate towards facility service. Further, the framework had not look in to inherent characteristics of a SC such as flows and relationships prevailing among multiple parties (internal customers, internal suppliers, external suppliers an external customers). Further, KPIs had not been developed covering broad spectrum of FMSC in hotels. This study therefore addresses the backdrop prevailing in literature and propose a PMS to assess FMSC performance.

2.11 Conceptual Framework

FMSC performance measurement is novel due to lack of researches in the area. However, measuring the performance of SC is not new. A wide range of literature highlights the importance given by researches in developing robust PMS to ensure SC performance. Therefore, in order to develop a PMS to measure FMSC performance, the prevailing literature on SC performance measurement was critically reviewed and conceptual framework was developed. The conceptual framework developed to facilitate the empirical investigation is presented in Figure 2.6.

The analysis carried out on SC performance measurement system definitions revealed the necessity of focusing on processes, relationships and activities undertook within SC in order to develop a PMS. Further, due to the availability of wide ranging performance indicators and due to the requirement of focusing on key indicators, many studies had given a significant importance to SC process. Moreover, it was evident that SCOR model was considered as a basis for many of the studies undertook on SC performance measurement system. Further, several authors such as Olugu et al. (2011) and Pasanen (2015) taking a leap forward had categorized the entire SCOR process in to upstream, mid-stream (internal SC process) and downstream. By considering the above findings the conceptual framework in Figure 2.6 was developed.

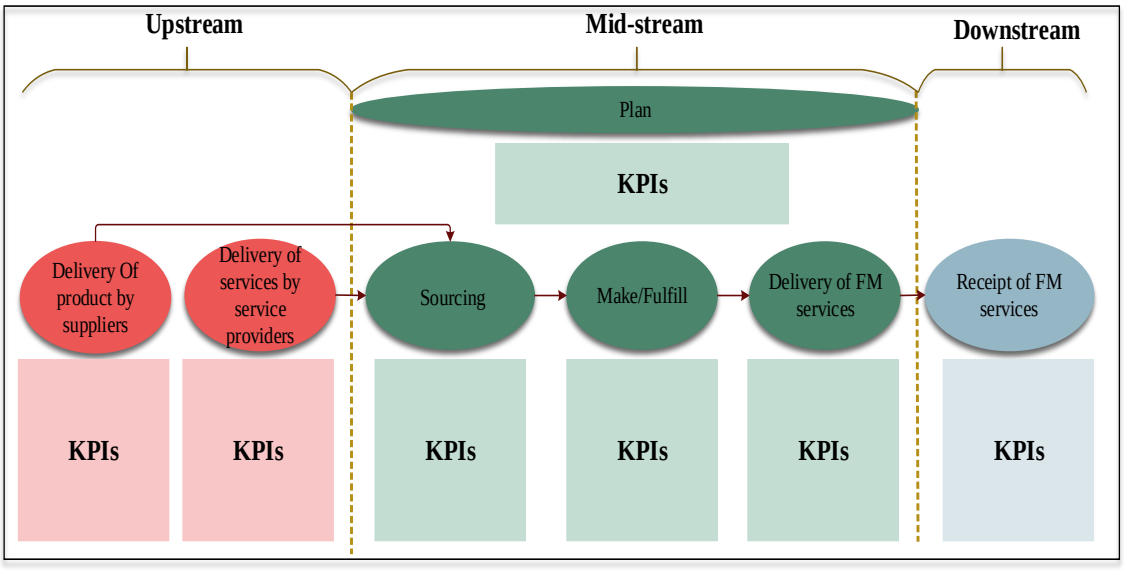


Figure 2.6: Conceptual Framework

In Figure 2.6, based on the findings of Barnard (2006), Heijden (2014), Olugu et al. (2011) and Pasanen (2015), delivery of product by suppliers and delivery of service by service providers were incorporated as processes occurred at the upstream.

Plan, source, make and delivery were considered as process occurred internal to the organisation by Olugu et al. (2011) and Pasanen (2015) and therefore considered as mid-stream. As shown in Figure 2.6, plan is spanning across the sub-processes 'source', 'make/fulfil' and 'deliver' since planning occurs during each process (Wang, Huang and Dismukes, 2004). However, along the sub-process 'make', which is highly relevant to product SC, the term 'fulfil' has been incorporated in to the conceptual model to reflect the findings of service SC. The sub-process 'delivery' in SCOR model has been termed as 'delivery of FM services' based on the opinion of Coenen and Felten (2014) and Heijden (2014). According to the authors, end user receives FM services delivered by the FM team.

As FM service is received by end user, the 'receipt of FM services' is incorporated as a sub-process at downstream, where interactions with customers are maintained.

Further, the conceptual framework provided a basis for empirical investigation by providing an avenue for KPI identification under each process.

2.12 Summary

The chapter initially reviewed literature on FM and FM functions. Then an in-depth understanding is provided on SC, SCM, and PMS for supply chain. Further, the literature review focused on identifying the linkage between FMSC and PMS and building a relationship between the two. Finally, a conceptual framework was derived by incorporating the key literature findings.

3 RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is a systematic way, which includes various steps to solve a research problem (Kothari, 2004). This research aims to develop a framework for facilities management supply chain performance evaluation. The methodology developed below provide a systematic way to achieve the research aim. Initially, the research process of the study is explained. Subsequently, the research approach undertook is presented, including the justification for selecting a particular strategy. Finally, the research method has been elaborated, which includes the data collection, analysis and interpretation techniques.

3.2 Research Process

"Research is conducted in the spirit of inquiry, which relies on facts, experience and data, concepts and constructs, hypotheses and conjectures, and principles and laws" (Amaratunga, Baldry, Sarshar, & Newton, 2002, p.8). According to Saunders et al., (2009), the research process comprises multiple stages undertook in order to address the research problem and would vary based on the research undertaken. The research process, which was used to carry out the study is presented in Figure 3.1 and discussed below.

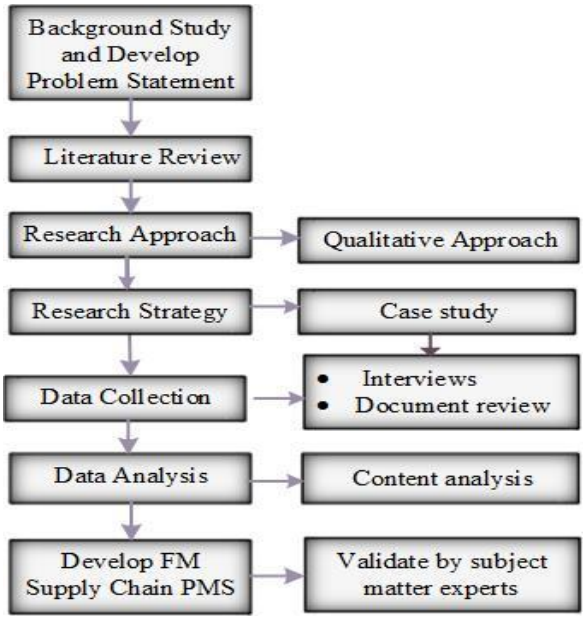


Figure 3.1: Research Process

3.3 Background and Problem Identification

Background study was carried out in chapter one, which lead the researcher towards identifying the current gap in research area. Through the background study, literature on FM, SCM and PMSs were reviewed, which directed the necessity of determining a PMS including KPIs to measure FMSC performance. Further, it was identified that there is a lack of a robust PMS developed to assess the performance of FMSC in Hotels. Therefore, the research aim was set to develop a framework for facilities management supply chain performance evaluation.

3.3.1 Literature Survey

A literature review was carried in align with the aim and objectives established in chapter one. An in-depth review was carried out on facilities management, supply chain management concept, facilities management supply chain and performance measurement system. This review provided a base to proceed with the study. The key findings extracted from the literature survey had been converted to a conceptual model, which was used as a guide in empirical investigation.

3.3.2 Research Approach

Creswell (2013), defined research approach as plans and procedures, which spans broad assumptions to detailed data collection methods, analysis and interpretations. Further, author had identified quantitative, qualitative and mix method approaches as the three different research approaches.

Quantitative approach involves collecting and analysing numerical data and application of statistical test (Amaratunga, Baldry, Sarshar, & Newton, 2002). According to Creswell (2013), quantitative approach facilitate inquiring and grasping the meaning behind social or human problem. However, the approach is been criticised for lack of explanation of reasons underlying a particular results (Walsh, 2003). Qualitative research is a field of inquiry, which cross cuts various “disciplines, fields and subject matter” (Denzin & Lincoln, 2008, p.3). According to Creswell (2013), qualitative approach is suitable for testing objective theories by investigative the association between variables. Mix methods approach incorporate both quantitative and qualitative research approaches (Taylor, Bogdan & Vault, 2015). According to Amaratunga, Baldry, Sarshar and Newton, (2002), the use of mix methods approach would provide more insight on the results and

assist in making inferences and draw conclusions. Abowitz and Toole (2009) stated that mix methods approach ensure reliability and validity of output.

The aim of the study is to develop a framework for facilities management supply chain performance evaluation. In order to peruse with the aim, the nature of the FMSC in terms of flows, participants, activities, relationships, process and challenges need to be identified. Further, the extent to which established performance model has been used in hotels need to be determined and KPIs were required to be identified in order to measure FMSC performance in hotels. In order to achieve the above, opinions and knowledge of experts are mandatory. It was further identified that a lack prevails in researches in terms of determining PMS for FMSC performance evaluation. Creswell (2013) stated that if limited researches had been carried out in the research area and if further investigation is required, qualitative approach is preferred. According to Baxter and Jack (2008), "qualitative study is an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources" (p.544). Yin (2011) had a similar opinion and stated that qualitative approach enable to explore more on emerging concepts through an in-depth investigation. Since, the investigation on FMSC performance measurement system should cover an in-depth exploration on FMSC flows, participants, activities, relationships, processes, challenges, current PMSs used and KPIs to evaluate FMSC performance, a variety of data sources were required. Hence, it was agreed that qualitative approach best suit the current study.

3.3.3 Research Strategy

Experiment, survey, case study, action research, grounded theory, ethnography and archival research were identified as main research strategies by Saunders, Lewis and Thornhill (2009). As the study was intended to explore the FMSC and develop a PMS to evaluate FMSC performance by incorporating KPIs, case study strategy was selected for the study.

3.3.3.1 Case Study

Simons (2009) defined case study as "an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program or system in a real life context" (p. 21). In order to develop a PMS to measure FMSC

performance, carrying out an in-depth study on FMSC, its process and identifying applicable KPIs is required. Therefore, case study was selected as the strategy to be utilized in progressing with the study. When carrying out case studies, it is important to determine the case study design.

3.3.3.2 Case Study Design

Case studies can be carried out as single or multiple case studies, in which single case studies are acceptable for rare or unique events and multiple case studies are preferred when similar or contrasting results due to predictable reasons are generated (Yin, 2013). In the current study, a multiple case study approach was selected to carry out the study as the results generated were not unique to a particular case and multiple case studies enhance the reliability of the PMS developed for FMSC performance evaluation in hotels.

Number of Cases

The next critical point is to decide the number of cases to be investigated in a case study. According to Yin, (2009), the possible cases under case study could be fall in to two to four or at a maximum ten to fifteen. Due to time restrictions and as data saturation was reached, the study was limited to three (03) case studies.

Unit of Analysis

It is important to determine the unit of analysis in a case study. In order to determine the unit of analysis, Baxter and Jack (2008) suggested to focus on the area required to be analysed for instance the process, individual, program and organisations. According to Berg (2001), "the unit of analysis defines what the case study is focusing on (what the case is), such as an individual, a group, an organisation, a city, and so forth" (p.231). As the current study focus on FMSC in hotels, the unit of analysis for the study was FMSC process. As it was determined that in order to develop a PMS for FMSC performance measurement, focusing in SC process is paramount.

Grunbaum (2007) identified four types of case study designs based on the number of cases and number of unit of analysis. According to the author, the four designs are congenital design, summation design, embedded design, and second level summation design and are presented in Figure 3.2.

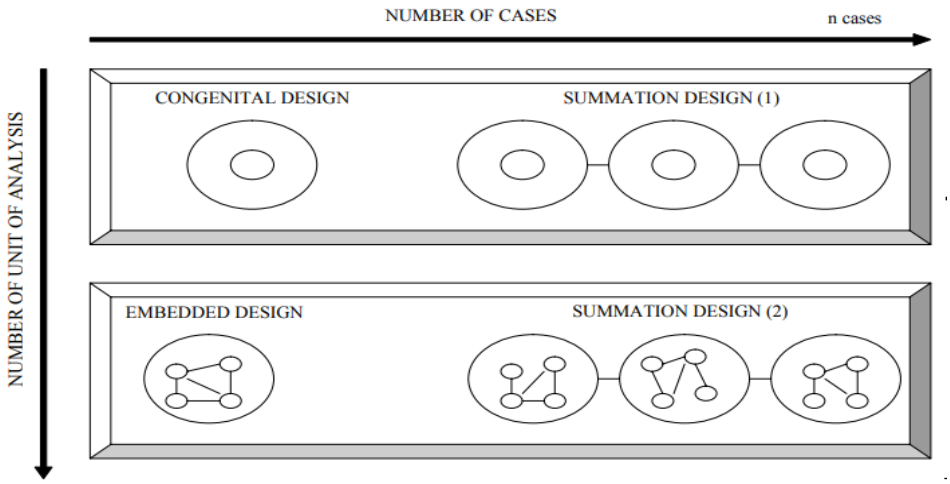


Figure 3.2: Case Study Design
Source: (Grunbaum, 2007)

Multiple case studies with several unit of analysis were deployed in the current study. Therefore, second level summation design was used for the study.

3.3.4 Data Collection Techniques

Several methods could be used in collecting data in case studies such as interviewing, observing, collecting, examining and feeling (Yin, 2011). The main data collection methods that were used in this research under case studies are interviews and document reviews.

Interviews

Semi-Structured interviews were carried out among professionals specialized in FM related functions and other disciplines in the case study organisation in order to get a greater insight on the study. Twenty one number of respondents were interviewed from various disciplines in three (03) five-star hotels.

In order to facilitate the process of data gathering, semi-structured data collection instrument was developed, which encompassed a platform to gather data from interviews and document review. Section one of the semi-structured data collection instrument focused on gathering background information from the case study. Section two provided an avenue to gather information on interviewed personnel and document reviewed. Section three of the semi-structured data collection instrument was developed to identify the current practices on FMSC and to identify current performance measurement systems

used to assess FMSC performance. Section four of the semi-structured data collection instrument facilitated in identifying the nature of FMSC in terms of SC parties involved, activities, relationships, flows, processes and challenges. Further, KPIs to measure performance of FMSC was also identified through the interviewing process. The semi-structured data collection instrument is given in Appendix A.

Documents Reviewed

Document review involves the process of systematically evaluating the documents (Bowen, 2009). Document review facilitated the study by enabling a broader picture on practices and procedure that is been carried out in the organisations in terms of FMSC and performance measurement of FMSC. Documents such as policies, procedures, evaluations, agreements, financial reports, sustainability reports, sourcing policies and supplier's code of conducts were reviewed during the case studies.

3.3.5 Data Analysis Technique

Wahyuni (2012) stated that content analysis is the common approach used to analyse qualitative data. Gathered data from case studies were analysed using manual code based content analysis and N-Vivo software.

3.3.6 Expert Validation

The process of taking ideas, feedback and recommendations is considered as expert validation (Dorussen, Lenz, & Blavoukos, 2005). In order to obtain feedback and recommendation on the developed PMS to assess FMSC performance, 3 subject matter experts from another three (03) five star hotels were interviewed. The final PMS developed incorporates the recommendations made by the experts.

3.4 Summary

This chapter provides a detail view on research methodology carried out in this study. The research approach used to carry out the study was qualitative approach. Under qualitative approach, case study was selected in order to get an in depth understanding on FMSC and derive a PMS to evaluate FMSC performance. Interviews and document review were used in the selected cases in order to gather relevant data. Semi-structured data collection instrument was used to support this task. The collected data was then analysed using content analysis in order to develop a PMS for FMSC.

4 DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents data analysis undertaken in order to achieve the objectives and arrive at conclusions. The main data collection method used was case studies. Three (03) five-star hotels were selected for the case studies. Within the case studies, interviews and document review were used as the main data collection techniques. The data collected through multiple means was analysed through content analysis in order arrive at conclusions.

4.2 Case Study Profile

As the study required an in-depth investigation, case study strategy was considered as the most suitable method to carry out the research. Hence, a detailed enquiry was undertaken in three (03) leading five star hotels situated in Colombo to develop the FMSC and FMSC process, to determine the current practices in FMSC performance measurement, to identify suitable KPIs to measure FMSC performance and to finally develop a PMS to evaluate FMSC performance in hotels. The overview of the case study profile is given in Table 4.1.

Table 4.1: Case Study Profile

Criteria	Case Study A	Case Study B	Case Study C
Ownership of the organisation	Privately Owned	Privately Owned	Privately Owned
Star rating of the hotel	5 Star	5 Star	5 Star
Number of rooms	• 466 luxurious rooms • 41 serviced apartments	• 229 luxurious rooms • 7 suites	• 176 luxury apartments • 12 executive rooms

Criteria	Case Study A	Case Study B	Case Study C
Other facilities	• Restaurants and bar facilities • Conference rooms • Banquet halls • Parking facilities • Swimming pools • Laundry • Spa facilities • Gymnasium	• Restaurants and bar facilities • Conference rooms • Banquet halls • Parking facilities • Swimming pools • Laundry • Spa facilities • Gymnasium	• Restaurants and bar facilities • Conference rooms • Banquet halls • Parking facilities • Swimming pools • Laundry • Spa facilities • Gymnasium
Number of employees	400	370	350
Standards the hotel comply with	BOI requirements	BOI requirements	BOI requirements

4.2.1 Interviews

During the background study and initial stages of interviewing process, non-prevalence of designated FM divisions in hotels were identified. In fact, FM functions are been undertook by several other departments in the hotel. Therefore, in order to determine the FMSC and to identify KPIs, the importance of covering all the departments, which undertake FM related functions and the key departments that closely interact with functions related to FM were identified. The profile of respondents subjected to interviewing is presented in Table 4.2.

Table 4.2: Profile of Interviewees

Case	Respondents	Experience/ Role in FMSC
Case A	A1: Chief Engineer	• 12 years of experience • Ensuring the service delivery process efficiency with relation to engineering function
	A2: Housekeeping Manager	• 15 years of experience • Collaborating and overseeing product delivery requirements • Planning for future demand in housekeeping
	A3: Security and Transport Manager	• 20 years of experience • Planning for outsourcing and in housing components of security services • Collaborating with finance and human resources functions
	A4: Finance Manager	• 15 years of experience • Planning service and products procurement

Case	Respondents	Experience/ Role in FMSC
		• Maintaining formal relationships with suppliers • Maintaining agreements and records related to suppliers
	A5: Human Resource Manager	• 14 years of experience • Planning and supplying required human resources for FM functional services
	A6: Front Office Manager	• 13 years of experience • Maintaining formal relationships with customers of FM functional services • Maintaining records and tracking performance of FM functional services provision
	A7: Manager-Stewardship	• 10 years of experience • Planning for culinary needs • Maintaining contacts with engineering unit for technical reports
Case B	B1: Deputy General Manager-Engineering	• 16 years of experience • Introducing process improvements for service delivery • Developing new supplier contacts and maintaining good relationships
	B2: Director Housekeeping	• 25 years of experience • Planning for future demand in housekeeping • Providing training in relation to services provision
	B3: Security Manager	• 15 years of experience • Planning for outsourcing and in housing components of security services
	B4: Finance Manager	• 18 years of experience • Planning for service and products procurement • Maintaining formal relationships with suppliers • Maintaining agreements and records related to suppliers
	B5: Human Resource Manager	• 11 years of experience • Planning and supplying required human resources for FM functional services
	B6: Front Office Manager	• 09 years of experience • Maintaining formal relationships with customers of FM functional services • Maintaining records and tracking performance of FM functional services provision
	B7: Banquet and Event Manager	• 11 years of experience • Maintaining good customer relationships
C	C1: Chief Engineer	• 18 years of experience • Collaborating with purchasing team to ensure quality supplier section

Case	Respondents	Experience/ Role in FMSC
Case C		• Planning and forecasting product and service requirements
	C2: Housekeeping Manager	• 14 years of experience • Collaborating and overseeing product delivery requirements • Provision of training to ensure quality of service delivery
	C3: Safety and Security Manager	• 12 years of experience • Planning for human resource components to be outsourced
	C4: Finance Manager	• 19 years of experience • Handling procurement of goods and services • Maintaining supplier relationships
	C5: Human Resource Manager	• 20 years of experience • Planning and supplying required human resources for FM functional services
	C6: Assistant Director Food and Beverage	• 22 years of experience • Maintaining collaboration with FM functional units to ensure seamless service delivery
	C7: Front Office Manager	• 7 years of experience • Maintaining formal customer relationships • Maintaining records and tracking performance of FM functional services provision

The demographic profile of the respondents based on the involved functions is presented in Figure 4.1.

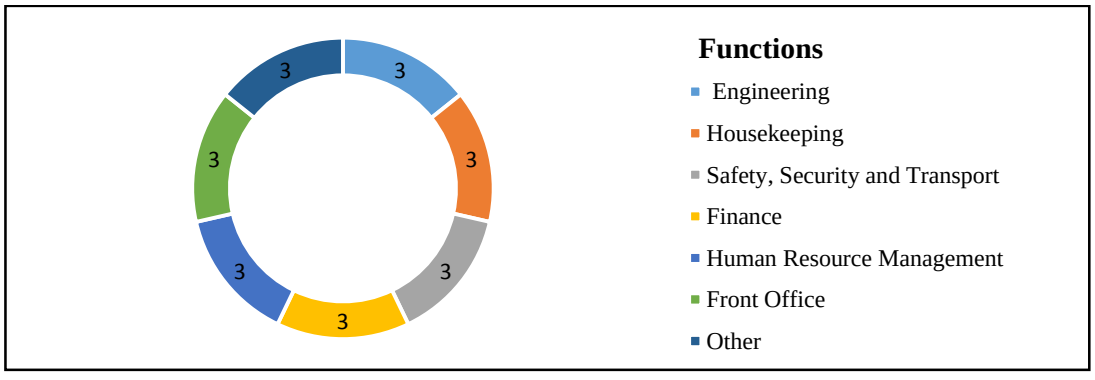


Figure 4.1: Demographic Profile of Respondents Based on the Involved Functions

Based on the Figure 4.1, respondents represents the backgrounds of engineering, housekeeping, safety, security and transport, finance, human resource, front office. The

other category includes respondents from the background of stewardship, banquet and event management and food and beverages.

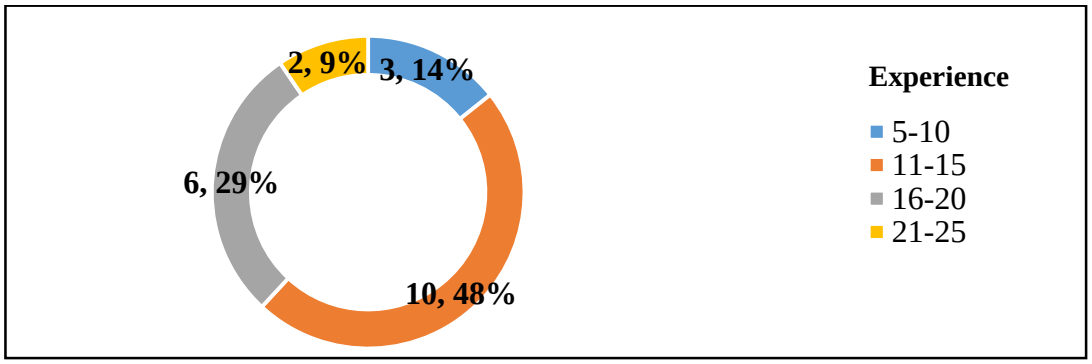


Figure 4.2: Demographic Profile of Respondents Based on Experience

Based on Figure 4.2, respondents with the experience between 11-15 years formed the majority (48%) of the respondent base, followed by respondents with 16-20 years' experience (29%), 5-10 years' experience (14%) and 20-25 years' experience (9%).

4.2.2 Documents Reviewed

Several documents were reviewed in order to identify the current practices in FMSC and to identify performance measures used in assessing FMSC performance. The documents reviewed, the purpose and objective covered is presented in Table 4.3.

Table 4.3: Documents Reviewed

Documents reviewed	Purpose	Objectives covered
• Service agreement • Standard operating procedures • Policies and audit tools	To identify Parties, information flow, service flow, finance flow, processes, activities involved in FMSC	Objective 2
• Financial reports • Sustainability reports • Sourcing policies • Suppliers code of conducts • Complaint handling procedures and systems	To identify current performance measures used in assessing FMSC performance	Objective 3

The document review process enabled the study to clarify areas requiring in-depth exploration and fine tune the opinions provided by the respondents.

4.3 Research Findings

The data collected from interviews and documents reviewed were analysed in order to arrive at research findings addressing each objective of the study. The findings of the study are presented in the following sections.

4.3.1 Activities, Participants, Flows and Relationships in Facilities Management Supply Chain

Questions on the SC activities performed under the function, parties and organizations involved along the SC of the function and the types of information, service and product flows incurred between the parties who undertake the function were mainly asked from respondents in order to determine the activities, participants, flows and relationships in FMSC. Respondents from case study organisations agreed that FMSC could be divided in to three distinctive phases such as upstream, mid-stream (internal SC) and downstream. Therefore, the data gathered from interviews were analyzed based on these categories. The following section presents findings on activities, parties, flows and relationships at upstream, mid-stream and downstream of FMSC.

4.3.1.1 Upstream Activities, Participants, Flows and Relationships

All the respondents who are engaged in FM related functions such as engineering (A1, B1 and C1), housekeeping (A2, B2 and C2) and safety, security and transport (A3, B3 and C3) expressed that at the upstream the main activities involved are the purchase of products and services from suppliers. Further, the opinion of respondents from finance background such as A4, B4 and C4 were on par with the opinion of professionals engaged in FM related functions. Respondent A4 stated that *"upstream of a SC deals with product and service purchasing. It involves all the interactions made by the supplier with the organization".*

Respondent A4, B4 and C4 agreed that the supplier base for many city hotels are similar, apart for few branded items supplied by international suppliers. According to the views of the respondents from cases A and C, this supply base could be mainly clustered under two groups as domestic suppliers and international suppliers. However, B1 identified subsidiaries from the same organization as another supplier category. According to B4, *"having our own suppliers provides us more flexibility and reliability. Many of our*

suppliers supply for other city hotels". Based on the opinion of respondents it was identified that at upstream the main suppliers involved are manufactures, suppliers of machinery and equipment, suppliers of building services, chemical suppliers, spare parts suppliers, flower suppliers, suppliers of laundry chemicals and cleaning, security providers, suppliers of energy efficient equipment and suppliers of room amenities.

Service required, product required, item specifications (item required, brand, model) and terms and agreements were identified as main information shared between the parties. This was further evident during the document review process. All respondents from engineering, housekeeping, safety, health and transport, finance and human resource backgrounds agreed that at upstream, the main finance flow involved was the payment made to suppliers and service providers in obtaining services such as consultation, service provided by equipment manufacturers, service provided by third party contractors, security service and cleaning service. The product flow included engineering tools, office equipment, office furniture, building service, chemical, spare parts, room amenities and linen.

In terms of relationships, it was evident in all three (03) case study organisations, formal and informal relationships are been built between suppliers and service providers. Respondent A1 stated that *"in undertaking the upstream activities, a formal relationships prevails between purchasing division and supplier as agreements are formed between the two. However, it is common for the relevant departments to maintain communication with service providers critical for their functions. At that instance informal relationships are created between the two".* However, in order to maintain contact with suppliers at upstream level processes are required to be under taken at mid-stream level. This is discussed under section 4.3.1.2 under mid-stream of FMSC. Carrying out maintenance and repairs by service providers, delivery of products ordered and provision of security services were identified as main activities undertook by suppliers and service providers at upstream level.

From the discussion it is evident that at upstream level the main activities involved include delivery of services and products, purchased through formal and informal relationships. During the process information is shared and a cash flow occurs. The summary of activities, participants and flows at upstream level is presented in Table 4.4.

Table 4.4: Upstream Activities, Participants and Flows

Participants	Activities	Information flow	Finance flow	Service flow	Product flow
• Manufactures, suppliers of machinery and equipment • Suppliers of building services • Spare parts suppliers • Contractors • Consultants • Chemical suppliers • Suppliers of energy efficient equipment • Suppliers of room amenities • Flower suppliers • Suppliers of laundry chemicals and cleaning detergents • Suppliers of daily consumables • Linen suppliers • Security providers	• Carry out maintenance and repairs by service providers • Delivery of products ordered • Provision of security service	• Service required • Product required • Item specifications (item required, brand, model) • Terms and • agreements	• Expenses on supplies and services	• Consultation • Service provided by equipment manufactures • Service provided by third party contractors • Security service • Safety • Cleaning service	• Engineering tools • Office equipment • Office Furniture • Building services • Chemicals • Spare parts • Amenities • Linen

4.3.1.2 Mid-Stream Activities, Participants, Flows and Relationships

Respondents from (A1, B1 and C1), housekeeping (A2, B2 and C2) and safety, security and transport (A3, B3 and C3), finance (A4, B4 and C4) and human resource (A5, B5 and C5) backgrounds agreed that in the mid-stream, collaboration between internal functions will occur to ensure final customer satisfaction. This process comprises internal customers and internal suppliers. The mid-stream of FMSC would be analysed by considering the interaction with FM functional units (engineering, housekeeping, safety, health and transport) and non- functional units (finance, human resource, front office, stewardship, kitchen, sustainability, marketing, IT, banquet and event management and food and beverage) who play the role of internal customer and internal supplier. The analysis comprise activities, service flow, information flow and finance flow occurred between the internal suppliers and internal customers at mid-stream. Further, relationships built between the parties at the mid-stream level has been subjected to analysis.

Procedure for purchasing goods and services

All the respondents related to engineering, housekeeping, safety, health and transport, finance, human resource, front office, stewardship, banquet and event management and food and beverages were in consensus on the procedure for purchasing products and services. Accordingly, when a product or service is required by a particular function, the particular parties' responsible for the function should inform the purchasing division. Subsequently, the purchasing division call for quotations and select the suppliers with the involvement of heads of the department. However, for technical and mechanical items ordered by other departments, the approval of engineering head is required. After analyzing the quotations the purchasing team would select the best supplier and form agreements. Respondent B4 stated that *"when any department needs a service or product to be purchased by outside, they have to go through purchasing team. At certain instances, the individual departments could recommend supplier who best fits for the purpose. However, quotations would be called and the quotation that best meet the criteria of price and quality would be selected. The purchasing division would be handling all the required legal aspects such as terms and conditions in agreements and handover to engineering".* Further, respondents A1, A4, B1, B2, B4, C1, C3 and C4 noted

that supplier evaluations are carried out in order to ensure that suppliers and service providers meet required standards. In addition, respondents B4 and B1 identified that when mechanical and electrical items are been procured, engineering department should provide approval for such procurement after a technical analysis. Respondent C1 commented that *"for instance, when the gym requires an exercise machine, the operators would be more proficient about the required model, speed and all. But, what if they procure a machine with 3 phases for a place where a 2 phase connection is available. So from operations and maintenance perspective, we are responsible to make sure that the product is technically suited".*

Relationships and flows between FM functional units

In terms of the relationships among FM functional units, respondents in engineering, housekeeping and stewardship (A1, A7, A2, B1, B2, C1 and C2) from all the cases noted that operations and maintenance function in engineering have a strong formal relationships with the functions of room cleaning, public area cleaning under housekeeping and kitchen stewarding under kitchen. As for room cleaning and public area functions under housekeeping, B1 opinion was that *"they are the main functions that interact with the facility on daily basis. They are the people who spot issues such as damaged floors, walls and so many other things on daily basis and communicate with the relevant team".* Manager-Stewardship from case A noted that maintenance and operations as a backbone of their function. He further, stated that in order to proceed with cooking, the equipment needs to be in good condition. Timely maintenance is therefore paramount. Further, respondents from all the disciplines agreed that a formal relationships prevails among all the departments due to the organizational structure and the hierarchy.

In terms of information communicated between the parties, it was identified complaints and issues, items specifications shared with the department when there is a need of purchasing electrical or mechanical items and information on assets maintained, which is required by engineering department. Service includes repair and replacement, consultancy service provided when an equipment is intended to be purchased and service provided in collaboration with outsourced service provider. In relation to finally identified service, respondent A1 added *"even though the service is performed by outsourced party, our department should make sure that the service is adjusted and*

provided in a manner that meet customer expectations. As it is a service that particular department gets through engineering department, automatically could be considered as service fulfilled by us". Respondents further noted that *"as we needed spare parts to replace item, the products circulated would be spare parts".*

Respondents A1 and B1 identified that for the functions of energy management, water management and chemical management performed under engineering the main connection lies with the group sustainability team. The information shared would be on energy, water and chemical data concerned on usage patterns and in return the group team would set targets and share recommendations to meet the goals. All the respondents agreed that the savings obtained from such recommendations could be considered as cash inflow incurred between the participants.

Relationships and flows between FM functional units and other units

In terms of interaction between safety, security and transport department and other FM functional units (housekeeping and engineering) and non-functional units, no strong relationship exists as per respondents C2 and B3, as no daily interactions happen. The same opinion was provided by other respondents from safety, security and transport and housekeeping discipline (A3, B3, and C3). According to respondent B3, *"on off complaints and service requirements could arise during which information such as the complaint related issues, time and date, service required and progress of service would be shared".* Respondent C3 noted that *"security department oversees the security of the entire premises. However, we don't have to interact frequently with FM functional units".* Respondents identified that complaints (issue, place and time), service required and progress of complain and service and information on audits (findings, issues, recommendations) as main information shared among the parties, whereas, security, safety and car parking service were identified as the service flown throughout.

In terms of the finance flow occurred at mid-stream the savings from recommendations made for water and energy, expenses paid for suppliers and service providers and compensation paid to guests or internal customers were suggested. A1 stated that *"we budget the upcoming expenses at the beginning of the year. So all our purchases are covered through budgetary allotments".* Repair, replacement service, car parking service

and consultation was considered as main service flows by respondents, whereas the products purchased at upstream were considered to be applicable at mid-stream level.

It was evident in the case studies that formal relationships are been built between FM functional units and non-functional units while undertaking day to day activities. Respondents expressed their views on relationships such as A1 stated that *"at mid-stream, all the FM functional units meets the requirements of internal departments and similarly obtain supportive services from those departments".* However, all the respondents were on par with the idea that formal relationships are built at mid-stream in FM supply chan. In summary, it is apparent from the analysis that

- ✓ No designated FM department to oversee FM functions. FM function are overseen by FM functional units
- ✓ Non-FM functional units (IT, Food and Beverages, kitchen, HR, sustainability, front office and marketing) will act as internal customers and internal suppliers developing formal relationships.
- ✓ The activities undertook a mid-stream are planning resource requirements, supportive services provide by other departments to deliver FM services (provision of employees by HR, allocation of funds, carrying out internal audits, sharing information on assets by other departments, data sharing by other departments), requests made by other departments on FM services and provision of FM service and provision of room amenities.
- ✓ During undertaking such activities a range of information is been shared among participants such as information on agreements, data, audits, procedures, workforce and assets.
- ✓ The services provided by internal customers includes repair, replacement service, car parking service and consultation.
- ✓ In terms of the product flow, the products procured at upstream level is been utilised at downstream level too.
- ✓ Finance flow include payments made for suppliers, compensation givens for effected parties and savings obtained from energy efficient products

The summarised findings of the above discussion is presented in Table 4.5.

Table 4.5: Mid-stream Activities, Participants and Flows

Participants	Activities	Information flow	Finance flow	Service flow	Product flow

• Internal suppliers and Internal customers (FM functional units and no-FM functional units)	• Planning resource requirements
	• Evaluate and select suppliers/service providers
	• Renew service agreements and building service certificates
	• Supportive services provide by other departments to deliver FM services
	  • 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
	• Provision of FM service
	• Provision of amenities
		• Technical analysis report
		• Terms and agreements
		• Tender information
		• Data on energy, water and chemicals (consumption,
		• Evidence during disciplinary actions
		• Information on audits (findings, issues, recommendations)
		• Information on workforce (carder, training undertaken)
		• Fire safety procedures
		• Information on assets maintained
			• Payment made to suppliers
			• Savings on energy, water and chemical
			• Compensation made to customer/employees
				• Repair, replacement service
				• Car parking service
				• Consultation
					• Engineering tools
					• Office equipment
					• Office Furniture
					• Building services
					• Chemicals
					• Spare parts
					• Amenities
					• Linen

4.3.1.3 Downstream Activities, Participants, Flows and Relationships

Operations and maintenance, energy management and water management are among the functions undertaken by engineering department in all the hotels. Respondent from case C, C3 added that *"basically the engineering division of a hotel looks in to hard FM where as soft FM is looked by housekeeping and safety, security and transport departments*". According to the respondents A1, B1, and C1, there are few ways that a guest complaint on breakdowns related to civil, mechanical, electrical, fire systems or water, energy and chemicals related issues could be forwarded. One such method is through front office service center. All the respondents agreed that this is the most common way and the point where formal relationship is built. The other respondents from housekeeping and safety, security and transport were align with the formal complaint generation process. However, according to respondents A2, B2, C2 and C6 functions such as room service under food and beverages and public area and room cleaning divisions under housekeeping, have to engage with customers more so there are chances that they get customer complaints. On such instances they directly communicate to related department forming informal relationships. In housekeeping, Respondent C2 elaborated on the process of guests' complaints. *"When a guest requires a service or product he usually calls the service center and from the service center the requirement would be directed to housekeeping. At certain instance, guests inform the room cleaning service or room service. In such an instance, the service center has to be informed of requirements and the requirements would be met by the department".* A similar scenario was witness in safety, security, and transport where the gust could complaint formally to service centre or complain to an employee in car park as an example respondent A3 stated that *"in safety, security and transport apart from calling the call center, since the department is in charge of car parking, there are chances where customer could compliant to employees at car park. Even in such an instance, the call center operators have to be informed of any requirement".*

In term of information flow occurred between the participants, information such as complaints (issue, place and time), service required and progress of complain and service were shared among parties. Respondent A2 added that "*during complaint handling process, information such as issues or requirements, place, time informed are*

communicated by the service center and the issue acknowledgment and rectification are shared with service center by the relevant team". Respondents from all the FM related disciplines such were in line with the opinion of the respondents.

In terms of finance flow payment made by the guests during their stay and the any compensation made to guests due to failures in safety was noted by respondents. B1 stated that *"the payments made due to the fault safety expectation could be considered as a penalty for a particular department"*.

In terms of service received, the services procured by outsourced parties and provided by in-house teams were considered as main services received by the guests. These services include consultation, service provided by equipment manufacturers, service provided by third party contractors, security service, safety, cleaning service and car parking service. The products purchased at upstream, such as engineering tools, office equipment, office furniture, building service, chemical, spare parts, amenities and linen are flown to downstream until the final internal and external customer requirements are met. However, according to the opinion of respondents a return of products could occur if the expectations of the customers are not met. The above discussed opinions on downstream of FMSC activities, parties and flows is summarized in Table 4.6.

Table 4.6: Downstream Activities, Participants, Flows and Relationships

Participants	Activities	Information flow	Finance flow	Service flow	Product flow
• In-house Guests • Outside-guests • Waste Collectors • Neighbours	• Informing service requirement	• Customer satisfaction • Complaints (Issue, place, time) • Service required • Progress of complain • Products required	• Receipt of compensation	• Receipt of outsource services • Receipt of in-house services	• Products procured at upstream • Return of product

4.3.2 Facilities Management Supply Chain in Hotels

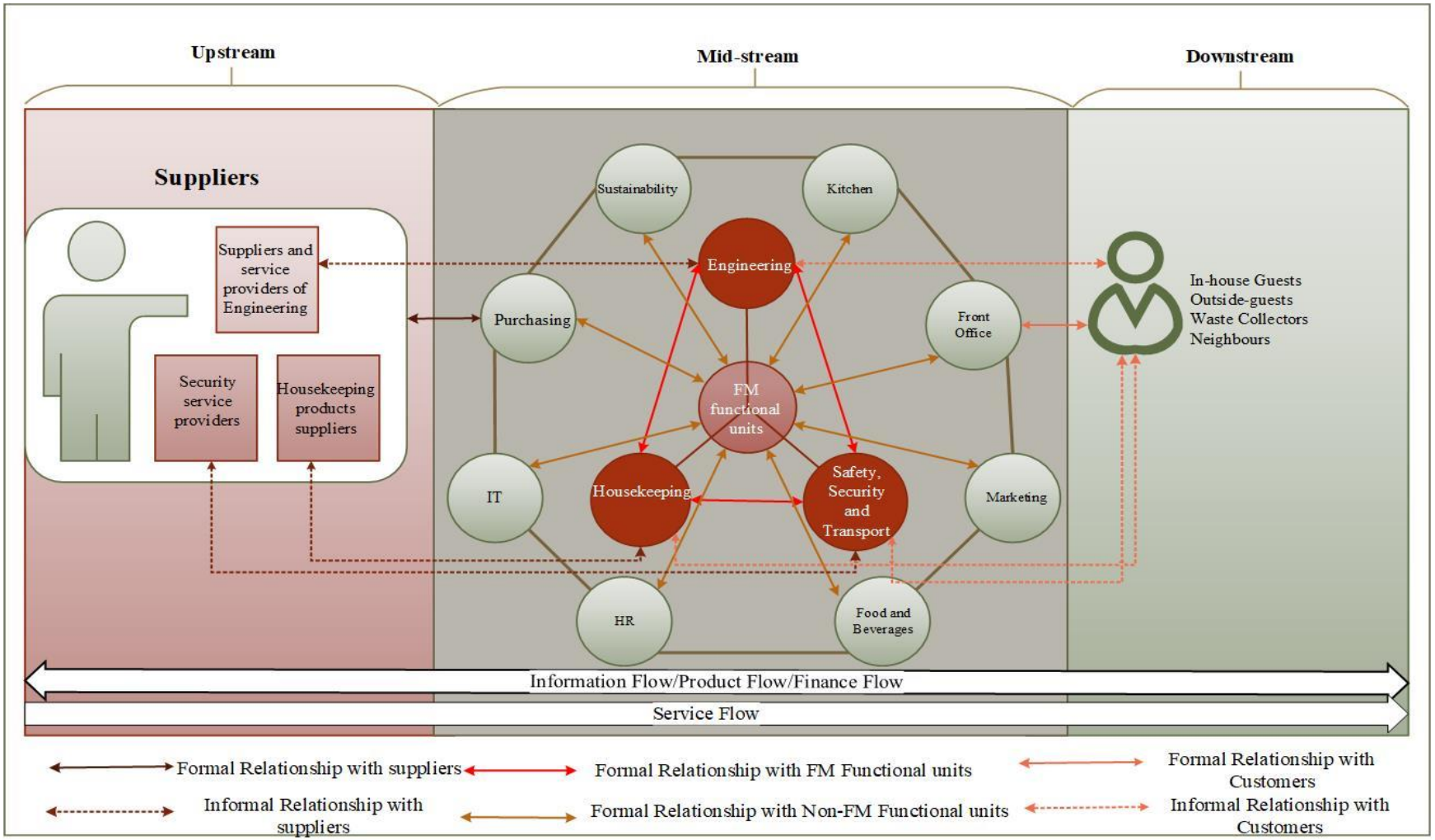
The detailed analysis carried out on FMSC enabled the researcher to develop a detailed FMSC for hotels. According to respondent A3, *"FM supply chain is not straightforward as in a manufacturing supply chain setting, due to multiple suppliers and multiple customers".* C3 stated that *"FM supply chain is more like a network where several interactions at upstream, mid-stream and downstream are required".* Therefore, by analyzing the activities, parties, flows and relationships undertook in FMSC, the SC of FM could be presented as in Figure 4.3.

Overall in FMSC, complaints are required to be made through call centers. This gives rise to a formal relationships due to the availability of a record of the particular issue. However, informal relationships could be generated when a guest requests a particular team member to rectify an issue due to the trust, well known or due to daily interactions. Purchasing division handles the procurement process of entire premises. Therefore, the connection between purchasing division and FM suppliers become formal. However, it is paramount for FM functional units to maintain contact with suppliers and also make sure the delivered items are technically appropriate for which informal communications would have to take place building an informal relationship between the parties. The relationships built with suppliers, guests and internal departments have been presented by two way arrows as a connectivity is built between the parties. As presented in Table 4.7, the information, product and finance flows are bidirectional as they occur in both directions. However, service flow is unidirectional as there is no return. The opinions of respondents on the flows in FMSC are presented in Table 4.7.

Table 4.7: Information, Product, Finance and Service Flow of Facilities Management Supply Chain

Flows	Explanation	Direction
Information flow	Shared in both ways among multiple parties	Bidirectional
Product flow	Product purchase and return	Bidirectional
Finance flow	Payments for suppliers and savings from purchases. Compensation for guests	Bidirectional
Service flow	Services procured cannot be returned	Unidirectional

Figure 4.3: Facilities Management Supply Chain of Hotels



4.3.3 Facilities Management Supply Chain Process

In order to determine the FMSC process, respondents were questioned on the current FMSC process adhered in hotel. Further, the main activities undertook in FMSC, identified in section 4.3.1 assisted the researcher to define the FMSC process in a more detailed manner and fine tune the conceptual framework (Figure 2.6). The main processes included in the conceptual framework were delivery of products and services by suppliers/service providers, source, make/fulfil, delivery of FM services and receipt of FM services. However, during the empirical findings several other process components relevant to FMSC were added. Mid-stream processes were agreed by all the respondents as plan, source, make/fulfil and deliver. However, respondents noted that planning is undertaken during each and every sub-process, therefore is not required to consider as a separate sub-process (as depicted in Figure 2.6) in FMSC process. At the downstream receipt of products was added by respondents as a sub-process in FMSC process. Respondents noted that as the housekeeping department overlooks the delivery of amenities to room, office and common areas, receipt of products by customers forms a sub-process of FMSC process. Therefore, all the respondents from FM functional units (A1, A2, A3, B1, B2, B3, C1, C2 and C3) agreed that FMSC process comprise 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. The process and activities identified under each process by the respondents are presented in Table 4.8.

Table 4.8: Facilities Management Supply Chain Process and Activities

FMSC Process	Activities
Delivery of product by suppliers	• Delivery of products ordered
Delivery of services by service providers	• Carry out maintenance and repairs by service providers • Provision of security service
Source	• 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

FMSC Process	Activities
	• Purchase and install energy efficient and water efficient equipment and system

Make/ Fulfil	• Planning resource requirements
	• Supportive services provide by other departments to deliver FM services
	  ○ 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

Delivery of FM services and products	• Planning the process of delivery • Provision of FM service • Provision of amenities
Receipt of FM services	• Informing and provision service requirements
Receipt of products	• Informing and provision product requirements

Based on the Table 4.8 the overall FMSC process was developed and presented in Figure 4.4.

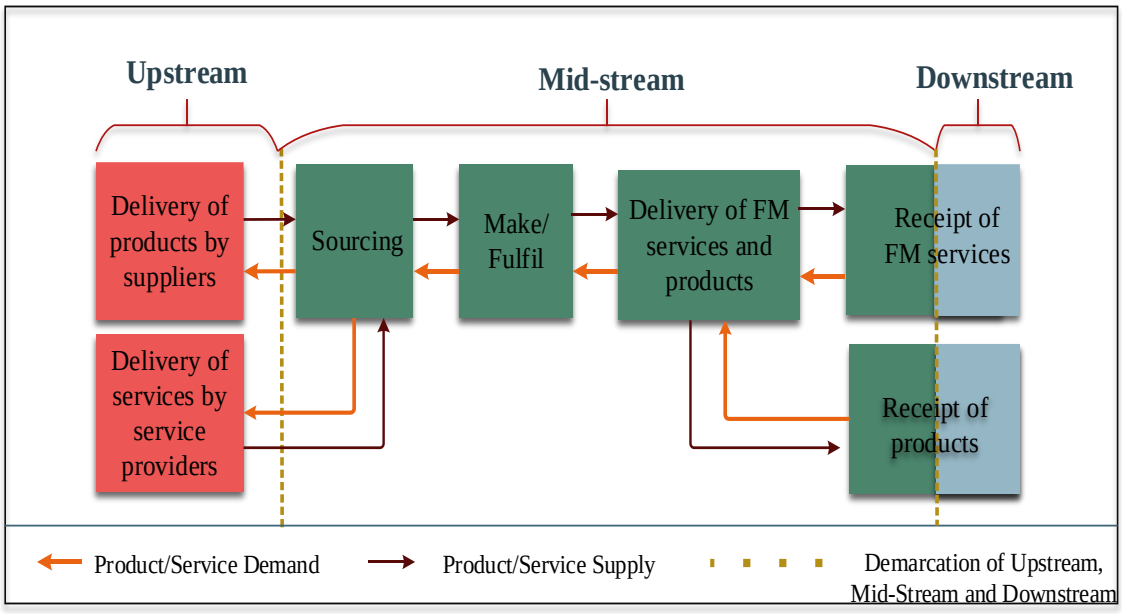


Figure 4.4: Facilities Management Supply Chain Process

According to Figure 4.4, product and service delivery were considered as process occurred at upstream level. The mid-stream processes included source, make/ fulfil and delivery of FM services and products. A Facilities Managers responsibility lies in meeting internal and external customer requirements. Therefore, it was agreed that receiving of FM functional services and products occur at both upstream and downstream levels. In addition, respondents A4 and B4 stated that in order for the FMSC process to operate there should be a demand for product/ services and supply of product/service. Arrows in the Figure 4.4 reflects the demand and supply of product and service. A detailed explanation on each sub-process is provided below.

Delivery of Products by suppliers and Services by Service Providers

Respondents from engineering (A1, B1 and C1), housekeeping (A2, B2 and C2) and health, safety and security (A3, B3 and C3) agreed that delivery of product and services by suppliers occur at upstream level. According to the respondent B4 *"at upstream the process involves the delivery of service and products. Here the suppliers deliver or supply the product requested through the purchasing process, which occurs at mid-stream".* The activities identified during the stage, which were clustered under the process were maintenance and repairs carried out by service providers, delivery of products ordered and provision of security service.

Sourcing

According to C4, souring involves all the processes undertook to purchase of product or service. Respondent A4 stated that *"the process of purchasing happens within the boundaries of the organization, this is where we decide on the suitable supplier and form agreements"*. A similar opinion was provided by the respondent B4. However, it was identified that purchasing division and stores as the main parties engaged in sourcing. Under the process, the activities on planning for service and product requirement, evaluating suppliers/service providers, supplier selection, renewing service agreements and building service certificates, procuring spare parts, chemicals purchase, installing of energy efficient, water efficient equipment and systems were identified by respondents as main FMSC activities carried out under sourcing.

Make/ Fulfil

Respondents A4, B4 and C4 expressed that once the product or service is received from the supplier, at certain instances the procured item should be converted to deliverable form in order to meet demand requirements. All the respondents from the FM functional units agreed with such view. As an example, Responded A3 from housekeeping stated that *"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 the hotel we will be combining them to meet final requirements".* Therefore, the applicability of make as a sub-process in FMSC process was determine. However, respondents A1, B1 and C1 stated that fulfilling service requirements forms a major part of FM. Respondent A1 stated that *"when a requirement rise such as in a case of uncomfortable lightning levels, the FM team should fulfil the customer expectations by providing adequate lighting levels".* Therefore, it was concluded that in FMSC process, both make and fulfil is applicable. On the other hand, B1 stated that in mid-stream, other departments support FM functional units and also would require service of FM functional units to meet their requirements. Therefore, respondents identified planning resource requirements, supportive services provide by other departments to deliver FM services (provision of employees by HR, allocation of funds, carrying out internal audits and data sharing by other departments) and requests made by other departments on FM services as main activities performed under make/ fulfil in FMSC process. The main parties involved in the make/ fulfil process was determined to be engineering, housekeeping and safety, health and transport divisions.

Delivery of FM Services and Products to Internal and External Customers

According to respondents, the product and requested by of 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 front office. Respondents C1 in particular stated that *"even when internal divisions' requirements are met the most acute practice is to contact engineering department through front office as it would enable them to maintain official records. However, this is not practised in greater extent currently".* Planning, provision of FM service and provision of amenities were identified as main activities performed under the process.

Receipt of FM Services and Products

Respondent A1 stated that once the service is delivered it would be received by internal departments and external customers. According to B3 *"along with services, products such as room amenities and amenities in common areas and office areas would be received by guests and internal departments".* Here, amenities are provided for office areas to be used by internal departments and amenities in common area and guest rooms to be used by guest. Therefore, at this process, the final requirement of the internal divisions and guests would be delivered. Respondents from all the cases agreed that this process is crucial as it has direct contact with customers.

4.3.4 Challenges in Facilities Management Supply Chain

From the opinion of the respondents, it was evident that FMSC is multifaceted in nature with several parties involved in undertaking FM functions. All the respondents in all three (03) case studies agreed that FMSC assists in delivering services uninterruptedly and ensure the quality and efficiency of service supplied. However, according to the opinion of the respondents, hotels, currently lack a specific department in order to undertake FM functions. According to respondent A1, "*no hotel could operate without proper FM practices, even though we do not have a dedicated department for FM, we do manage FM functions through several departments mainly engineering, housekeeping and safety, security and transport".* Respondents from other case studies too agreed that FM functions are performed under these three (03) main departments. Respondent B1 added that "*even though we take housekeeping as a FM function, it is one of the core departments in the hotels. The other main departments are food and beverages and front office. Housekeeping, which is the practice of maintaining the building clean, however, would directly impact the service of hospitality given to the customers by the hotel".*

According to the respondents from FM function units, currently hotels does not have a set of defined practices in terms of FMSC. Hence, the focus is at a lower level. In order to identify the current challenges, questions on the issues in managing the supply chain of the function was directed towards respondents from FM functional units. Several challenges from customers, suppliers and internal perspective was identified by respondents.

Under the customer related challenges, lack product knowledge was identified as the main challenge by 8 respondents. Respondent A1 added that *"lack product knowledge is the main issue from customer. For instance if the person does not know how to control temperature in a room, which is a simple task, then it may give rise for an unnecessary complaint"*. Change in demand was considered as another challenge arising from customer perspective. According to the respondents A1 and B2, peak seasons creates tremendous pressure on the staff in terms of meeting high requirements.

In terms of internal challenges 6 respondents expressed that lack of information as a main challenge effecting FMSC. B1 stated that *"due to lack of information, we have to attend the same job many times. If precise information is given, it would be more supportive for us to carry out the job".* Lack of proper communication and lack of transparency were considered as other challenges emerged internally. According to respondent A1, *"delayed communication could increase the severity of a defect or result in high customer dissatisfaction as the process of service provision could also get delay".* In terms of lack of transparency, B3 stated that *"as purchasing division oversee the process of supplier section, we are not aware what happens after a supplier is recommended by us. We should be made aware of status of supplier selection".*

All the respondents form engineering, housekeeping and safety, security and transport agreed that unavailability of adequate information, lack of reliable suppliers and poor quality in deliveries, as common challenges arising from external parties of the FMSC. In addition, respondents A1, B1 and C1 had similar opinion in terms of lack of specialized technicians with suppliers. C1 stated that "*many service providers operate in the market by having one specialized person and few workers who are not technically competent. Also, some suppliers do not have sufficient spare parts. We cannot maintain spare parts for outsourced services. It is the service provider's duty to maintain adequate stocks".* Lack of consistency in quality was considered as another challenge emerged from supplier. B3 opinion was that suppliers or service providers does not deliver the agreed quality with time. The challenges identified by the respondents are summerised in Figure 4.5.

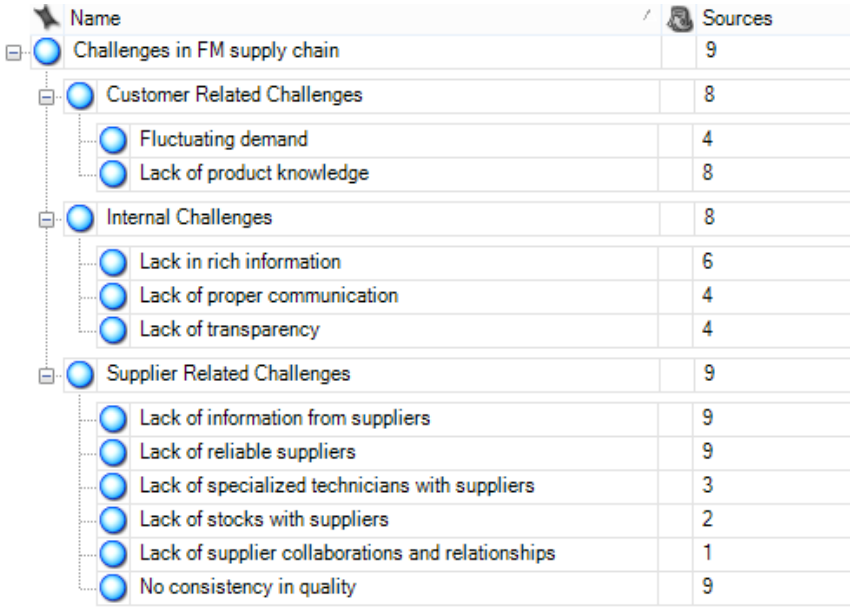


Figure 4.5: Challenges in Facilities Management Supply Chain

It is well understood that FMSC undergoes several challenges emerging from the customers, suppliers and internally. Therefore, the next chapter describes the impact of such challenges on performance.

4.3.5 Impact of Challenges on Facilities Management Supply Chain Performance

Respondents added the above issues had been made an immense impact on performance of FMSC. All the respondents agreed that in short run, the issues in FMSC would result in delayed service provision and increased work load due to repetitive actions. Further, time wastage was identified by respondent as another impact of poor supply chain management. Respondent A1's opinion was that *"If a person lack in knowledge on systems such as complaints lodging, he might not be able to provide the correct information, which may lead in repetitive works such as the technician would have to visit the same place several times. This would result in time wastage, increase workload and delayed services".* C1 added that *"issues in SC in long run would lead in spending more than expected. This will happen especially when the quality of the product supplied is lower and required to shift to another supplier incurring additional costs for expected quality".* All the respondents agreed that the challenges in FMSC could create an impact on quality in long run.

All the respondents agreed that poor performance in FMSC would create an influence in organizational performance in short and long run. Respondents from all three (03) case studies had a similar opinion in terms of the increased number of complaints in short run, and in long run all stated that this would create an impact on hotel's reputation and reduce the customer base. Further, respondents from case A and C identified increased expenses as a short term impact on the financial performance of the organization. A1 stated that *"unplanned rectifications and purchases would create an impact in overall planned expenses in the hotel".* In long run, decreased margins were identified in addition to the impact on reputation and customer base. According to B2, *"when we lose our customers, the overall profit of the organization declines. Therefore, it is vital that FM functions are undertaken in smooth manner to meet customer requirements and expectations".*

It is evident from the discussion that FMSC can create an impact in organizations performance in short and long term. Therefore, the necessity of monitoring the performance of FMSC is crucial. However, prior to monitoring FMSC performance, it is paramount to consider the current PMS used in hotels to measure FMSC performance.

4.3.6 Current Performance Measurement Systems Used in Hotels to Measure Facilities Management Supply Chain Performance

In order to identify the current PMS used in hotels to measure FMSC performance, respondents were enquired whether they evaluate FMSC performance? If so what are the methods, tools and systems used to evaluate FMSC performance?

During the data collection process, a lack of a well-developed and precise PMS for FMSC performance in the case study orgnisations was evident. According to the respondents opinion from case A, B and C, indicators such as number of jobs received, number of repeated job, number of pending job, time allowed to rectify, time taken to rectify, timed out and negative comments generated in social media are tracked through complaint handling process and guests feedbacks. A1 noted *"there is a system to monitor performance of staff and guest feedback, which is weekly updated. In this system, guest will be able to score the service provided in the hotel from arrival to departure. For internal department there is a system where the number of jobs received to engineering department, time allowed to rectify, repeated job, pending job, timed out and time taken to rectify is recorded"*. Therefore, based on the opinion of the respondents guest feedback

systems and complaint monitoring systems are mainly used in evaluating the performance of service delivered in case A.

Respondent B2 stated that even though ensuring FMSC performance is a key requirement, the developments in measuring FMSC performance measurement is still at primitive stage. According to B1, *"for engineering related services, a job card system is used where a particular technician will be assigned for a job and that's his duty to ensure that the job is undertaken within the allowed time. If there are unacceptable delays, it affects his incentives"* A similar case was witnessed in case study C in which guests can forward their complaints to the call centre and the technical staff have to attend to that complain within 20 minutes. The respondent highlighted that number of work orders under the categories of civil, mechanical, etc. and number the of pending rectifications as performance measures used currently in the hotel.

Based on the opinion of respondents a lack of a well-developed system to measure FMSC performance was witnessed. However, to obtain a greater insight on the available PMS in related case studies, a document review was carried out. During the process, financial reports, sustainability reports, sourcing policies and suppliers code of conducts of the case study organisation were analysed. At the end of the process the application of several developed PMSs such as Balance Scorecard, Benchmarking and Questionnaires in measuring performance of case study organisation were identified.

A benchmarking process was evident in all three (03) case studies in which certain indicators related to engineering (e.g. quality improvement, fire life safety, food and safety management system, engineering compliance, talent development, colleague engagement, environmental initiatives), security (e.g. security compliance, talent development, colleague engagement) and housekeeping (e.g. hotel market share, hotel financial results, quality improvements, talent development, colleague engagement, environmental initiatives) were covered. Though these were not targeted at the entire FMSC, certain indicators such as quality, compliance, talent development and colleague engagement could be considered as indicators targeting internal SC process. The supplier code of conduct and sourcing policies maintained by the case study organizations provided evidence on criteria based on which supplier selection is carried out. However, these are not monitored as KPIs of the FMSC but considered as criteria for supplier

selection. However, carrying out such evaluations on time and having track of the policy requirement breached and met could be considered as key indicator to assess a key component in sourcing process. The availability of balance scorecard to measure performance was identified during the review process in case C. Operational effectiveness, revenue maximization, loyalty, brand management and learning and growth were main criteria covered by the BSC. However, the BSC was not focused on FMSC.

Therefore, based on the discussion, it is evident that case study organization utilized benchmarking, questionnaire and balance scorecard in measuring performance at organisational level. However, these measurement systems considered few areas under FMSC. In summary in terms of the current uses of a PMS to evaluate FMSC performance it was identified that

- ✓ No precise PMS is available to measure FM supply chain performance
- ✓ Few indicators were extracted from complaint monitoring systems, system to monitor performance of staff, job card system and system for guest feedback
- ✓ PMS such as benchmarking process, balance scorecard and supplier evaluation were used at organisational level but weren't totally concentrated on FMSC.

It was not convincing as to the depth that these PMS considered on FMSC. Hence, the need of developing a precise system to measure FMSC performance arise. All the respondents highlighted the necessity of having a precise PMS to measure FMSC performance. Respondent B3 noted that "*we only have few ad hoc measures. These are not precise, not target oriented, not recorded or monitored strictly. Therefore, having an established PMS with KPIs would assist by greater extent in managing FM supply chain".* According to the respondents, all the 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 facilitates in identifying areas of poor performance. In order to develop such system, it is mandatory to ensure that crucial aspects of FMSC is covered and the developed indicators are critical for FMSC performance. The upcoming section addresses such concern.

4.3.7 Key Performance Indicators to Measure Facilities Management Supply Chain Performance in Hotels

Due to a lack of PMS, in order to assess FMSC performance, developing such system is paramount. In order to develop a PMS, defining a set of metrics is crucial. Respondents A1, A4, B1, B4, B2, C1, C3, and C4 noted that KPIs for FMSC performance measurement could be developed for the distinctive categories of upstream, midstream and downstream. Respondent A1 stated that "*the main purpose of developing KPIs to ensure measure and monitor the performance of FM supply chain. Therefore, it is crucial to identify the activities and process correctly and develop a set of main performance indicators or KPIs facilitating such requirements*". A similar view was given by respondent C3 in which the respondent added that *"though several indicators prevail to measure customer satisfaction in hotels these do not cover the entire supply chain"*. According to the opinion of the respondents, KPIs were identified to measure the effectiveness of FMSC process. However, when identifying KPIs the activities under each process were considered. Table 4.9 presents the summarized version of the KPIs identified under each process.

Table 4.9: Facilities Management Supply Chain KPIs

Process	Main activities	KPIS
Delivery of Product by Suppliers	• Delivery of products ordered	• *Number of quality products delivered* • *Temperature control during transportation* • *Number of urgent deliveries refused* • *On time delivery* • *Meeting specification requirements* • *Number of Damage free delivery of supplies* • *Number of products returned*
Delivery of Services by Service Providers	• Provision of security service • Carry out maintenance and repairs by service providers	• *Number of services delivered on time* • *Effectiveness of service provided until next service period*

Process	Main activities	KPIS
		• *Reliability of maintenance and security service providers* • *Consistency of service provided*
Source	• 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	• *Forecast accuracy* • *Number of policy requirements breached by suppliers* • *Number of policy requirements met by suppliers* • *Availability of agreements with service providers* • *Transparency of supplier selection process* • *Reliable communication and coordination between suppliers and departments*

Make/Fulfil	• Planning resource requirements
	• Supportive services provide by other departments to deliver FM services)
	  ○ 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
		• *Inventory planning accuracy*
		• *Number of available competent technicians*
		• *Labour efficiency*
		• *Sufficient budgetary allocation*
		• *Rate of return*
		• *Accuracy of audit investigating and compliances*
		• *Accuracy of information shared*
		• *On time provision of information*

Delivery of FM Services and Products	• Planning the process of delivery • Provision of FM service • Provision of room amenities	• *Responsiveness of FM functional units* • *Time taken to rectify service requirements* • *Number of repeated job*

Process	Main activities	KPIS
		• *Degree of integration of IT system for complaints handling* • *Appropriate behaviour and attire from FM functional units* • *Nature of tangibles*
Receipt of FM Services	• Informing and provision service requirements	• *Time taken to rectify issue is within the allowed period* • *Number of complaints on quality of service provided* • *Cleanliness* • *Environmental comfort*
Receipt of Products	• Informing and provision product requirements	• *On time delivery of room amenities* • *Availability of amenities in common area and office area* • *Number of complaints on quality of products*

Table 4.9 presents KPIs identified for each activity identified under main FMSC process of delivery of product and services made by suppliers, source, make/ fulfil, delivery to FM customers and receipt of FM services and products by FM customers. According to the FM supply chain process determined, at upstream level products and services are been delivered by the suppliers and service providers to carry out FM functions. In order to measure the sub-process 'product delivery by suppliers', respondents identified seven KPIs in relation to the main FMSC activities under the process. In order to provide FM services to internal and external customers, the need of outsourced services and consultation requirements arise. Therefore, four KPIs for the sub-process 'delivery of services by service providers' were proposed by the respondents in order monitor the performance of the process.

To identify the KPIs under the sub-process 'source', six key activities under the process was identified. Based on the identified key activities six KPIs were determined. According to the views and opinions of the respondents, it was manifested that the FM

functional units should make flower arrangements, decorations and more in order to meet customer expectations. Further, the FM team should be able to fulfil the service requirements of customers. Therefore, in order to monitor the sub-process 'make/ fulfil', eight KPIs were suggested by respondents. Respondents C3 stated that *"there are number of performance measures but only few measures are very critical for the success of the process".* Following the process, the product or service would be delivered to internal and external customers. In order to measure the efficiency of this process 'delivery of FM services and products', respondents suggested six KPIs. Respondent B1 noted that "*due to the nature of FM service there will be higher number of requests for services from internal customers and guests. However, when meeting such requests the cleanliness of equipment and the behaviours of person delivering the service are paramount to create a good impression in customer's mind".*

Once the product or service is delivered, the product or service will be received by internal and external customers. In order to measure the sub-process 'receipt of FM services', KPIs such as time taken to rectify issue is within the allowed period, number of complaints on quality of service provided, cleanliness and environmental comfort were suggested by respondents. According to A1 "*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".* Finally, to measure the sub-process 'receipt of products' KPIs such as on time delivery of room amenities, availability of amenities in common area and office area and number of complaints of quality of products were proposed by respondents.

4.3.8 Validation of Facilities Management Supply Chain Performance Measurement System

The developed PMS by integrating KPIs to measure FMSC performance was validated in order to ensure reliability. To support the validation process, the developed PMS for FMSC was presented to three (03) subject matter experts from another three (03) five-star hotels. The profile of the experts has been presented in Table 4.10.

Table 4.10: Profile of Subject Matter Experts

Subject Matter Experts	Designation	Experience/Role
SME 1	Chief Engineer	• 15 years of Experience • Experienced on all FM functions • Track record for maintaining process efficiency and effectiveness on service provision.
SME 2	Deputy General Manager Engineering	• 20 years of Experience • Experienced on all FM functions • Expert in managing supplier relationships and requirements necessity for a monitoring system to track supplier performance. • Involved in enhancing customer satisfaction through process improvements
SME 3	General Manager Engineering	• 23 years of Experience • Experienced on all FM functions • Had involved in maintaining and enhancing performance of service delivery process.

The respondents were satisfied with the developed PMS to measure FMSC performance. However, SME 1 commented to incorporate the parties covered by the PMS in respective places so that it would provide an overall understanding on the target audience of the measures. SME 2 was satisfied with the KPIs but suggested to include on time delivery of service requirements as a KPI under receipt of service. SME 3 revised the KPIs of number of policy requirements breached by suppliers and number of policy requirements met by suppliers to requirements under supplier evaluation criteria breached by suppliers and requirements under supplier evaluation criteria met by suppliers. Based on the above comments the PMS developed was revised by

- Incorporating the parties covered by the FM supply chain PMS in hotels
- Incorporated on time delivery of service requirements as a KPI under receipt of service

- Revising and incorporating the KPIs of requirements under supplier evaluation criteria breached by suppliers and requirements under supplier evaluation criteria met by suppliers

The final PMS to measure FMSC performance was developed by incorporating the suggestions made by the experts.

4.3.9 Performance Measurement System of Facilities Management Supply Chain

By incorporating the findings gathered from FMSC, FMSC process and KPIs to measure FMSC performance, the final PMS for FMSC was developed. The developed PMS is presented in Figure 4.6.

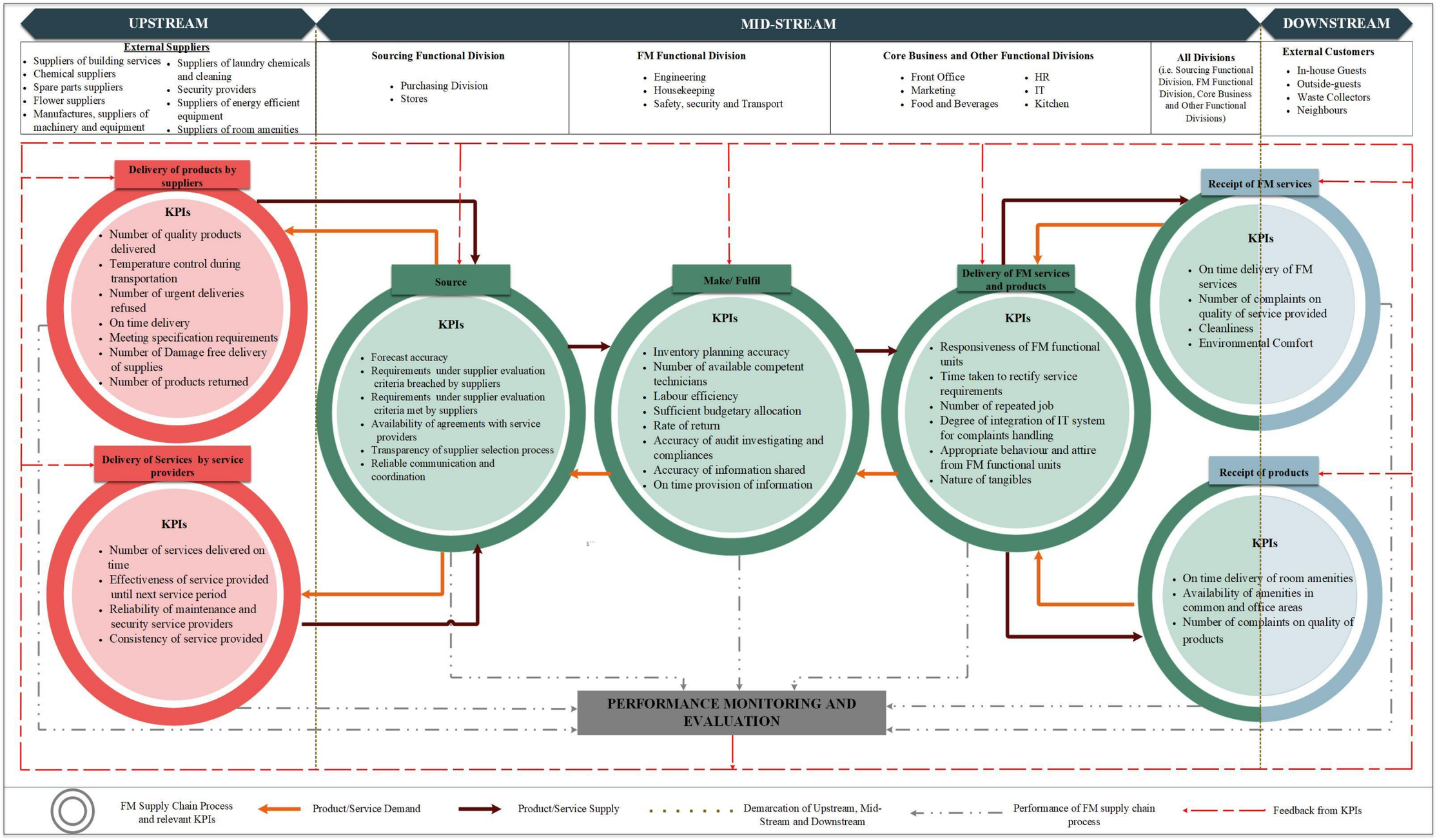
The FMSC performance measurement system comprise three sets of metrics. The set of metrics at upstream targets to measure the process, relationship and activities undertook with external suppliers. Under the category, KPIs had been developed to measure the service and product delivery made from the supplier's end.

The set of metrics developed at mid-stream targets to measure the internal SC process, relationship and activities undertook with internal FM units and non-FM units. Under this category, KPIs had been developed to measure the process of source, delivery, make/ fulfil, and part of receipt of service and products and all the activities and relationships involved in carrying out the processes.

At the downstream, the set of metrics developed mainly target to measure FMSC process, relationship and activities undertaken with external customers. The set of metrics has been developed by incorporating KPIs under the process elements of receipt of FM services and receipt of products.

Product/ service demand and product/ service supply arrows in Figure 4.6 presents the flow of demand and supply between the sub-processes of FMSC process. The parties involved in individual processes is incorporated at the top of Figure 4.6. These parties includes external suppliers, internal departments and external customers. Further, the PMS had been incorporated with the mechanisms for performance monitoring and evaluation. Finally, based on the performance results through monitoring and evaluation, a feedback loop is generated, which is directed back towards individual process in order to maintain and enhance performance.

Figure 4.6: Facilities Management Supply Chain PMS



4.4 Discussion of the Research Findings

The main stream literature revealed the prevalence of several FM functions in hotel industry. Accordingly, the identified FM functions such as operations and maintenance, housekeeping, security and safety agree with the findings of Jones (2002), Okoroh, Jones and Ilozor (2002) and Heijden (2014). However, Fallon and Rutherford, (2010) stated in their study that FM functions are disseminated among many departments. This was manifested in all three (03) cases in this research. These departments included engineering, housekeeping and safety, security and transport. Nevertheless, Nardelli and Rajala (2018), stated there are several FM departments in large organizations due to complexities in activities. Yet, the current study witnessed no such prevalence despite the complex function undertook under FM domain.

Due to the prevalence of several FM functions undertaken in different departments, the study findings revealed that FMSC comprise numerous parties under the main categories of internal customers, internal suppliers, external suppliers and external customers. The findings of Coenen and Felten (2014) and Waheed and Fernie (2009), revealed a similar output and defined the parties engaged in terms internal and external perspectives to the organisation. Further, the study agrees with the finding of Mudrak, Wagenberg, and Wubben (2004), Nutt (1999) and Williams (1996) on parties in FM such as FM contractors, in-house FM teams, FM suppliers, FM consultants, users and management. However, FMSC in hotels spreads in to a broader spectrum and involves several other SC parties' specific to hotel industry, which were identified through the current study.

The study identified detailed information flow, service flow, products flow and cash flow occurred in FMSC. Several authors such as Cavinato (2004), Hofmann, (2005), Jeffries (2016) and Karunasena, Vijerathne and Muthmala (2018), argued on the importance of information flow, service flow, product flow and finance flow. Although the studies were explicitly not on FMSC, the authors had highlighted the importance of the above categories to FM. However, Abdeen and Sandanayake (2018) in their study identified parties, flows, upstream and downstream activities specific for a FMSC in a factory setting. According to the findings of the current study, few of the identified activities, parties and flows by Abdeen and Sandanayake (2018) are applicable to FMSC in hotels. However, the drawback prevailing in literature in terms of defining detailed activities

performed under upstream, mid-stream and downstream and identifying flows and parties' engaged in FMSC of hotels, were addressed from the current study.

The current study findings on relationships among FMSC partners, agrees with the findings of the authors Lu, Potter, Sanchez Rodrigues and Walker (2015) and Papadonikolaki, Verbraeck, and Wamelink (2017), in terms of the main relationship types of formal and informal relationships. Further, this study identified that formal relationships among suppliers prevails with purchasing division as contracts and agreements are formed between the suppliers and purchasing division. However, due to the requirement of maintaining communication, informal relationships prevail among suppliers and FM functional units. Moreover, formal relationships were evident among guests and front office, where formal complaint handling is undertaken. However, at several instances the prevalence of informal relationships among FM functional units and guests were identified by the respondents. As discussed above, due to the involvement of multiple parties, information flow, service flow, product flow, finance flow and relationships maintaining performance of FMSC has become a challenge. In order to address the concern, developing a PMS to evaluate FMSC performance was considered vital.

Chae (2009) pointed out that in order to develop a PMS for SC, considering the SC process is vital. Gunasekaran et al. (2001), Gunasekaran and Kobu (2007), Lapide (2000) and Olugu, Wong and Shaharoun (2011) had widely utilised SCOR model, which includes plan, source, make and deliver in order to develop PMS for SC. These processes were explicitly focused on manufacturing environment, therefore, authors such as Barnard (2006) and Weyers (2017) had adjusted the process to match service SC by inculpating request and fulfil in place of source and make. While the mainstream literature had few disparities and arguments on such change to process, the current study identified that FMSC process comprise 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 the current study planning was not separated as a separate sub-process but considered under source, make/ fulfil and deliver. 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 make and fulfil were integrated and included in FMSC process. Initially, the literature revealed that the sub-process make is applicable to product SC process and the sub-process fulfil was replaced in the place of make in service SC process. However, in FMSC process both the terms were utilised 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 FMSC process. Therefore, at upstream, the two additional sub-processes incorporated to 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, which was added to the FMSC process, is shared between mid-stream and downstream.

Authors such as Cai et al. (2009), Chae (2009) and McCormack, Ladeira, and Oliveira (2008) suggest that when measuring SC performance measurement, companies should look in to indicators, which are absolutely necessary to measure SC process. The study findings agrees with such opinion and the PMS developed to assess performance of FMSC of hotels has considered the FMSC process. Though, authors such as Toni and Montagner (2009) had made an effort in developing a PMS for facility service SC, the authors had not considered the overall FM domain but concentrate towards facility service and not identify KPIs under the developed PMS. In order to address the backdrop, the current study developed a PMS for FMSC performance measurement in hotels to evaluate overall FMSC performance.

KPIs to measure performance of upstream, mid-stream and downstream processes are incorporated under the developed PMS to measure FMSC performance. Even though KPIs to measure overall FMSC performance were not available in literature, the applicability of several indicators developed for product SC and service SC to FMSC was witnessed. These include indicators such as 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) and Gong and Yan (2015). However, the developed PMS to measure FMSC performance in hotels by this study had been inculpated with 38 KPIs, developed specifically to suit key activities under the key processes of FMSC by giving

due consideration to parties involved, flows and relationships developed between the parties.

4.5 Summary

The chapter initially concentrated on identifying the current practices of FMSC in hotels. Subsequently, the challenges prevailing in the SC were identified and their impact on FMSC performance and organisational performance at short term and long term were recognised. Further, the chapter has been incorporated with the developed FMSC encompassing, parties, flows and relationships. In addition, the activities identified in FMSC facilitated the researcher in developing FMSC process, which had been presented in the findings. Finally, KPI were identified under each FMSC process. By incorporating all the findings the final performance measurement system for FMSC was developed and presented in the chapter. To the end of the chapter, a discussion has been built up by comparing the findings of the current study with literature findings

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The Chapter presents an overview on the conclusion drawn from the study and the contribution of this research to knowledge. Further, the chapter discuss the limitations under which the study was undertaken. Finally recommendations to practitioners and avenues for further research are discussed under the chapter.

5.2 Conclusions

The study revealed that the FMSC is made out of upstream, mid-stream and downstream activities. The main parties identified at upstream were manufactures, suppliers of machinery and equipment, suppliers of building services, chemical suppliers, spare parts suppliers, suppliers of laundry chemicals and cleaning, security providers, suppliers of energy efficient equipment, suppliers of room amenities and flower suppliers. The main activities undertook were align to delivery of product and services. Information such as service required, product required, item specifications (item required, brand, model) and terms and agreements were shared among parties at upstream. Further, it was evident that at upstream, suppliers build formal relationships with purchasing division and informal relationship between FM functional units.

At mid-stream, the main parties involved were identified as FM functional units and non-FM functional units. These parties actively collaborate with one another in order to carry out the mid-stream activities, which range from procuring services and products and finally delivering them to internal customers and guests. Information required in order to undertake these activities, such as tender or supplier related information and data were mainly shared at midstream level. It was proved that at mid-stream, formal relationships are built among internal units of the hotel.

Downstream of FMSC mainly comprise the interactions with external customers where the main activity involved would be, informing service requirements by guests during which information related to complaints and progress of such complaints would be shared. At this level, formal relationships are generated between front office and external

customers and informal relationships are generated between FM functional units and external customers. Finance and product flows of FMSC flows along the chain from upstream to downstream and vice versa. On the contrary, service flow remains to be unidirectional as there is no return of service as in products.

In order to determine a performance measurement system for FMSC performance measurement, defining the FMSC process was considered to be vital. The activities identified during determining the FMSC, enable the researcher to fine tune the process agreed by the respondents. Accordingly, the FMSC process manly comprised of delivery of products by supplier, delivery of services by service providers, sourcing, make/ fulfil, delivery of FM services and products and receipt of FM services and receipt of products by customers. Delivery of product and services by suppliers/service providers occurred at upstream. The mid-stream involved sourcing, make/ fulfil and deliver. Receipt of services and products is shared at mid-stream and downstream as part of FM customer base is formed by internal customer and external customers.

Through the analysis, it was revealed that FMSC undergoes several challenges, which are internal and external to hotels. The customer related challenges identified by the respondents are lack of product knowledge and fluctuating demand. The internal challenges identified were lack of rich information, lack of proper communication and lack of transparency in supplier selection process. Whereas, supplier related challenges are lack of information from suppliers, lack of reliable suppliers, no consistency in quality, lack of specialized technicians with suppliers, lack of stocks with suppliers and lack of supplier collaboration and relationships. These identified challenges could impact organisation performance and FMSC performance in short term and long term. Time wastage, increase work load due to repetitive issue and delayed in service provision were identified as short term impact on FMSC performance, whereas, high operational costs and poor quality service were identified as long term impacts. As for organizational performance increase expenses, increased number of complaints and frequent breakdowns and system interruptions were identified as short term impact and in long term decreased margins, decreased customer base and impact on reputation were identified. Therefore, determining a PMS to evaluate FMSC performance was considered to be vital to ensure performance of the organisation as a whole.

However, within the current context, a lack of robust PMS in order to measure FMSC performance was witness. Several indicators such as time allowed to rectify, repeated job, pending job, timed out, time taken to rectify the job and number of job cards were recorded within FM functional units. Further, availability of scoring system for guest to score the service received was available. In addition, at the case study organisation, the use of questionnaire, benchmarking and balance scorecard at the organisational level were evident. However, these systems were not specifically designed to measure FMSC performance. Therefore, the requirement of established a performance measurement system for FMSC arise.

In order to develop the PMS to assess FMSC performance, the identified FMSC process and the activities incepted under the process were utilized. KPIs identified for the sub-process delivery of products by suppliers included number of quality products delivered, temperature control during transportation, number of urgent deliveries refused, on time delivery, meeting specification requirements, number of damage free delivery of supplies and number of products returned. Number of services delivered on time, effectiveness of service provided until next service period, reliability of maintenance and security service providers and consistency of service provided were identified KPIs to evaluate delivery of services by service providers. KPIs such as forecast accuracy, availability of agreements with service providers, requirements under supplier evaluation criteria breached by suppliers, requirements under supplier evaluation criteria met by suppliers and reliable communication and coordination between suppliers and departments were identified under sourcing. The sub-process make/ fulfil mainly comprised KPIs such as inventory planning accuracy, number of available competent technicians, labour efficiency, rate of return, sufficient budgetary allocation and accuracy of audit investigating and compliances. Under the sub-process delivery of FM services and product, few of the KPIs identified were responsiveness of FM functional units, time taken to rectify service requirements and number of repeated job. On time delivery of FM services, number of complaints on quality of service provided, cleanliness and environmental comfort were proposed by respondents as KPIs to evaluate the sub-process receipt of FM services. Further, KPIs such as on time delivery of room amenities, availability of amenities in common area and office area and number of complaints on quality of products were identified to evaluate the process of product receipt.

Overall, from the study it was evident that FMSC in hotels comprise numerous activities, flows, relationships and processes, which challenge the performance of FMSC. Therefore, having a PMS to measure the performance of FMSC is vital. Hence, by considering the nature of FMSC, the current study developed a PMS to measure FMSC performance in hotels, which could be utilised by FM practitioners to enhance overall performance of hotels.

5.3 Contribution to Knowledge

The present study makes several noteworthy contributions to the existing body of knowledge as follows:

- Investigating the challenges prevailing in facilities management supply chain
- Investigating the impact of such challenges on the performance of facilities management supply chain in short and long term.
- Developing the facilities management supply chain by incorporating activities, parties, flows and relationships
- Investigating key performance indicators suitable to measure the relationships, process and activities under different supply chain processes.
- Developing a performance measurement system by incorporating key performance indicators to measure facilities management supply chain performance.

5.4 Limitations of the Study

Among several other sectors where FM practices are prevalent, the study was based on hotel sector. This is due to the reason that hotels encompass complex, large and integrated systems, which will provide an avenue for the study to develop a robust PMS for FMSC performance measurement. Among hotels, the study was undertook in five- star hotels as currently, the country has a high concentration of five-star rated establishments and the complex process incorporated in these hotels needs more attention. Data collection was limited to three (03) case studies as data saturation was reached. The findings of the study should be considered in light of the above discussed limitations.

5.5 Recommendations for Industry Practitioners

The PMS developed for FMSC performance measurement in hotels can be utilised by practitioners of FM or other related disciplines in hotels to ensure a seamless delivery of service through proper monitoring mechanism. Further, the PMS would provide an avenue to identify processes and activities of poor performance and address the results prior to any cascading effects. The FMSC performance measurement system would therefore assist FM practitioners to contribute towards overall hotel performance by ensuring both internal and external customer satisfaction.

5.6 Recommendations for Academic Research

The study was limited to developing a PMS to evaluate FMSC performance in hotels. Wide scope of PMS for FM supply chain could lead to research schemes mentioned below.

- Developing a performance measurement system to measure facilities management supply chain performance in other sectors.
- Testing the suitability of the proposed performance measurement system for facilities management supply chain performance evaluation in other sectors.
- Prioritizing the key performance indicators identified through the study in relation to hotel industry.

The above areas of recommended studies would enable researchers from diverse disciplines to explore on FMSC performance measurement and contribute to the knowledge base on FMSC and PMS. .

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APPENDIX A- Semi-Structured Data Collection Instrument

Nishara Abdeen
No 143/25/1/1,
Bandaranayake Mawatha,
Moratuwa.

…../…./2019

……..,
……..,
……..,

Dear Sir/ Madam,

Data Collection for M.Sc. by Research Degree

I am a postgraduate student of University of Moratuwa reading for Masters of Science (by Research). In fulfilment of this degree, the students are required to study as a full-time research students and produce a report on their study. The focus of my research is to ***develop a performance measurement system to evaluate facilities management supply chain performance in hotel industry***. The research is carried out under the supervision of Dr. Yasangika Sandanayake and Dr. Thanuja Ramachandra, Senior Lecturers of Department of Building Economics, University of Moratuwa.

This case study data collection instrument will be distributed to the professionals of the organization such as Facilities Managers and Engineers who are engaged in the disciplines of facilities management, supply chain management and performance measurement. The confidentiality of the organization as well as the participants will be maintained throughout the research and the identities of the participants will not be revealed in any document or event relating to this study. I hereby certify that the information collected will be used only for fulfilling the research aim. I would be grateful if you could contribute for this case study data collection instrument.

Thank you,
Yours faithfully,

……..
Nishara Abdeen,
Research Scholar,
Department of Building Economics,
University of Moratuwa.
Email: nisharaabdeen04@gmail.com
Tel: +9411576280

SEMI-STRUCTURED DATA COLLECTION INSTRUMENT

SECTION 1 - BACKGROUND INFORMATION OF THE ORGANISATION

i. What is the nature of ownership of the organisation?
ii. What is the core business of the hotel?
iii. What is the star rating of the hotel?
iv. How many rooms does the facility comprise of?
v. What are the other facilities?
vi. What is the number of employees employed in the hotel?
vii. What are the standards does the hotel comply with?

SECTION 2 - INFORMATION ON DATA COLLECTION TOOLS

Who are the personnel interviewed (Designation, job role, experience, etc.)?

What are the documents reviewed?

What are the observations made?

SECTION 3 - FM SUPPLY CHAIN AND PMS

1. What are the main departments in the hotel?
2. Do you have a FM division in the facility?
3. Please provide explanations for the below on FM Functions.
   - **a)** What FM functions are available in your hotel?
   - **b)** What are the departments that handle above FM functions?
   - **c)** Why do you consider the above identified functions to be FM functions?
4. Does above functions form the core business or non-core business? Have you focused on FM supply when delivering FM functions?
5. What are the issues you had come across in FM supply chain?
6. How the above identified issues have affected the performance of FM supply chain and organizational performance in short and long term?
7. Do you evaluate the FM supply chain performance? If so what are the methods, tools and systems used to evaluate FM supply chain performance? If no, why?

8. Are you satisfied with the current FM supply chain performance measurement system and KPIs?
9. What are the improvements required in the current FM supply chain performance measurement system and KPIs?

SECTION 4 - SUPPLY CHAIN OF FM FUNCTIONS

10. Please provide answers to the questions listed in PART A with reference to the FM functions listed in PART B.

PART A

a) What are the supply chain activities performed under the function?
b) What are the supply chain process under the function?
c) Who are the parties and organizations involved along the supply chain of the function?
d) What are the types of information, service, product flows and relationships incurred between the parties who undertake the function?
e) What are the issues in managing the supply chain of the function?
f) How it effects on the supply chain performance of the function?
g) How to overcome the above issues?
h) What kind of measures that can be used to evaluate performance of the supply chain of the function?

PART B

i. Maintenance and Engineering Function
ii. Energy and Water Management Function
iii. Housekeeping Function
iv. Security Function
v. Other Functions (Please identify the other functions)

********** Thank you for the contribution **********

APPENDIX B- Interview Transcript

Nishara Abdeen
No 143/25/1/1,
Bandaranayake Mawatha,
Moratuwa.

…../…./2019

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……..,
……..,

Dear Sir/ Madam,

Data Collection for M.Sc. by Research Degree

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Thank you,
Yours faithfully,

……..
Nishara Abdeen,
Research Scholar,
Department of Building Economics,
University of Moratuwa.
Email: nisharaabdeen04@gmail.com
Tel: +9411576280

SEMI-STRUCTURED DATA COLLECTION INSTRUMENT

SECTION 1 - BACKGROUND INFORMATION OF THE ORGANISATION

i. What is the nature of ownership of the organisation?
Private ownership

ii. What is the core business of the hotel?
Hospitality

iii. What is the star rating of the hotel?
5-Star

iv. How many rooms does the facility comprise of?
466 luxurious rooms, 41 serviced apartments

v. What are the other facilities?
Restaurants and bar facilities, Conference rooms, Banquet halls, Parking facilities, Swimming pools, Laundry, Spa facilities, Gymnasium

vi. What is the number of employees employed in the hotel?
400

vii. What are the standards does the hotel comply with?
BOI requirements

SECTION 2 - INFORMATION ON DATA COLLECTION TOOLS

Who are the personnel interviewed (Designation, job role, experience, etc.)?

Designation	Experience (years)
Chief Engineer	12
Housekeeping	15
Security and Transport Manager	20
Finance Manager	15
Human Resource Manager	14
Front Office Manager	13
Manager-Stewardship	10

What are the documents reviewed?

- Service agreement
- Standard operating procedures
- Policies and audit tools
- Sourcing policies
- Supplier's code of conducts
- Complaint handling procedures and systems

SECTION 3 - FM SUPPLY CHAIN AND PMS

01. What are the main departments in the hotel?
The main departments are IT, Food and Beverages, kitchen, HR, sustainability, front office, marketing, engineering, housekeeping and safety, security and transport departments.

02. Do you have a FM division in the facility?
No, basically the engineering division of a hotel looks in to hard FM where as soft FM is looked by housekeeping and safety, security and transport departments

03. Please provide explanations for the below on FM Functions.
    a) What FM functions are available in your hotel?
    Operations and maintenance, energy management, water management and chemical management, housekeeping, security, safety and car parking are the main FM related functions in hotels
    b) What are the departments that handle above FM functions?
    As mentioned earlier the main departments that handle the above functions are engineering, housekeeping and safety, security and transport departments
    c) Why do you consider the above identified functions to be FM functions?
    These functions actively contribute towards managing the overall facility

04. Does above functions form the core business or non-core business? Have you focused on FM supply when delivering FM functions?
These functions are mostly non-core business but when we consider a function such as housekeeping this is a major function that will decide hotels overall outlook and customer satisfaction.

05. What are the issues you had come across in FM supply chain?
The customer related issues are lack of product or service knowledge for instance if the person does not know how to control temperature in a room which is a simple task then it may give arise for an unnecessary complaint.
Lack of proper communication is another major issue that is occurred internally. For instance if Guest relation officer does not have enough information to communicate with guest then it come as a complaint.

06. How the above identified issues have affected the performance of FM supply chain and organizational performance in short and long term?
If a person's lack of knowledge on systems such as complaints lodging he might not be able to provide the correct information which may lead in repetitive works such as the technician would have to visit the same place several times. Lead in time waste and create bad reputation on guest.

07. Do you evaluate the FM supply chain performance? If so what are the methods, tools and systems used to evaluate FM supply chain performance? If no, why?
There is a system to monitor performance of staff and guest feedback, which is weekly updated. In this guest will be able to score the service provided in the hotel from arrival to departure. For internal department there is system where the number of jobs received to engineering department, time allowed to rectify and, repeated job, pending job, timed out, time taken to rectify is recorded. Based on the job condition an inbuilt time is allowed to carry out the job. Open job is where there is no time duration for instance a major repair. Pending job is where there is a time limit which is 10to 20 minutes. If the job is not done within the time it escalates u to director engineering.

08. Are you satisfied with the current FM supply chain performance measurement system and KPIs?
Satisfied with the system to measure several performance. At certain instance we are not communicated of a certain issue during the time guest stays but after he leaves he sends a complaint. Currently there is an issue due to not having a system to measure supplier performance from product side. It's better to have a direct contact. Lack of transparency is another issue. We don't have visibility in terms of number of things such as number of quotations taken and parties who had replied. Until finance department response for a request the process in between is not transparent. If we had proper indicators we would know them. Reliability of the system is questioned.

09. What are the improvements required in the current FM supply chain performance measurement system and KPIs?
We only have few ad hoc measures. These are not precise, not target oriented, not recorded or monitored strictly. Therefore, having an established PMS with KPIs would assist by greater extent in managing FM supply chain

SECTION 4 – SUPPLY CHAIN OF FM FUNCTIONS

10. Please provide answers to the questions listed in PART A with reference to the FM functions listed in PART B.

PART A

a) What are the supply chain activities performed under the function?
Upstream of a supply chain deals with product and service purchasing. It involves all the interactions made by the supplier with the organization. In undertaking the upstream activities, a formal relationships prevails between purchase department and supplier as agreements are formed between the two. However, it is common for the relevant departments to maintain communication with service providers critical for their functions. At that instance informal relationships are created between the two. The supply chain activities between inter departments are mostly

common. These include rectification of complaints, provision of other resources and consultancy.

b) What are the supply chain process under the function?

When engineering department need to order products the request is sent to purchasing department. The purchasing department call for quotations and handover to engineering and engineering department choses the quotation which matches the specifications. But in capital grant related purchasing we need to get approval from engineering head office. Contactors are evaluated during initial agreement. Mostly whether are authorized dealers and accredited. For instance for generator the party should be local manufactures or accredited supplier or dealer for the product brand or mode. Chemicals should be procured form suppliers who have legal authority. For instance whether they have approval to import chemicals to Sri Lanka. After we purchase required products we make it sure they are in a deliverable form and then deliver to requested parties.

c) Who are the parties and organizations involved along the supply chain of the function?

We don't directly handle third party suppliers of the engineering department. But our normal suppliers are manufacturers, maintenance service providers, chemical suppliers and spare parts suppliers. Our customers are guest and internal departments.

d) What are the types of information, service, product flows and relationships incurred between the parties who undertake the function?

Complaints, Specifications, Training requirements, terms and conditions in agreements, specifications are information shared among parties.
In terms of services flow, even though some services such as maintenance service is performed by outsourced party, our department should make sure that the service is adjusted and provided in a manner that meet customer expectations. As it is a service that particular department gets through engineering department, automatically could be considered as service rendered by us. As we needed spare parts to replace item, the products circulated would be spare part..
We don't have a formal relationship with suppliers, purchasing department has the formal relationship but we communicate with our suppliers.

e) What are the issues in managing the supply chain of the function?

The main issue is communication deficiencies. People sometimes give the wrong information, which will cause unnecessary delays in service provision.

f) How it effects on the supply chain performance of the function?

It will delay the service provision and effect the efficiency and effectiveness of service delivery.

g) How to overcome the above issues?

Having a proper system in place and unannounced audit from an audit firm where the audit from come as a gust use the services and provide feedback.

h) What kind of measures that can be used to evaluate performance of the supply chain of the function?

The main purpose of developing KPIs to ensure measure and monitor the performance of FM supply chain. Therefore, it is crucial to identify the activities and process correctly and develop a set of main performance indicators or KPIs facilitating such requirements. So if you see for supplier service delivery you can use KPI such as Number of services delivered on time, effectiveness of service provided until next service period, meeting specification requirements. In order to make sure that the internal purchasing process is efficient you can incorporate KPIs such as forecast accuracy, transparency of supplier selection process. Responsiveness of FM. functional units, time taken to rectify service requirements, number of repeated jobs can be considered to evaluate the process of supplying FM functional services.

PART B

11. Maintenance and Engineering Function
12. Energy and Water Management Function
13. Housekeeping Function
14. Security Function
15. Other Functions (Please identify the other functions)

********** Thank you for the contribution **********