

INTEGRATION OF SUSTAINABILITY INTO FACILITIES MANAGEMENT PRACTICE IN HEALTHCARE SECTOR

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ABSTRACT

Built environment is recognised as one of the least sustainable industries in the world. Health Care (HC) sector is recognised as the second energy intensive sector in the built environment and is identified as one of the most vulnerable sectors and a potential threat in harming the environment. As Facilities Management (FM) is recognised as a “key actor” in addressing sustainability practices in the built environment, it has become a major concern to deliver FM practice in a sustainable manner. However, integrating sustainability is challenging as sustainable FM practice is firm specific and need consideration of economic, environment and social pillars of sustainability. Thus, this paper investigates how sustainability practices can be integrated in to the FM services and practices in the HC sector.

A Delphi survey was conducted among 10 experts to identify the significant FM services and FM practices to integrate sustainability in the health care sector. The first round of Delphi survey revealed that building services (BS), quality management (Q) and space planning (SP) are the top three FM services for integrating sustainability with RII values of 0.94, 0.9 and 0.9 respectively. In addition, 28 FM practices were identified significant, amongst, educating the work force on related standards, procedures, Strategic Facility Planning (SFP) for HC and deploy quality control and assurance practices with proper standards was identified as three top most FM practices with receiving an RII of 0.96, 0.96 and 0.94 respectively. A conceptual framework was developed for effective integration of sustainability into FM practice comprising of 8 FM services, 28 FM practices and 78 sustainable practices. This will further to be taken to the subsequent rounds of the Delphi survey to refine the conceptual integration of FM services, practices and sustainable practices for effective integration of sustainable practice into the FM practice in the HC sector.

Keywords: Facilities Management; Healthcare Sector; Sustainable Facilities Management.

1. INTRODUCTION

Sustainability has become a major obligation in the built environment as it faces major challenges around the world due to its significant impact on the environment (Chotipanich & Lertariyanun, 2011). For example, buildings are estimated to use 45-50% of energy, 50% of water out of the total global resources and in the meantime responsible for polluting the air in cities by 23%, emitting greenhouse gases by 50% and landfill waste by 50% out of the total global pollution (Dixon, 2010). Among the built environment sector, HC sector is recognised as the second energy intensive sector and emits around 8% out of total 40% of CO₂ emission (Kras, 2011). In addition, HC sector in US alone generates over 3 million tons of solid waste per year consisting of hazardous solid, toxic, infectious and radioactive wastes (Davies & Lowe, 1999). In addition, clinical waste in HC sector is ranked among the top 4 sources in emitting and spreading harmful substances which lead to cause respiratory diseases and other illnesses to the community (Buffoli *et al.*, 2014). Moreover, unlike the other facilities such as; office buildings or educational or industrial facilities or hotels, HC sector is categorised under critical facility as it could bring many harm and damages in an operation failure (Torell, 2012). Further, “care for the healthy” is the core objective of the HC sector in which both delivery of medical care and delivery of non-core services to satisfy patients and visitors wellbeing needs equal importance (Wu, 2011). Even though HC is recognised for “caring for the healthy” it undermines the population by being a threat to their health and

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wellbeing by failing to meet the social responsibility. Thus, there is a general push to bring the HC sector to incorporate sustainable practices.

This creates a demand for Facilities Management (FM) to adopt sustainability in the HC sector as they are identified to be in a unique position to deliver real differences in retrofitting sustainability practices in buildings (Elmualim *et al.*, 2012). This leads to many benefits such as; financial returns, reducing energy consumption and waste, while increasing productivity and standing in the community (Hodges, 2005). This shift in FM is described as “sustainable movement” for FM today where Sustainable Facilities Management (SFM) was acknowledged (Meng, 2014). However, lack of understanding about sustainability and unwillingness of integrating sustainability are preventing FM from practicing sustainability (Elmualim *et al.*, 2009). The general idea of SFM is to incorporate sustainability practices into the operations of FM practices (Baaki *et al.*, 2016). In essence, Nielsen and Galamba (2010) assert that, SFM does not create totally new practices, but rather incorporating practices concerning the social, economic and environmental pillars of sustainability into the existing FM practice. In this context, SFM is defined as “delivery of sustainability within FM” (Shah, 2007). In another definition by IFMA (2016) stated SFM as “integrating the people, place and business of an organisation that optimises economic, environmental, and social benefits of sustainability”. Hence, both the definitions state moreover the same meaning that SFM means integrating sustainability into the current FM practice. However, facility managers apparently suffer from a kind of blind spot on integrating sustainable practices into the current FM practice as there are no visible SFM practices streamlined to integrate sustainability into the current FM practice in HC sector (Baaki *et al.*, 2016).

Furthermore, SFM practice is challenging as it tends to differ in number of ways in different facility types from offices to housing, retail locations, healthcare, hotels, universities, world heritage sites and others. These facilities, from technical building components to the usage and economic contexts it differs, thus, requiring to seek FM practice and sustainable practice on specific context (Price, 2004). For instance, FM services such as building services management, real estate management, risk management and quality management, etc. require different type of sustainability practices (Nutt, 2004). Nielsen *et al.* (2009) highlighted this on integrating SFM practices in the operations of housing estates in Denmark. The research identified green accounting, individual metering, energy management and energy labelling of buildings as some of the sustainable practices mostly emphasised in the housing sector. Shari and Soebarto (2014) highlighted eliminating sick building symptoms, accessibility to public transport, energy efficient facilities, water efficient facilities and 3Rs in waste management practices etc as most significant sustainable practices to be focussed by office buildings in Singapore. Furthermore, use high quality and long lasting material (linen), recycle waste water, install low-flow sinks, toilets, showers and design to preserve views were highlighted in hotels (Ahn & Pearce, 2012). This showcases that, different types of ownership demand different types of FM practice thus determining the success of SFM. This creates the necessity of streamlining the SFM practice to be compatible with the HC specific context.

This paper reports results of a study attempting to gain insights about FM practice and how sustainable practices can be integrated in the HC sector. In attempting to gather empirical evidence, the study adopted Delphi survey to collect data and information from the key persons concerning FM practices in HC sector. Its key findings provide not only empirical results of FM practice, but also conceptually integrates sustainable practices into the current FM practice. The paper is consisted of four main parts. The first part explains the research design and methodology adopted. In following, it presents findings of the first round Delphi survey. Next, section conceptually integrates FM services, practices and sustainable practices into the FM practice. Finally, the paper is disclosed with the conclusions.

2. RESEARCH METHODOLOGY

The study initially involved in an extensive literature review in identifying facilities management (FM) context, FM practice and sustainable practices in relation to HC sector. FM context was reviewed to identify the current FM services and practices. For that, purpose FM related published journals, conference papers were reviewed from 1990 to 2017, in which 10 articles listing the appropriate context of FM was shortlisted and reviewed. Thereafter, HC specific FM practices were reviewed from published materials such as; journals, conference papers and HC specific documents in relation to each of the FM services. Then sustainable practices in relation to each of the FM services and practices were reviewed from 2000 to 2017 through extensive document review. These documents were electronically searched in the search engines with the key words of “sustainable FM

practices in HC”, “HC sustainable practices” and “HC green practices”. Amongst many documents were obtained in which 52 documents [including journal papers (17), conference papers (12), HC guide documents (10), books (4), issue papers (3), green buildings guides (2) and government guides (4)] were examined. These documents were clustered among many fields for example; energy, water, HC waste, quality management and space planning etc focused on individual aspect of sustainability. Amongst those, documents written to aid building operators in meeting sustainability were selected. After the selection of documents, sustainable practices were identified and grouped in terms of its related FM practice depending on the characteristic and feature. This enabled the study to conceptually integrate sustainable practices into the FM practice.

Then, a Delphi survey was conducted among 10 key persons concerning FM practice in HC sector. The respondents who possess an experience above 10 years in FM practice with HC involvement and exposure to sustainability were selected. Thus, the details of the respondents are presented;

2.1. DEMOGRAPHICS OF RESPONDENTS

In terms of the educational background 50% of the respondents had master’s educational qualification, 30% had degree in engineering and 20% had degree in management. Considering the experience in the field of FM practice 60% of the respondents had 11 to 15 years of experience, 20% had 1 to 5 years and 10% of respondents had 6 to 10 years and 16 to 20 years of experience. Further to the experience in HC sector, the respondents had 6 to 10 years 40%, 1 to 5 years 30%, 11 to 15 years 20% and 10% had more than 25 years. However, all the respondents had more than 10 years of experience in total despite the experience in FM practice or HC sector they possessed. The following demographic results are presented in graphical method in Figures 1, 2 and 3 respectively.

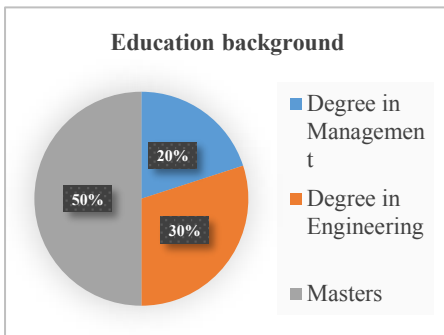


Figure 1: Education background

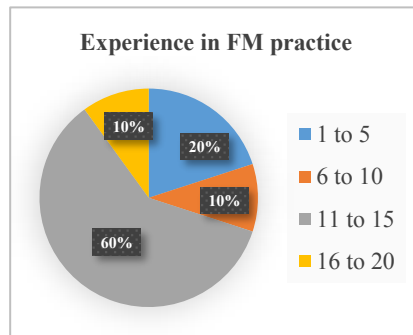


Figure 2: Experience in FM Practice

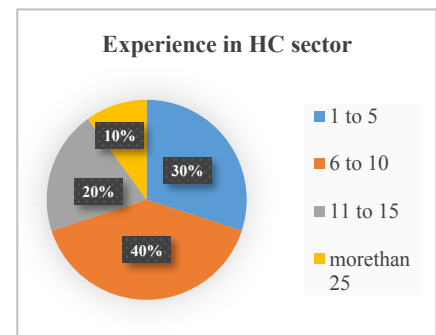


Figure 3: Experience in HC Sector3

This study presents the first round of Delphi survey results which focused on identifying the most important FM services and practices in integrating sustainability. In the design of questionnaire, a five-point Likert scale was employed to quantify responses. The level of significance was based on the respondents’ professional judgement on a given scale which consisted of: 1=“not at all important”, 2= “slightly important”, 3=“moderate”, 4=“highly important” and 5=“excellently important”. In addition the appropriateness of each FM practices in terms of the FM service classification was mapped in the first round based on a scale consisting of: 1= “strongly disagree”, 2=“disagree”, 3=“moderate opinion”, 4=“agree” and 5=“strongly agree”. Data analysis was conducted using relative importance index (RII) ratings to identify the most significant FM services and practices to integrate sustainable practices. RII value of 0.7 or above are regarded as sufficient (Ikediashi Ogunlana, S. and Ujene., 2012) and the value resulted below were taken further to the subsequent rounds as it did not attain consensus.

3. EXPERT SURVEY RESULTS

This section of the paper presents the findings from the first round of Delphi survey conducted.

3.1. SIGNIFICANT FM SERVICES IN INTEGRATING SUSTAINABILITY

11 FM services were identified through an extensive literature review. In essence, Table 1 presents the results attained in the first round of the Delphi survey on the significant FM services in integrating sustainability into the FM practice in HC sector.

Table 1: Significant FM Services in Integrating Sustainability

FM services		RII	Rank
Building Services and management	BS	0.94	1
Quality management	Q	0.90	2
Space Planning and management	SP	0.90	2
Finance management	F	0.88	4
Risk management	R	0.86	5
Information Technology	IT	0.84	6
Planning and programming	P	0.82	7
Operations management	O	0.78	8
Human Resources management	HR	0.66	9
Real Estate management	RE	0.58	10
Marketing management	M	0.46	11

Delphi survey results revealed that BS as the most important FM service in integrating sustainability in the context of HC sector with receiving RII of 0.94. Similarly, in literature review also BS was frequently reported and considered important. Q and SP identified as equally important receiving RII of 0.90 and identified as the second significant FM services in integrating sustainability in HC sector. However, these FM services were moderately sighted in the literature findings. Furthermore, RE and HR were highly referred in literature review but according to the expert survey these services are identified as not significant in integrating sustainability in the context of HC sector with receiving RII of 0.58 and 0.66. Moreover, marketing management in literature was sighted very rarely and in the view of expert also, it was regarded as not important in integrating sustainability in the HC sector with RII value of 0.46. Accordingly, out of total 11 FM services identified in the literature findings only 8 FM services were considered important in integrating sustainability in HC sector. Thus, the remaining 3 FM services namely HR, RE and M did not reach consensus amongst the expert and intend to be carried forward to the subsequent round to attain consensus of experts. Next section presents the results on significant FM practices in integrating sustainability.

3.2. SIGNIFICANT FM PRACTICES IN INTEGRATING SUSTAINABILITY

Table 2 shows the RII value and ranking obtained for the 38 FM practices in integrating sustainability.

Table 2: Significant FM Practices in Integrating Sustainability

FM practices	RII	Rank
Q1 - Educating the work force on related standards and procedures	0.96	1
P1 - Strategic Facility Planning (SFP) for HC	0.96	2
Q2 - Deploy quality control and assurance practices with proper standards	0.94	3
BS1 - Maintain building and fabric	0.92	4
BS2 - Housekeeping services	0.92	4
BS3 - Waste management	0.92	4
Q3 - Service tasks standardisation and benchmarking	0.92	4
F1 - Prioritise risk and allocate budget	0.92	4
IT1 - Integration of several FM services	0.92	4
P2 - Facility analyse and synthesize the HC requirement	0.92	4
HR2 - Effectively manage diverse workforce	0.92	4
HR5 - Involve in change management process	0.92	4
R1 - Identifying and detecting risks in HC	0.90	13

	FM practices	RII	Rank
R2	- Assigning values to risks upon it severity	0.90	13
P3	- Long-term, mid-term, annual resource planning of HC	0.90	13
HR3	- Create a learning environment for workforce	0.90	13
BS4	- Run and maintain plant	0.88	17
Q4	- Delivery of consistent high-quality performance	0.88	17
F2	- Manage the finances of the facility function etc	0.88	17
IT2	- Determine different technical requirements of HC activities	0.88	17
HR4	- Conduct performance management periodically	0.88	17
F3	- Budget estimation and cost control	0.86	22
HR1	- Participate in interview panels for multiple positions	0.86	22
SP1	- Involve in space management activities	0.84	24
SP2	- Space allocation, utilisation and relocation	0.84	24
SP3	- Space use audit and monitoring	0.84	24
R3	- Minimize the impact on the patient and the hospital	0.84	24
BS5	- Manage transportation	0.82	28
IT3	- Digitalising the record system Eg: electronic medical record, administrative and financial system etc	0.82	28
F4	- Identify the impact of the transaction on the system's financial statements and ratios	0.8	30
R4	- Create a learning environment for workforce	0.8	30
O1	- Purchasing and procurement control negotiation	0.8	30
O2	- Initiate effective ambulatory Care	0.76	33
RE1	- Lease negotiation and management from clinic space to ambulatory surgery centers (ASC)	0.72	34
BS6	- Catering	0.66	35
M1	- Enhances visibility and image	0.65	36
O3	- Patient management	0.64	37
M2	- Participate in marketing programs, promotions and campaigns	0.63	38

Accordingly, out of the total 38 FM practices the respondents indicated that educating the work force on related standards and procedures and Strategic Facility Planning (SFP) for HC as the most important FM practices in integrating sustainability in the HC sector with receiving the highest RII of 0.96. Following, FM practices namely, deploy quality control and assurance practices with proper standards attained the third important practice with receiving RII of 0.94. As HC sector is vulnerable in spreading diseases and other hazardous substances, maintaining quality achieved the first top priority among the experts' opinion. Moreover, FM practices such as catering, enhances visibility and image, patient management and participate in marketing programs, promotions and campaigns received the least RII value of 0.66, 0.65, 0.64 and 0.63 and identified as not significant in integrating sustainability in the HC sector. Consequently, these practices were intend to be carried forward to the subsequent rounds of Delphi survey to reach consensus among the experts. Therefore, the first round of Delphi survey revealed that, 8 FM services and 34 FM practices were considered important in integrating sustainability in HC sector. This was carried forward in integrating sustainable practices into FM practice in HC sector.

4. INTEGRATION OF SUSTAINABLE PRACTICES INTO FM PRACTICE: CONCEPTUAL VIEW

This section conceptually integrates the finding from the previous sections 3.1 and 3.2 with integrating its respective sustainable practices. FM services and its respective FM practices were crossed checked and mapped for its appropriateness in the first round of the Delphi survey and consensus was reached upon all 38 FM practices. Therefore, all the FM practices classified under the FM services were integrated in accordance to the expert survey opinion. Thereafter sustainable practices were identified through a document review and they were classified under each of the FM practices and FM services depending on the feature and characteristics.

Table 3 presents the conceptual integration of FM services, FM practices and sustainable practices for FM practice in HC sector. In essence, 8 FM services and 34 FM practices were identified as significant in integrating sustainability into the FM practice in HC sector. However, out of the 11 FM service, 3 FM services namely HR, M and RE and its relevant 8 FM practices were considered not significant in the conceptual integration as per the expert's opinion. Therefore, out of the total 34 significant FM practices only 28 FM practices were carried forward in the conceptual integration of sustainable practices into FM practice in HC sector.

Table 3: Conceptual Integration of Sustainable Practice into FM Practice

FM service	FM practices	Sustainable practices
BS	BS1	s-BS1a. Improve better indoor environment quality to prevent infection, sick hospital syndrome (SHS) causing headaches, fatigue, eye and skin irritations etc. in hospitals to protect visitors, patients and hospital staffs [1]
		s-BS1b. Improve the acoustic level of HC setting to avoid sleep disruption, awakening, increased hospital stay and rehospitalisation for patients and work pressure, stress, annoyance, increased fatigue, emotional exhaustion and burnout etc for HC staff [2]
		s-BS1c. Maintain good day lighting to stimulate healing environment since exposure to day lighting reduce heart rate, increase activity levels, influence the intake the pain drugs, improve mental health and reduce length of patient stay in HC [3]
		s-BS1d. Use of automated shading and redirecting sun light strategies to improve healing [3]
		s-BS2e. Ensure proper thermal comfort (20°C - 24°C) at general conditions and ensure to provide low temperature during cardiac surgery, usually a higher setting for paediatric surgeries at 17°C or below [4]
		s-BS1f. Preserve heritage Eg: replace “exotic” trees with “native species”, encourage cultural practices among staffs [5]
	BS2	s-BS2a. Use of proper infection control measures and dust control measures for comprehensive cleaning strategy [6]
		s-BS2b. Deploy Integrated Pest Management strategy to minimise the usage of chemical treatment of eliminating pests [7]
	BS3	s-BS3a. Execute the HC waste management plan. [8]
		s-BS3b. Minimise waste [8]
		s-BS3c. Follow appropriate methods such as 3R, 5S system and zero waste strategy etc. [9]
		s-BS3d. Follow appropriate colour coding system for different type of wastes [9]
		s-BS3e. Ensure appropriate onsite, off-site storage and transport of non-hazardous, hazardous waste and medical wastes to avoid any leaks, infections and pollution [10]
		s-BS3f. Treat infectious wastes before final disposal if necessary [10]
	BS4	s-BS3g. Select appropriate non incineration technologies combination to decontaminate waste through thermal process, chemical process, irradiative process, mechanical process and biological process [11]
		s-BS5a. Incorporate suitable filtration to trap microbiological pathogens, particulate contaminants and other hazardous substances to remove from the circulating air [12]
		s-BS4b. Prevent nosocomial infection through maintaining differential pressure controls to ensure clean-to-less-clean airflows [12]
		s-BS4c. Maintain proper directional airflow controls to avoid mixing of airborne pathogens [12]
		s-BS4d. Identify applications for energy saving measures in electromechanical installations Eg: HVAC, lighting systems, boilers, gas systems etc. [13]
		s-BS4e. Use of renewable energy sources Eg: solar panels, wind, biomass [13]
		s-BS4f. Conduct energy audits and determine energy usage to ensure efficient energy consumption [14]
		s-BS4g. Use of sensors in applicable perimeter zones to save energy Eg: Day lighting, occupancy sensors, timers, automated shades etc. [15]
		s-BS4h. Identify water conservation opportunities in boilers, cooling towers, kitchen, laundry and sanitary areas etc. [16]
		s-BS4i. Reduce access water usage in medical activities namely surgical scrubbing, dialysis unit, patient care activities, laser cooling, hydrotherapy and birthing pools etc. [16]
	s-BS4j. Consider the amount or type of water used for outside watering Eg: rainwater harvesting, sprinkler timings, plant choice and mulching [16]	

FM service	FM practices	Sustainable practices
	BS5	s-BS4k. Use of alternative supply sources Eg: boreholes, rainwater harvesting and greywater reuse etc. where water quality is not recommended [16]
		s-BS4l. Reduce avoid pollution through sewage and waste water discharge in HC Eg: introduce Sustainable Drainage Systems (SuDS) [16]
		s-BS5a. Reduce carbon emission and fleet-fuel consumption in fleet management [9]
		s-BS3b. Introduce vehicle sharing, bicycle transport and shuttle services in between HC site [9]
Q	Q1	s-Q21. Create awareness among the research managers, doctors and employees about the biosafety requirements [17]
	Q2	s-Q2a. Epidemiological advice followed for appropriate water quality at specialist unit such as dialysis unit, neo-natal units, maternity departments and children's units [18]
		s-Q2b. Secure and sufficient supply of nutritious food [19]
		s-Q2c. animal welfare standards are followed in food management [20]
		s-Q2d. appropriate quality are followed in cleaning process [20]
	s-Q2e. high water quality standards and safety are monitored at various application in HC such as for laboratory usage, pharmaceutical purposes, Medical Device Reprocessing purpose and dialysis etc. [21]	
Q3	s-Q3a. Carry out disease prevention duties such as cleaning, health-care waste management, hand hygiene and asepsis consistently Eg: comply with the recommended "dwell" time to eliminate the targeted organism [21]	
Q4	s-Q4a. Periodically conduct quality audits and check lists [22]	
SP	SP1	s-SP1a. Usage of various colour themes through incorporating pastel colour, various colour fabric and synthetic leather, colour therapy etc. [23]
		s-SP1b. Use of proper landmark and symbols features to avoid stress of patients [23]
		s-SP1c. Alignment of proper indoor environment to upkeep the indoor environment quality in terms of acoustic, visual and thermal comfort [23]
		s-SP1d. Provide easy visual angle and observation areas [23]
		s-SP1e. Provide distinctive visual differentiation between surfaces such as; ceiling, wall and floors by appropriate means of colour, texture and pattern [23]
	SP2	s-SP2a. Dedicated space(s) assigned for segregation and storage of waste [24]
		s-SP2b. Incorporating healing gardens through roof gardens, indoor gardens, aquarium, fountains [18]
		s-SP2c. Provision for view out areas to support healing environment [18]
	SP3	s-SP3a. Ensure proper furniture layout arrangements to ensure ergonomics effects, risks and easy handling [18]
		s-SP3b. Arrange waiting rooms to provide more social contacts and increase the length of stay of families and friends [25]
F	F1	s-F1a. Avoid supporting and allocating funds against projects that are clearly unsustainable [26]
	F2	s-F2a. Evaluating and prioritizing capital investments considering economic, environment and social benefits [24]
		s-F2b. Consider long-term financial forecasting and asset management planning [27]
	F3	s-F3a. Introducing green accounting strategies [28]
	F4	s-F4a. Consider LCC analysis in all departments [29]
R	R1	s-R1a. Conduct environmental infection control in health-care facilities. This allows to predict the measures to prevent infections associated with air, water, and other elements of the environment [30]
	R2	s-R2a. Conduct ecological risk assessment periodically. This allows to identify environmental problems in HC and enables to establish priorities, and provide a scientific basis for regulatory actions [31]
	R3	s-R3a. Conduct risk assessment in case of any catastrophic event [23]
	R4	s-R4a. Maintain a Proof of notification of hazardous substance released to the environment [13]
IT	IT1	s-IT1a. Use of centralized system to avoid duplication, repetitive work, in purchasing [32]
		s-IT1b. Introduction of HC building management system to improve energy consumption, carbon dioxide emission, electricity consumption and comfort of patients and occupants [32]
		s-IT1c. Introduce centralised transportation information desk to minimise repetition and avoid emissions to environment [32]
	IT2	s-IT2a. Transforming to mobile technologies [33]
		s-IT2b. Introduce live data on available transport options [19]
	IT3	s-IT3a. Introduce feed-forward information systems with real-time feedback [34]

FM service	FM practices	Sustainable practices
		s-IT3b. Transforming Electronic Medical Records (EMR) systems to Health Information Exchange (HIE) platforms [34]
P	P1	s-P1a. Introduce telecare, home care, video and teleconferencing facilities to reduce care miles, air pollution and to support and care for people with chronic illness living at home [35]
		s-P1b. Collaboration and take remedial action with Municipal authorities to reduce the pollution caused through disposal of waste dumped in landfills [36]
		s-P1c. Plan for reduction of carbon emission from all operational activities of HC considering energy management, fleet management, procurement, and preventative HC etc. [36]
	P2	s-P2a. Implement a hospital water safety plan ensuring design, commissioning, operational management, pseudomonas aeruginosa – advice for augmented care units and controlling and monitoring the system [37]
		s-P2b. Plan for HC waste management considering hazardous HC waste i.e. sharps, infectious wastes, pathological wastes, pharmaceutical wastes, chemical wastes, radioactive waste and non-hazardous wastes for individual departments [37]
	P3.	s-P3a. Appoint special team on sustainable practices to develop and implement the sustainability plan at HC [16]
O	O1	s-O1. Incorporating sustainable procurement strategies in terms of procuring goods and services. This may include practices such as;
		s-O1a. use of fair trade food [30]
		s-O1b. use of biologically and organically produced food [30]
		s-O1c. reduce distance travels from suppliers[30]
		s-O1d. use of less toxic cleaning agents [30]
		s-O1e. Purchase of environment friendly product. Eg: energy saving and efficient appliances, computers, scanners, monitors etc. [30]
		s-O1f. locally produced items [30]
	O2	s-O3a. Provide sustainable ambulatory care Eg: patient evidence-based care, reduce patient readmission, enhanced mutual trust with doctors [38]
	[1] Thomson <i>et al.</i> (2011); [2] Joseph and Ulrich (2007); [3] Boyce (2016); [4] Verheyen <i>et al.</i> (2011); [5] Thompson, Brewer, and Brewer (2002); [6] TEFMA (2004); [7] Dyck <i>et al.</i> (2005); [8] Sapkota <i>et al.</i> (2014); [9] BREEAM (2014); [10] World Health Organization (WHO) (2016); [11] Kaiser <i>et al.</i> (2001);[12] Leung and Chan (2014); [13] Bocken <i>et al.</i> (2014); [14] EPTA (2007); [15] Pitt <i>et al.</i> (2009b); [16] Priyalal <i>et al.</i> (2015); [17] Kumar (2014); [18] Department of Health UK (2013); [19] ACT Government (2010); [20] Sutherland <i>et al.</i> (2013); [21] Baker (2012); [22] Kincaid (1994); [23] Kleindorfer <i>et al.</i> (2012); [24] Miller (2009); [25] Braveman and Gruskin (2003); [26] Cohen (2007); [27] Green Building Council of Australia (2009); [28] Abigo <i>et al.</i> (2012); [29] Kohler and Bauproduktion (2003); [30] Carnero, (2015); [31] Solomon <i>et al.</i> (2013); [32] NHS (2015); [33] Lindberg <i>et al.</i> (2013); [34] Grossmann, <i>et al.</i> (2011); [35] Lindberg <i>et al.</i> (2013); [36] Prüss <i>et al.</i> (2014); [37] Bonadonna <i>et al.</i> (2017); [38] Mccain (2011)	

The conceptual integration of FM services, FM practices and sustainable practices comprises of 8 FM services, 28 FM practices and 78 sustainable practices. Amongst all the FM services highest number sustainable practices were identified in BS i.e. 29 numbers in which run and maintain plant (BS4), FM practice comprised the highest number of 12 sustainable practices. Even though BS4, FM practice received 17th rank in integrating sustainability it comprised the highest number of sustainable practices and identified as the most important FM practices in integrating sustainability in the conceptual integration. The second highest number of sustainable practices were identified under SP, FM service of 10 numbers which were unevenly distributed under its relevant 3 FM practices. Similar to the findings of the significant FM services in section 3.1, BS and SP identified to comprise the highest number of sustainability practices and identified as most important FM services in integrating sustainability practices. Furthermore, O had the third highest level of sustainable practices of 9 numbers in which the FM practice, purchasing and procurement control negotiation (O1) had the second highest number of 7 sustainable practices. In accordance to the sections 3.1 and 3.2 results O and its FM practice O1 identified less important receiving 8 and 31 ranking. However, in the conceptual integration O identified as the 3rd important FM service and O1 as the second important FM practice comprising highest number of sustainable practices. Moreover, FM services such as Q, IT, P, F and R consist of sustainable practices varying from 8, 7, 6, 5 and 4 numbers respectively. Among these FM services the least sustainable practices were identified in the R, FM service. However, R was identified as significant in both results in sections 3.1 and 3.2 receiving the fifth and fourteenth rankings respectively whilst in the integration of sustainability practices it is the least important FM services comprising of least number of sustainability practices. Thus, this added to the total 78 number of sustainable practices distributed under 28 FM practices and 8 FM services. This will be further carried forward to the subsequent rounds of Delphi survey to map the

appropriateness and identify the significant sustainable practices in effective integration of sustainable practices into FM practice in HC sector.

5. CONCLUSIONS

For effective integration of SFM practice in HC, integration of FM service, FM practices and sustainable practices were identified vital. Therein, this study identified 8 FM services such as; BS, SP, O, Q, IT, P, F and R as the most significant in integrating sustainability in the HC sector through a Delphi survey in which BS achieved the most important FM service. However, M, HR and RE services did not reach consensus and carried forward to reach consensus to the subsequent round. Then HC specific 28 FM practices were identified as the most significant practices in integrating sustainability in which educating the work force on related standards and procedures and Strategic Facility Planning (SFP) for HC achieved the most important FM practice. Out of the total 38 FM practices only 28 was identified as most significant in integrating sustainability in the HC sector. Thereafter this study conceptually integrates FM services, FM practices and sustainable practices into the FM practice in HC sector.

The conceptual integration of sustainable practices into FM practice comprises of total of 78 sustainable practices under its related FM services and FM practices. This was classified in terms of its context and feature in which highest number of 29 sustainable practices were identified in BS area. Moreover, the highest number of sustainable practices were identified in terms of FM practices namely; BS4 (12), BS5 (7), O1 (7), BS1 (6) and Q2 (5). In addition, Q1, Q2, P3, F1 to F4 and R1 to R4 FM practices consisted of the least number of 1 sustainable practice. According to the survey findings BS4 FM practice received 17th ranking whilst in integrating sustainability practices it comprised the highest numbers. Similarly, in survey findings O1 FM practice received 31 ranking whilst in integrating sustainable practices it consist 7 practices and received the second important FM practice. This shows the different findings from survey and conceptual integration of sustainable practice in FM practice in HC sector. Therefore, as way forward of the study, the findings will be carried forward to the subsequent rounds of the Delphi survey in determining the most significant sustainable practice in integrating sustainability into FM practice in HC sector. This will enable the industry practitioners to identify the most important SFM practice with respect to each of the FM services and practices in HC sector.

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