

An Investigation of Integrated Facilities Management Functions in Sri Lanka

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Abstract

Facilities Managers often confront with the issues of people, technology, and processes in the built environment. Therefore, they need to be armed with the new business solutions and technical innovations in order to cater organisational requirements. Integrated Facilities Management (FM) is one such solution in which two or more firms collectively perform FM functions. Although it is a commendable concept, it has given less attention in the recent history. This study, therefore, investigates the applicability of integrated FM concept in the built environments of Sri Lanka. Literature review revealed that the key dimensions which determine the nature of integration are the ownership/management, distance, and core business of organisations. The integration could be either in the form of facility services, utility/infrastructure, and/or information. Multiple case studies were selected for investigating the concept to the built environments of Sri Lanka. The study is concluded with identifying possible nature of FM integrations in the built environment. The study found that the integration is strong when the firms are at a close proximity, under a same ownership, and in a same core business, whereas integration is weak when the firms are at a long distance, under a different ownership, and in a different core business.

Keywords: *Integrated Facilities Management, Distance, Ownership, Core Business*

1. Introduction

Facilities Management profession has recently become a significant proponent in the built environment. Barrett and Baldry (2003) defined FM as an integrated approach of maintaining, improving, and adapting the buildings of an organisation in order to create an environment that strongly supports the primary objectives of the organisation. Noor and Pitt (2009) stated that effective FM encompasses multiple activities under various disciplines and combines resources, hence it is vital to the success of any organisation. However, FM has changed its discipline and involved in finding solutions in innovative ways of addressing core business challenges (Kaya, Heywood, Arge, Brawn, and Alexander, 2004).

Isolated FM units in early days are now integrating with neighbours, competitors or other organisations in order to conduct FM operations collaboratively. Integrated approach could be a realistic solution for built environments. Few researches have studied the integrated FM concept and identified the formation of networks, partnerships, or inter-organisational collaborations between built environments as approaches in delivering excellent services to the core business. Although it is a commendable concept, building owners and Facilities Managers have given less attention for integrating FM functions, and facilities are shared among the businesses in ad-hoc manner. Therefore, there is a need to investigate the existing integrated FM functions in Sri Lankan built environments. Hence, this paper reviews the concept of Integrated Facilities Management and investigates the existing integrated FM functions in Sri Lankan built environment.

The first section of this paper reviews the literature on integrated FM followed by the research methodology of the study. Fourth section presents findings of the case studies followed by cross case comparison and analysis of integrated FM functions. The last section concludes the study with recommendations.

2. Literature Review

2.1 Integrated Facilities Management

Collaborative business relationships, including strategic alliances, joint ventures, clusters, and consortia are popular mechanisms for dealing with resource constraints, accelerating technological advancement, and sensitive levels of competition in the global marketplace (Palakshappa and Gordon, 2007). Accordingly, Facilities Managers are also involved in formal, informal, or voluntary based collaborations in built environments, which required concrete knowledge for successful formations (Storgaard, Larsen, and Olsen, 2010). Kincaid (1994) stated that managers must be equipped with knowledge of facilities and management to carry out their integrated support role in order to attain effective integration in field of FM.

Many researchers have developed number of collaborative relationships in the field of Facilities Management. Introduction of new concepts such as integrated FM (Kincaid 1994), Centralising effluent treatment plant (Clara, 1998), Industrial Districts (Meneghetti and Chinese, 2002), collaborating infrastructure services (Cant, 2005), Joint working (Andrew, Donald, Pitt and Tucke, 2008), District heating and cooling (Aumente et al., 2011), Strategic alliance in Airport FM (Pitt, Werven and Price, 2011), Industrial symbiosis (Meneghetti and Nardin, 2012), and Industrial cluster (Huang and Xue, 2012) further emphasised the importance of collaborating or sharing diverse FM functions among organisations in different forms.

In the concept of strategic alliance, Pitt, Werven and Price (2011) highlighted that formation of a network structure or alliance with cooperation between two airports or between an airport and a third party for managing facilities to share knowledge or resources has become the current trend in air port industry. The main reasons to form alliances can be categorised as the creation of synergies, sharing risk, access to raw materials, access to resources such as facilities and expertise, sharing research and development costs and enhancing or retaining competitive advantage through economies of scale, or image (Vyas et al, 1995). Further Pitt, Werven and Price (2011) pointed out that strategic alliance would enable FM to spread the risk of testing new technologies such as energy management and integrated building management systems among organisations. Cant (2005) investigated effectiveness in collaborating infrastructure services in regional retail centres using one of the largest inner-city redevelopment schemes in Europe. Author highlighted that independent FM functions would fail to meet the expectations of scheme owners, retailers, and customers. Thus, it is recommended to pursue a collaborative approach of FM at a strategic level and collaborating with the other professionals is identified as important in delivering best value for the client. Huang and Xue (2012) elaborated benefit of centralising supply chain among same ownership firms. Those firms have been operated more productively through centralising supply chain. Further, authors noted that clusters present opportunities for an organisation to streamline and shorten its supply chain, as those partners and related resources existed in a concentrated area.

Andrew, Donald, Pitt, and Tucker (2008) illustrated the experience of a group of public sector Facilities Managers who decided to work jointly. Authors identified following joint works that can be used to enhance business operation;

- Common database for sharing information and the systematic development of benchmarks (cost/m², energy performance, and m²/occupant)
- Common strategy for collocation of services on property to benefit customers
- Eliminate conflicts through joint working and cooperation
- Integrated office standards policy for shared accommodation

- Joint body for procurement and management of the building
- Respond emergencies services together more closely

Industrial district is another concept of integration which empowers to enjoy the benefits for either client or FM service provider. An Industrial District is a geographically determined productive system, formed by a large number of small-medium sized firms, which are involved at various stages and in various ways, in the production of the same product (Pyke and Sengenberger, 1992). Meneghetti and Chinese (2002) exploited the characteristics of all possible integrations in industrial district through aggregation matrix as shown in Figure 1. Aggregation matrix focused on the technical and physical features of industrial districts from an external observer's point of view and recognised two dimensions as (i) Level of homogeneity in service demand and (ii) physical proximity of firms.

	Physical Proximity	Physical Distance
Homogeneity	Centralised facilities and management	Replicated facilities and polices
Heterogeneity	Distributed solutions	Specific facilities and management

Figure 1: The Aggregation Matrix for Facilities Management in Industrial Districts
(Source: Meneghetti and Chinese, 2002)

Authors have detailed four quadrants of Figure 1 as follows.

- *Centralised facilities and management:* Centralisation is technically feasible and avoids redundancies if there is a homogenous demand in a sufficiently small area
- *Replicated facilities and polices:* This avoids additional project costs for the design of tailor-made and specific services, typical of heterogeneous and sparse customers
- *Distributed solutions:* The generation of different by products, which can be useful to another group of firms or a single firm, as a support service or even as a core-business factor
- *Specific facilities and management:* Specific facilities and management policies must be developed only for enterprises characterised by a combination of a highly specific demand and relative physical isolation from the other enterprise

Meneghetti and Nardin (2012) stated that the industrial symbiosis has enabled FM to operate successfully. According to Ashton (2008), industrial symbiosis encompasses collaborative resource management by diversifying firms in geographic proximity in order to achieve environmental and economic benefits such as reductions in operational costs and emissions, more secure access to inputs and basic utilities, and increased longevity of the resource base. Moreover, Chertow, Ashton, and Espinosa (2008) identified four types of resources that could be shared under industrial symbiosis as;

- *Utility/infrastructure sharing* – The pooled use and management of commonly used resources such as steam, electricity, water, and wastewater,
- *Joint provision of services* – Involves firms collectively meeting their ancillary needs, which relate to materials and services not directly related to the core business of a company. Fire suppression, security, cleaning, catering, and waste management are examples of ancillary services that have environmental implications,
- *By-product exchanges* – The use of traditionally discarded materials or wastes as substitutes for commercial products or raw materials, and
- *Information* – To increase the collective efficiency of their operations, and coordinate planning, project management and regulatory permitting.

District heating and cooling system is another opportunity for FM which distributes heat from a centralised location for residential and commercial heating requirements (Ionel, Popescu, and Dungan, 2011). Clara (1998) indicated that the centrally located effluent treatment plant could be named as one of the ideal options in clusters where there are low operational cost and initial cost. In the context of the built environment of Sri Lanka, Karunasena and Kannangara (2012) suggested a centralised waste management system that could be shared by all factories in free trade zones in Sri Lanka.

All aforementioned studies are focused on integration of FM functions within an organization or between organisations. However, there is a lack of an established definition for integrated FM when two or more firms collectively perform FM functions. Therefore, having considered the above studies, integrated FM can be defined as “*exchanging or sharing utility/infrastructure facilities, facility services and information, and collaboratively performs FM functions by two or more organizations in order to optimise FM functions*”.

2.2 Nature of Integrated Facilities Management

The aforementioned concepts embraced great opportunities for Facilities Managers. However, it was noticed that there are different characteristics combined in those collective approaches. Gang, Fua, Sarkisc and Xue (2010) demonstrated that the industrial symbiosis based on the synergistic opportunity arising from geographic proximity in sharing physical resources. Huang and Xue (2012) identified that physical proximity, core competencies, and relationships could be some main characteristic of clusters in integration. Meneghetti and Chinese (2002) noted that managerial commitment, a well-grounded economic and strategic motivation, along with a consistent organisational structure are required for successful integration. Cluster of supply chain also has taken the advantage of sole ownership and geographical location in initiating cluster supply chain. Meneghetti and Chinese (2002) proposed that the distance between organisations and nature of core business as the two dimension that facilitates integration in industrial districts. Considering the holistic view of industrial and non-industrial built environments, distance between organisations, core business, and ownership are considered as the governing factors of FM integration in this study and shown in Figure 2.

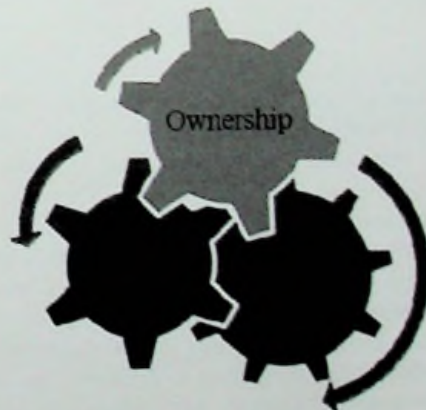


Figure 2: Dimensions of Facilities Integration

Organisations may engage in exchanging and sharing of different facilities and collaboratively performing FM functions. This study, therefore, investigates the integration of following functions among the organisations in Sri Lanka:

- (i) *Utility/infrastructure sharing*: physical facilities such as water, electricity, fire, generator distributions system and other real properties,

- (ii) *Facility services sharing*: building related services such as security, cleaning, catering, and waste management, and
- (iii) *Information sharing*: documents, standards, best practices, and other operational data.

The study further investigates the possible exchanges of integrated FM functions among the organisations. Therefore, a conceptual framework developed for this study is presented in Figure 3. It shows the integration of utility/infrastructure, facility services and information among organisations under different dimensions of integration, i.e. distance between organisations, core business and ownership.



Figure 3: Conceptual Framework for Integrated Facilities Management

3. Research Methodology

A comprehensive literature review was carried to understand integrated FM concepts and to develop conceptual framework for this study. When considering the aim and the nature of the research study, it was obvious that this study needs holistic and in depth investigation into integrated FM functions in Sri Lankan context. Case study involves the study of a phenomenon in its real-life context (Yin, 2003) and incorporates the views of participants in the case under study. Further to Yin (2003), case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. Having considered the exploratory nature of the study, the conceptual framework was then tested using multiple case studies. Aforementioned framework recognised three dimensions which diverse the integration as distance, core business, ownership of the organisation. Therefore, eight case combinations were selected to exploit the integrated FM concept in Sri Lankan built environment as explained in each quadrant in Table 1. Semi structured interviews were carried out with the corporate level Facilities Managers who have experience in facilities integration.

Table 1: Case Study Combinations

Distance	Ownership	Core Business	Case Combination	Nature of the Organisations	
				1	2
Closely located	Same ownership	Same business	A	Five factories in a zone	
		Different business	B	Hotel	Restaurant
	Different ownership	Same business	C	Commercial buildings in a zone	
		Different business	D	Hotel	Commercial
Distantly located	Same ownership	Same business	E	Factory	Factory
		Different business	F	Hotel	Residence hotel
	Different ownership	Same business	G	Commercial	Commercial
		Different business	H	Commercial	Apartment

4. Case Study Findings

Case Combination - A: (Closely Located, Same Ownership, Same Business)

Organisations selected under the case combination - A are located in the green industrial zone in Sri Lanka which spread over 165 acres. The industrial zone has been rebuilt by one of the largest textile chain in the Sri Lanka to place their textile manufacturing factories, while achieving corporate long-term goals. Development has segregated into three sections as industrial, training and leisure and accommodation. Currently, there are five factories under the same ownership in the industrial section, about 200 houses in the accommodation section and huge facilities in the training section. However, maintenance of the zone has been assigned to a separate FM team.

The interviews have been carried out with the Senior Manager in the FM team (Respondent A1) and Plant Engineer (Respondent A2) in one of the factories. Table 2 presents the summary of shared FM function between factories.

Table 2: Integrated FM Functions in Case Combination - A

Utility/Infrastructure	Facility services	Information
<ul style="list-style-type: none"> ▪ Water distribution system ▪ Electricity distribution system ▪ Fire hydrant system ▪ Steam distribution system ▪ Water & effluent treatment plant ▪ Gym / entertainment facilities ▪ Training centre ▪ Staff accommodation ▪ Cafeteria 	<ul style="list-style-type: none"> ▪ Implementation of operational and maintenance standards ▪ Implementation of ISO-14000 ▪ Engineering services ▪ Corporate level fm ▪ Engineering expertise skill 	<ul style="list-style-type: none"> ▪ Energy data ▪ Engineering related information ▪ Health and safety information ▪ FM operational related information ▪ Best practices and knowledge

At the initial stage of the development, aforementioned utilities have been designed as centrally located and distributed among factories. Except those utilities, air conditioning system, generator power supply system, security service, janitorial services, maintenance, and other FM functions

held separately by a small FM team in each factory. Respondent A2 stated *“There is a special team who is responsible for those utilities which I can focus my other works and reduce number of technical staff. Less initial cost and maintenance cost is another advantage. For an example, I have rejected the concept of individual sewerage treatment plants and connected the same to the centralised system since it is profitable”*. Respondents commonly agreed to this integration which was apparently profitable for both the service provider and the factory. However, establishment of zone cafeteria was rejected by several factories due to the expensiveness of foods.

According to the respondent A1, there are monthly engineering, health and safety meetings with the factory Facilities Managers in order to discuss operational issues, further improvements and to share the expertise knowledge in open forums which added value for participants. Corporate database further assists in reviewing energy data, consumption data, and new practice for specific managers in the group as an internal benchmark. Accordingly, factories use common processes and procedures in order to standardise their operations. It is also observed that the factories are collaboratively conducting FM tasks within the zone as well as have certain inter relationships between other firms in the same group.

Case Combination - B: (Closely Located, Same Ownership, Different Core Business)

The organisations selected under the case study B belong to same ownership in hotel business. Both built environments are located close proximity to Colombo. Distance between the facilities is approximately 80 feet. The luxury five-star hotel has nine storey building. The restaurant is a newly constructed property with four storey building which operates from morning to mid night. The restaurant is specialised in Italian food and includes luxury facilities such as gymnasium, spa, swimming pool, and cafeteria.

In the initial construction of the restaurant property, the parent company had made a decision to facilitate non-core business activities using the hotel team. Thus, the parent company has legally handed over this property to the hotel in order to manage the property. During the interviews with the Chief Engineer (Respondent B1) in FM team, it was revealed that the both properties are managed by a central team was executed for both properties. Following Table 3 presents common FM functions for both entities.

Table 3: Integrated FM Functions in Case Combination - B

Utility/Infrastructure	Facility services	Information
<ul style="list-style-type: none"> ▪ Steam distribution system ▪ Fire hydrant system ▪ Generator power distribution system ▪ Security (CCTV) monitoring system ▪ Fire detection and prevention panel including sprinkles, heat detections, smoke detection ▪ Telecommunication system 	<ul style="list-style-type: none"> ▪ Implementation of operational and maintenance standards ▪ Engineering services ▪ Housekeeping services ▪ Pest control ▪ Security service ▪ Laundry service ▪ Corporate level FM ▪ Tool and equipment 	<ul style="list-style-type: none"> ▪ Energy related information ▪ FM operational related information ▪ Procurement related information ▪ Financial planning ▪ Best practices and knowledge ▪ Documentations – standard operating procedures, energy, preventive maintenance

The Chief Engineer stated, *“This integration is cost-effective. For an example if we have installed separate fire pumps, it has high initial cost and also high maintenance cost. Further, it requires additional staff for the operation. Having a centralised system for two properties is handiness for me to handle the operation with less involvement of staff.”* Further, all monitoring and controlling panels for both entities such as fire

alarm system and generator changeover panel are installed in central location in the hotel. Hence, cost of operation is distributed among the entities, based on their consumption.

The both organisations have integrated maintenance and operations for the steam generation process and hence both companies are enjoying less maintenance cost, time, and the hassles. According to the Chief Engineer, restaurant has registered as a commercial property, while hotel has registering as a hotel facility. Therefore, there are different tariff plans for both the properties. Thus, water, electricity, and air conditioning cannot be integrated. Further, due to some practical and safety issues, gas distribution system and car park have not been shared.

As being under the same ownership, similar procedures, documents and processes have easily shared between properties. It is notice by findings that the organisations had not recruited additional staff and equipments since the facility integration and hence FM staff work under pressure. Hotel had rescheduled their operations in order to cope up with the situation. The two building are functioning well due to the benefits of the integration.

Case Combination - C: (Closely Located, Different Ownership, Same Business)

The organisations selected for case study C are located in a privately held zone and they are in the businesses of IT, software development, and business process outsourcing services companies. Zone spreads over 14.5 acres and currently 250,000 square feet have been developed including six rentable properties with modern facilities such as gymnasiums, food courts and in-house parking facilities. Zone accommodates nearly 3750 occupants in 20 popular companies in the IT industry. Distance between all facilities is approximately 50 meters. Property developer maintains both in house and outsourced FM team in order to manage their property.

Case study interviews were carried out with the Head of the Facilities Management team (Respondent C1) and the Director FM (Respondent C2) of the facility. Table 4 presents the common FM functions carried out within the Zone. FM team is responsible for providing utility facilities for the tenants and other services will be provided based on the tenants' requirement in accordance with the agreement.

Table 4: Integrated FM Functions in Case Combination – C

Utility/Infrastructure	Facility services
<ul style="list-style-type: none"> ▪ Water distribution system ▪ Electricity distribution ▪ Generator power supply ▪ Building management system ▪ Sewerage and drainage system ▪ Gymnasiums ▪ Food court 	<ul style="list-style-type: none"> ▪ Engineering services (Annual maintenance and other breakdowns) ▪ House keeping ▪ Security services ▪ Pest controls ▪ Same suppliers ▪ Tools and equipment

Findings emphasised that FM team is responsible in providing utilities for the properties. Some of the utilities are located centrally while some utilities such as air condition units, fire prevention and detection system are attached individually to the buildings. These systems are connected to the central building management system. Respondent C1 stated, "*Centralised monitoring and controlling system facilitate the management of time, resources, money, as well as quick response emergencies*". However, the study found several mismatches in the integration. Common transportation system for the zone has been rejected by individual organisations. Management of the Respondent C2 has been built a separate food court for their staff since common food court has less room and its' expensiveness. However, Respondent C1 stated that the organisations prefer individuality in obtaining services as being the competitors in the same industry.

Respondent C1 shares human resources such as technical staff in providing FM services to all properties while operating from a central location. Some organisations have requested the shared facilities and services such as janitorial and security while others outsourced these services. It is evident that although firms are located in close proximity, none of these organisations are in collaborative approach in carrying out FM functions.

Case Combination - D: (Closely Located, Different Ownership, Different Core Business)

Case combination - D studied the integrated FM functions between a commercial building and a hotel facility located in close proximity. Commercial building has two towers of 39 stories each. Commercial building is designed to provide rentable office and business space with modern infrastructure facilities. Hotel is in a five-star category which has 17 stories including a basement floor, a lobby level and a mezzanine floor.

Both organisations operate individually under different ownerships. The study interviewed a Senior FM (Respondent D1) in the commercial property and the Chief Engineer (Respondent D2) of the hotel. Case study found that the two organisations share their car park facilities. Respondent D2 mentioned, *"The first respondent D1, has requested a common emergency evacuation access and a shared car park to solve two critical issues."*

Commercial building is operating from 8 a.m. to 6 p.m. The commercial organisation noted that space available for car parking for their tenants and customers is insufficient during daytime which is the peak time for their business. However, during the night, the same car park is abandoned due to low demand from the tenant. In contrast, it is found that hotel car park slots are available during daytime. However, the hotel management was unable to satisfy car-parking demand during night due to large number of guests demanding for lodging, attending banquet functions and having dinners. Considering the situation, two FM managers from both parties have agreed to share car-parking facilities in two premises. The agreement was to allow using the car parking slots in the other facility, whenever their parking slots are filled.

Facilities Manager of the commercial property said, *"Due to the nature of the operations in both businesses, our demand on car park varies. However, due to this decision, problem of insufficient car parking has been solved. In addition, the Corporate Management is happy on the decision of integration. The decision adds value to the customer."* Although both organisations have realised the benefits of integrated facilities, it is observed that they are reluctant to integrate further FM functions or facilities. Facilities Manager of the hotel facility said that, *"The existing regulations restrict the integration of facilities such as utilities. There should be a win-win situation in order to integrate the FM functions. Factors such as mutual trust between parties, transparent agreements, and involvement in top management are essential to conqueror the integrated situation."*

Case Combination - E: (Distantly Located, Same Ownership, Same Business)

One of the reputed apparel manufacturing chains is selected for case study E. The chain consists of eight factories that spread over Sri Lanka. There is a separate in-house FM team in each factory. Study interviewed Senior Manager (Respondent E1) who is responsible for FM functions of all factories and Plant Engineer (Respondent E2) of one of the factories. Discussion findings are shown Table 5.

Table 5: Integrated FM Functions in Case Combination - E

Utility/Infrastructure	Facility services	Information
<ul style="list-style-type: none"> ▪ Central BMS monitoring and controlling system 	<ul style="list-style-type: none"> ▪ Implementing operational and maintenance standards ▪ Corporate Facilities Manager ▪ Same service provider ▪ Central finished good transportation system 	<ul style="list-style-type: none"> ▪ Data base for utilities ▪ Best practice and knowledge ▪ Supplier information ▪ FM operational related information ▪ Documentations – standard operating procedures, energy, preventive maintenance ▪ Financial planning ▪ Procurement related information

The chain has a single central database which displays all relevant information to Plant Engineers and Head Office management. In addition, Building Management System in each factory is linked to the Head Office in order to assist, monitor and control some services such as air conditioning system. The Head Office controls the performance of each factory using utilities data. Respondent E1 stated that “sharing the data was one of the biggest issues. Therefore, we have now converted to an automated system.” The shared data facilitates performance appraisal, internal benchmarking, preparation of budgets, improvements, and further decision making.

Interview discussions highlighted that the parent company sets controls in order to standardize the FM operations. Thus, all factories follow the same processes, procedures, audits, and document formats. Respondent E1 said, “Initially some staff members resisted in standardisation due to the fear of losing their flexibility. But with the involvement of top management, we were able to control the resistance.” Eight Plant Engineers with the Central FM team held meetings frequently at a selected plant. Respondent E2 emphasised that “frequent meetings with plant engineers were mostly benefited, where discussions were held on issues, best practices, and progress openly. We do always update our knowledge.” Further, it helps to identify a common efficient service provider to provide services to all factories. In addition, there is a centrally coordinated transport system for the delivery of finished products in order to avoid delays. Further, it is cost effective and adds value to the organisation.

Case Combination - F: (Distantly Located, Same Ownership, Different Business)

One of the buildings selected for this study is a five star hotel and the other building is also in hotel category which provides apartments for long or short stay. Both organisations are managed by one of the reputed international chains in the world. The five-star hotel is a 19 storey building with over 380 guest rooms and the other hotel is a 33-story building with 175 apartments. There is a separate FM team for each hotel. Case study presented the interview findings with the Hotel Chief Engineer (Respondent F1), FM Executive (Respondent F2) and Housekeeping Executive (Respondent H3) in the residential hotel.

Both entities share certain FM related activities as it is being under one management as presented in Table 6. However, entities found it difficult to integrate infrastructure/ utilities due to the distance between two buildings which is 3.1 Km via road.

Table 6: Integrated FM Functions in Case Combination - F

Facility services	Information
<ul style="list-style-type: none"> ▪ Implementation of operational and maintenance standards ▪ Food and beverage ▪ Toiletries and other items ▪ Laundry facility ▪ Internal sales ▪ Tools and equipment 	<ul style="list-style-type: none"> ▪ Common data base for share energy, occupancy satisfaction, employee works, best practices and knowledge ▪ Documentations - audit format ▪ Procurement related information ▪ Best practices and knowledge

If any of the hotel guests requested a suite, the hotel directs them to the residential hotel. Accordingly, this study recognised several examples for informal sharing between the entities. The auditing is handled by one company and hence knowledge and skills are shared. Further, fire, light, and safety audits are done by the Director Operations of entities. The two entities share food and beverage, toiletries and other similar items when one organisation is out of stock. Further, there is a common laundry for both facilities. Moreover, the parent company shares information on energy performance, best practices, and guest satisfaction through a web portal. Although two entities are in different core businesses, the organisations are taking the advantage of single ownership in sharing FM functions.

Case Combination - G: (Distantly Located, Different Ownership, Same Core Business)

Case combination - G consisted of two competitors who rent office spaces and provide FM services. Two commercial properties are 16 storey and 11 storey buildings located in 1.4 km distance. Both entities perform their FM operations independently. However, it is revealed that a common pool of janitorial staff and equipment are sharing among the properties with the supervision of janitorial service provider. Therefore, the study interviewed the corporate Facilities Manager (Respondent G1), Maintenance Manager of the properties (Respondent G2), and the Area Manager of the janitorial service (Respondent G3).

Two properties have outsourced their janitorial services to one service provider who handle around 110 sites in Colombo region. Two properties are separately getting the help of 53 and 10 janitorial staff from the outsourced company. The service provider has allocated permanent staff and additional staff for each property. It is also found that the excess staff members are normally transferred to the sites that need extra staff and hence company performance is optimized.

Case Combination - H: (Distantly Located, Different Ownership, Different Core Business)

Case combination - H includes a commercial building and an apartment complex. The commercial building has two towers which provide rentable office and business spaces to prospective clients. Apartment complex is a mixed development with eight multi-tower apartment complexes with hotel, shopping mall, food court, and theatres.

Interviews were conducted among the Senior Facilities Manager (Respondent H1) of the commercial property and the Manager (Respondent H2) of apartment complex. Management Council of apartment complex has outsourced total FM function to the commercial property FM team. Thus, commercial building and apartment complex share common operations summarised in Table 7. The two properties are distantly located via the road (8 Km), and hence it was difficult to share utility/ infrastructure.

Table 7: Integrated FM Functions in Case Combination - H

Facility services	Information
<ul style="list-style-type: none"> ▪ Engineering services ▪ Common pool of technical and operational level staff and security staff ▪ Engineering expertise ▪ Corporate level Facilities Managers ▪ Special tools and equipments ▪ Same suppliers 	<ul style="list-style-type: none"> ▪ Procurement related information ▪ Documentations – standard operating procedures, energy, preventive maintenance, procurement policies ▪ Best practices and knowledge ▪ FM operational related information

The interviews revealed that the FM service provider has assigned with a separate FM team for both properties. The corporate level facilities managers are jointly involved in facility planning, decision making for both parties. Thus, most of the management functions such as procurement, maintenance, and human resources management are similar. Both companies are sharing common pool of staff.

5. Analysis of Integrated FM Functions

All case studies presented in the previous section share various FM function at different scales. Table 8 presents the summary of FM functions that are shared among different built environments.

Table 8: Summary of Integrated Facilities Management Functions

	Integrated functions	A	B	C	D	E	F	G	H
Utility/infrastructure	Water distribution system	x		x					
	Electricity distribution system	x		x					
	Fire hydrant system	x	x	x					
	Steam distribution system	x	x						
	Water and Effluent treatment plant	x							
	Generator power supply		x	x					
	BMS or other controlling units (fire, CCTV,)		x	x		x			
	Sewerage and drainage system	x		x					
	Telecommunication system		x						
	Car park				x				
	Cafeteria	x		x					
	Gym / entertainment facilities	x							
	Training centre	x							
	Staff accommodation	x							

	Integrated functions	A	B	C	D	E	F	G	H
Facility services	Operational and maintenance standards	x	x			x	x		x
	Engineering services	x	x	x					x
	Housekeeping services		x	x					
	Security service		x	x					
	Pest control		x	x					
	Laundry service		x						
	Common pool of operational level staff (engineering, housekeeping, security)							x	x
	Corporate level FM	x	x			x	x		x
	Engineering expertise skill	x	x			x			x
	Same suppliers		x	x		x		x	x
	Tool and equipment		x	x				x	x
	Food and beverage, toiletries and other items						x		
	Internal sales						x		
	Central finished good transportation								
Information	Energy related information	x	x		x	x	x		x
	FM operational related information	x	x		x	x	x		x
	Procurement related information		x		x	x	x		x
	Financial planning		x			x			x
	Best practices and knowledge	x	x		x	x	x		x
	Corporate data base	x	x			x	x		x
	Document formats					x	x		

According to the Table 8, closely located firms have integrated utility/infrastructure. However, case combination E has shared BMS monitoring and controlling functions, although the firms are located distantly. Yet, there are restrictions in sharing water, electricity, and air condition system due to legislations. Case combination A and C are significant examples for industrial symbiosis and industrial district as per the literature. However, developments have not exploited substantial opportunities of integration within the zone.

Firms which belong to same ownership are collectively operating FM functions by implementing operational and maintenance standards, expertise skills through corporate facilities managers.

Findings also highlighted that different ownership organisations and case combinations G and H are integrated FM functions through an outsourced service provider. Thus, companies can be benefited by outsourced service providers who use common pool of human resources, tools, equipments and standards.

The research findings revealed that most of the owners have implemented corporate database for sharing information. Building Management System (BMS) would be the ideal method for sharing information in facilities integration. However, there is a strong integration in FM functions between closely located, same ownership and same core business firms. When firms are distantly located, different ownership and different core business integrations is weak.

Integration of FM functions creates a win-win situation for all parties who are exchanging or sharing utilities/infrastructure facilities, facility services and information. Accordingly, facilities managers can encourage and assist company management to integrate facilities in order to optimise business performance. The findings of this study will guide industry practitioners on possible utilities/infrastructure facilities, facility services and information that could be exchanged and shared under different organisational settings such as distance, core business and ownership to confront the emerging business challenges.

6. Conclusions and Recommendations

Organisations implement FM as a tool to overcome their workplace problems, while enhancing the value of core business. The rapid development of management concepts and technologies forced organisations to implement innovative FM strategies. Integrated FM is a novel sustainable approach for any of organisations to meet the core competencies of the business environment.

Preliminary investigations through case studies and discussions with FM experts have revealed that there are examples of integrated physical facilities and FM functions among the built environments in Sri Lanka. Nevertheless, it is evident that there is a less motivation for integration of FM due to several reasons.

The study found that the distance, ownership, and core business as the driving forces for the facilities integration. If firms are in geographical proximity, utility/infrastructure could be centralized and easily shared. Collective approaches are suitable for the firms who are under same ownership. Distantly located firms could not easily share utility/infrastructure. However, there is a high tendency of centralising utility/infrastructure among the organisations in a clusters or located in a zone. Some organisation share FM functions though an outsourced FM service provider. As being under a same ownership or management, there is a high potential of sharing FM functions. Although organisations are distantly located, they could easily share information. Sole ownership is one of the reinforcements for information sharing.

In conclusion, when the firms are in close proximity, under the same ownership, and in the same core business, there is a high possibility of sharing utility/infrastructure, FM services and information. Long distance, different ownerships, and different core business act as a barrier for integration of FM functions. Apart from the distance, ownership and core business, there are significant features which could drive integration such as investment, top management commitment, mutual trust, contractual agreement, culture of organisations, and initial design. The integrated FM functions presented in this paper would be useful aids for designing and implementing integrated FM concept in built environments in Sri Lanka in order to optimise the performance of facilities management.

7. References

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