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Developing a Conceptual Model for Strategic Knowledge Sharing of Facilities Management Protocol (FMP)

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Abstract

The aim of this paper is to identify a key dimension of knowledge sharing strategy to improve Facilities Management Process of Protocol (FMP) in achieving facilities management organization performance. It investigates the key dimension of facilities management protocol strategy that can be adopted by the Facilities Management organizations and examines the problem related to IBS during the operational stages of maintenance management. An analysis of previous research provides an insight of the relationship between the IBS attribute and Facilities Management Protocol (FMP) component that can proposed a significant variable to improve the FM performance to solve problem related maintenance for IBS building. The review shows that a factor related to FM Protocol such as 'operate and optimize facility', 'monitor and record facility condition', 'implement schedule maintenance work', 'manage inventory and spare part', and 'supervised vendor work' was identified as a key dimension for FMP strategy to improve FM performance. Meanwhile a factor such as 'diagnosing tools and assessment', 'systematic procurement procedure', 'complementary IBS input and information document' and 'handing over document' was classified as a key factor to improve FM performance through adopting knowledge sharing strategy. This paper suggests that through improvement of each factor, the recognition of the whole strategic approach process in FMP can be increase thus helping to strengthen the facilities management organization for competitive advantages.

Keywords: Knowledge sharing, facilities management protocol, Industrialized Building System

1.0 INTRODUCTION

Knowledge sharing in facilities management organization is seen as valuable approach to improve organization performance (Pathirage et al., 2007). It is commonly acknowledged as the transmission of knowledge (implicit or tacit) from an organization, group or person to another one (Osmani et al., 2014). In today's fast changing business environment, knowledge sharing has become an important component of competitiveness and a nation's economic development, but it is relatively unexplored and underutilized (Han & Anantatmula, 2007; Osmani et al., 2014).

Facilitating knowledge sharing strategy can lead to increased innovative performance for maintenance routine activity (Aromaa et al., 2015). However, knowledge sharing does not come easy – individual's willingness to engage in knowledge sharing is a central barrier for sustainable knowledge sharing activities, and in recent years, the number of articles, books and seminars analysing how to overcome these barriers have exploded, yet how to overcome them still remain quite ambiguous (Jensen, 2012; Panahi et al., 2012).

The challenge to integrate and share knowledge in the facilities management sector has become an important agenda for many researchers worldwide. The issues relate to a lack of quality revealed through building defects, poor building performance and poor management of the FM organization (Wong, 1996). Since facilities management protocol is recognized as a process to integrate knowledge at every level of the facilities management process (Griffith & Sidwell, 1997; Nima et al., 2001), the factors that contribute to its success need to be identified. Poor practices relating to facilities management practices, that include lack of interaction, miscommunication and inappropriate use of knowledge by FM practitioners, suggest that this issue needs to be prioritized (Osmani et al., 2014; Zaidi & Davies, 2010). Many FM team do not receive feedback or input due to the lack of a formal and explicit knowledge base, resulting in low quality outputs and poor building performance (Jergeas & Van der Put, 2001). One of the factors closely related to this problem is caused by inadequate transfer of information in the building handing over process (Baharuddin et al., 2016). Information is a key component for updating and optimizing knowledge. This information must be managed to bring in value. Previous research by Zaidi and Davies (2009, 2010) has proposed a model of information supply that includes the elements of 'control', 'innovation', 'best practices' and 'audit' as being relevant areas to explore to improve knowledge sharing.

The main aim of this paper is to increase the understanding of facilities management protocol (FMP) and how its effect to the numerous attributes of Industrialised Building System (IBS) during maintenance work. Therefore, this paper has viewed the development of comprehensives FM Protocol for IBS building through effective knowledge sharing strategy, can be the missing link to bridge the gap during building operation at commissioning stages. As a result, a conceptual model for knowledge sharing of FMP was developed to tackle challenges emerged from facilities management and IBS perspectives.

■2.0 AN OVERVIEW OF FACILITIES MANAGEMENT PROTOCOL (FMP) TOWARDS INDUSTRIALISED BUILDING SYSTEM (IBS)

The adoption of IBS construction (IBS or a hybrid IBS) can be considered as an alternative option in maintaining sustainability in construction using pre-fabricated components that are systematically done using machine, formwork and other forms of mechanical equipment. The IBS construction provides the most advantageous solutions in terms of better control maintenance cost, shorten construction period and increase the quality of buildings. The term Facilities Management Process of Protocol (FMP) is defined as a guideline to support primary activities of the organisation by facilities management organisation to take an action on the development and improves of process of the main operation (Hamid et al., 2009). This involves the process of *Strategic, Planning, Plan/Option, Delivery* and *Review* (RICS, 2013). The FM Protocol is aimed at achieving organizational objectives through strategic and technical management in creating a good life cycle for facility management (Fleming et al., 2008).

In this study, the basic concept of FM Process of Protocol was developed based on the understanding of FM process involves at operational stage of building operation and maintenance. In providing insights of this field, many research studies have been conducted on the FM process in various perspectives. Underwood and Alshawi (2000) developed FM process model to support an application for maintenance forecasting valuation. Yu et al. (2000) presented a computer-integrated facilities management system that can facilitate computer-integrated design, construction and facilities management during the entire life cycle of a building project. Hassanain et al. (2003) presented a generic framework model for maintenance management. Akasah et al. (2009) developed a maintenance management process model. Moreover, recent studies conducted by Shin et al. (2018) suggested the Facilities Management Process of office building which aims to align the FM objectives to increase reliability and performance.

Despite many studies have pointed out the various approach in strategic FM to improve organizational performance; the FM process of protocol needs to be planned and controlled more effectively. The lack of understanding of FM Process of Protocol among facilities management practitioners results in insufficient information being available to complete facilities management operation tasks (Formoso et al., 1998). Poor communication, lack of adequate documentation, deficient or missing input information, unbalanced resource allocation, lack of coordination between disciplines and poor handing over inspection and process have been pointed out as the main problems at operational of building operation and maintenance (Koskela, 1997; Nawi et al., 2014). Therefore, substantive research on FM Protocol is necessary to determine the type of FM activities that are conducted and the critical success factor that are pursued in an actual building maintenance and operational context. Thus, a comprehensive study is also required to establish a standardized FM process for IBS building in order to provide an effective FM guideline for FM organizations.

Table 1 Definitions of Operational Protocol from various perspectives

Authors	Definition	Remarks
Hamid et al. (2009)	Process of protocol is defined as a guideline to support primary activities of the organisation by facilities management organisation to take an action on the development and improvement of process of the main operation of Facilities Management.	Operational Protocol from the perspectives of Facilities Management
Carbonara and Stefano (2020)	An operational of protocol is refer to the corporate vision strategy in identifying the full range of activities necessary to reach a desired objective for managerial public real estate assets. This involves the representation of the entire decision-making process in defining the necessary steps, responsibility and methods for implementing the strategies to be adopted.	Operational Protocol from the perspectives of managing public assets
Formoso et al. (1998)	Operational Protocol is an approach used by organization that consists of a general plan of the building design process that contain the main activity, their precedence relationship, and the main inputs and outputs of such activities that can potentially bring a number of benefits for business organization to improve design process.	Operational Protocol from the perspectives of design process
Machfudiyanto et al. (2018)	Managing building involves the business activity process that encompasses a resources, roles and rules that are required to comply with the standard operating procedures (S.O.P) to meet the building function. This objective of S.O. Ps is to unify the perceptions of parties involved to have better understanding of the task to be undertaken.	Operational Protocol from the perspectives of building maintenance

Alshehri (2016)	The Maintenance Protocol is referred as a combination of generic maintenance activities that are repeated and transform input into output. This process is aims to sustain the capability to deliver services, record problems for analysis, take corrective, adaptive, perfective, and preventive actions, and confirm restored capability.	Operational Protocol from the perspectives of maintenance process

■3.0 CHALLENGING ISSUES OF IBS IN FACILITIES MANAGEMENT

Construction industry in developed countries has started to used IBS as an alternative to improve construction quality and productivity, reducing risks related to occupational safety and health, alleviating issues for skilled workers and achieving the ultimate goal of reducing the overall cost of construction (Haron et al., 2009; Kamar et al., 2009). However, despite the advantages of using IBS in construction projects have been promoted as an alternative to improve building quality, many scholars in this area have highlighted a serious concern on the maintenance issues during the post construction phases of building operation related to IBS building (Ismail, 2014; Ismail et al., 2016).

The problem of poor maintenance of buildings that adopted the Industrialised Building System (IBS) is commonly highlighted by the failure of facilities manager to provides an effective service delivery of facilities management (Ismail et al., 2016). According to Ismail (2020), failure to form effective communication channel between complementary knowledge on IBS construction and construction members has resulted ineffectiveness in managing building maintenance. Recent studies have also shown that factors such as the lack of readiness on the part of workers to undertake maintenance task activities and lack of standard procedures to be followed by an organization in maintaining building has contributed to the major challenges for building performance (Machfudiyanto et al., 2018). According to Kamaruddin et al. (2013), the monitoring, diagnosing technology and repairing maintenance method of IBS building is far behind some developed countries. In many cases, IBS building operation and maintenance are still depending the conventional method applied in facilities management approach. Issues related to defect repetition such as building leaking, cracking in building jointing have shown a serious concern on building quality issue in IBS (Ismail, 2014).

The issues of no integration between maintenance systems, lack of coordination between design and construction, minimal defect diagnosis in decision making process as well as the lack of knowledge in linking defect diagnosis operations in maintenance resulting to the maintenance issues among facilities management team for IBS building (Ismail et al., 2016). Rahman and Omar (2006) stated poor building design of IBS component may leads to the issue of comfort and safety of the occupants. The research found that the poor connection of structural work between the beams to column to base at construction site were identify a key factor contributed to the maintenance issues of IBS building.

One of the problems in the building industry highlighted due to the limited degree of learning from experiences of use and operation of existing buildings when new building projects are planned was resulted to the poor maintenance of IBS building (Jensen, 2012; Rahman & Omar, 2006). Issues such as unsystematic process for building handing over at commissioning stages, lack of maintenance input and feedback from facilities management team to the designer team were emerged based on this challenge (Ahzahar et al., 2011; Chiu & Lin, 2014). Moreover, facilities management practices for existing building stock are crucial as this involves the operation and maintenance (O&M) stage which is the most prolonged phase in the asset life cycle (Hasim et al., 2020). However, some concern due to the inefficiency in decision making process has been found to be a major cause of aesthetic and functional faults (Chiu & Lin, 2014). Factors due to inefficient to provide sufficient information of maintenance strategy with the extensive coordination on technical knowledge requirement prior to maintenance operations has resulted a major impact to the IBS building maintenance activity (Ismail, 2014; Jensen, 2012).

The above discussion indicates that a proper facilities management protocol (FMP) in FM is needed to achieve FM performance. The right path for achieving FM performance is influences by an effective's facilities management through a clear and comprehensives Facilities Management Process of Protocol (FMP). In addition, and objectives of FMP is to focus on the task and activities that are occurring within the FM organizations, rather than short-term tangible results (Amaratunga & Baldry, 2002).

■4.0 THE REVIEW OF FACILITIES MANAGEMENT PROTOCOL (FMP) MODEL

In relation to the study of FM Protocol and IBS Maintenance, this study formulates the descriptive method for the research. The previous FMP model on facilities management and construct variable from IBS study served as input for the study. The arrangement of the instrument to be used in data retrieval was the next step. Then, content and construct validity were carried out to determine the variable used. In this study a previous model from Shin et al. (2018) were compared to establish a clear understanding process of protocol in facilities management to improve FM performance. Shin et al. (2018) establish the Facility Management Process Model in implementing operation and maintenance for office building by using the integration definition for functioning modelling (IDEF0) method. In this model, a major activity of FM Protocol was developed consists of five sequential processes recognize as 'operate and optimize facility', 'monitor and record facility condition', 'implement schedule maintenance work', 'manage inventory and spare part', and 'supervised vendor work". Figure 1 reflects the major activities for FM process model by Shin et al. (2018).

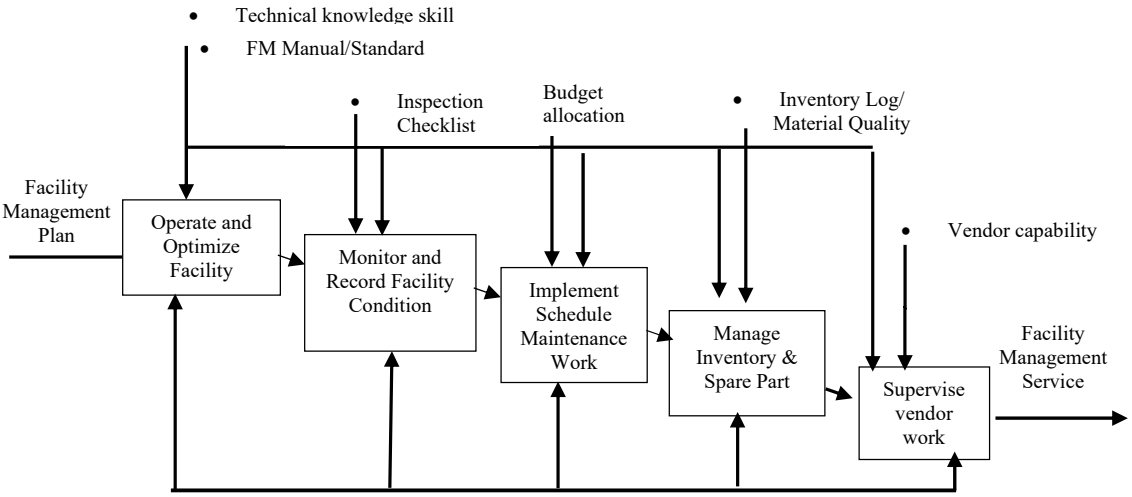

Figure 1 Facilities Management Process Model in implementing operation and maintenance for office building by Shin et al. (2018)

Several studies have pointed out that a large percentage of defects in building arise through improper planning of facilities management plan (Chong & Low, 2006; Ismail, 2014). Also, it is widely recognized that poor operating and optimize facility has a very strong impact on the level of facilities management performance during the commissioning stages of maintenance operation (Ismail et al., 2016). Based on this model, the sub-process of 'operate and optimize facility', 'monitor and record facility condition', 'implement schedule maintenance work', 'manage inventory and spare part', and 'supervised vendor work" has identified as a key activity to implement maintenance work. However, the lack of facilities management planning in each stage of sub-process results in insufficient information being available to complete FM tasks. Poor communication, lack of adequate documentation, deficient or missing input information, unbalanced resource allocation, lack of coordination between disciplines, and erratic decision making have been pointed out as the main problems to deliver an effective maintenance and operation of building (Machfudiyanto et al., 2018; Shin et al., 2018).

■5.0 THE KNOWLEDGE SHARING IN FACILITIES MANAGEMENT PROTOCOL OF IBS MAINTENANCE (FMPibs-KS) CONCEPTUAL MODEL

This section presents the conceptual framework for examining the effect of Operation and Maintenance Protocol and IBS Maintenance on knowledge sharing for the study. The conceptual framework is based on research studies explored various relationships between sharing culture, effective transfer of information, individual attitude and improving interaction and communication. The first phase in developing the framework, key dimension of Facilities Management Protocol (FMP) was identified based on comprehensive literature review from published material such as prominent FM academic journal and other related materials. The compilation of FMP definitions provides an overview of FM protocol that are widely used in the FM area. The purpose of reviewing published literature on FMP is to develop the fundamental understanding on key issues and challenges that surrounds the subject.

The Knowledge Sharing in Facilities Management Protocol of IBS Maintenance (FMPibs-KS) conceptual model is later developed by the combination between previous model in building operation and maintenance and embedded with the IBS maintenance attribute. The construct variables were determined through the identification of critical success factor (CSF's) during the building operation and maintenance stages of building operation. This CSF was classified as the main contribution to develop the FMPibs-KS framework.

In the first part of this conceptual model, a total of five construct variable adapted from FMP model developed by Shin et al. (2018). The component of facilities management protocol known as 'operate and optimize facility', 'monitor and record facility condition', 'implement schedule maintenance work', 'manage inventory and spare part', and 'supervised vendor work" is required to improve the process FM Protocol by adopting knowledge sharing strategy. Since the key issue on knowledge sharing such as sharing culture, effective transfer of information, individual attitude and improving interaction and communication have been found in the literature to have direct effect on FMP, each of the key dimension of knowledge sharing explored in this study, and possible relationship between them are depicted in the conceptual framework.

The second part of this framework is to establish and developed based on four construct variables from IBS maintenance that includes 'diagnosing tools and assessment', 'systematic procurement procedure', 'complementary IBS input and information document' and 'handing over document by the designer to FM team'. This component was identified as a key factor to drive a strategy to improve IBS system through an adopting knowledge sharing strategy such as improving sharing culture, effective transfer of information, individual attitude and improving interaction and communication among team member. Table 2 demonstrates previous studies related to facilities management protocol and IBS maintenance to support the development of this conceptual model, while Figure 2 depicts the significant relationship of the factors to proposed related hypotheses for conceptual model.

Table 2 The conceptual model of Knowledge Sharing in Facilities Management Protocol of IBS maintenance (FMPibs-KS) developed from previous studies

Authors	Factor	Knowledge Sharing Critical Issues
Akasah et al. (2009), Formoso et al. (1998), Shin et al. (2018)	Operation & Maintenance Protocol	Lack of understanding on FM process of protocol due to insufficient information sharing, poor of communication, lack of coordination, missing input of information.
Ismail (2014), Ismail et al. (2016), Jensen (2012), Koskela (1997), Rahman and Omar (2006)	IBS Maintenance	Unsystematic process of handing over due to due to lack of coordination between design and construction, inefficient to provide sufficient information of maintenance strategy among practitioners, poor attitude of staff, lack of training resulted to incompetency of staff that effect an overall performance of IBS maintenance.

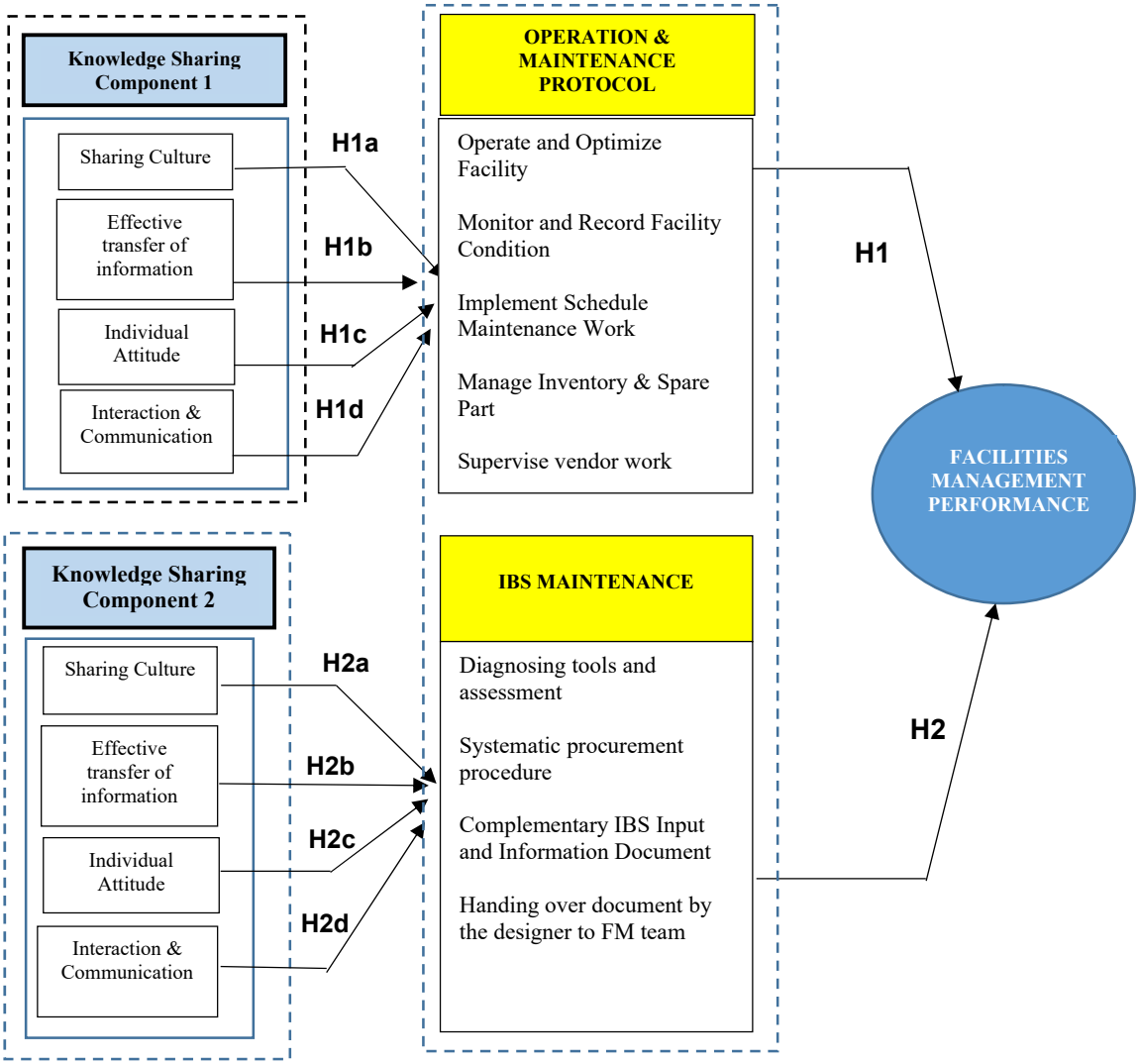

Figure 2 The FMPibs-KS conceptual model and proposed hypotheses

The above diagram shows that 'Operation and Maintenance Protocol' and 'IBS Maintenance' is an important component in determining the success of FM Performance to which FM practitioners to share knowledge among themselves. Consequently, this study employs the concept of knowledge sharing which leads to the following hypotheses:

H1: In the Operation and Maintenance Protocol context; sharing culture, effective transfer of information, individual attitude and interaction and communication positively affect knowledge sharing to improve facilities management performance.
H2: In the IBS Maintenance context; sharing culture, effective transfer of information, individual attitude and interaction and communication positively affect knowledge sharing to improve facilities management performance.

Based on the findings and the developed hypotheses, a new conceptual framework (see Figure 2) has been proposed on the nexus between maintenance operation protocol and IBS maintenance to foster a knowledge sharing strategy in facilities management protocol (FMP). The model indicates that by establishing opportunities for sharing culture, effective transfer of information, improving individual attitude and effective communication and finally by establishing interaction and communication among FM personnel can creates opportunities for effective flow of knowledge sharing in FMP.

6.0 CONCLUSIONS

The research concluded by developing the knowledge sharing strategy in FMP and IBS Maintenance contributed to the positive improvement of FM Performance. Based on the conceptual idea for this research, this paper suggested that the data collection from the focus group interviews such as facilities manager, designer team and builders are required to obtain a depth input for each attribute discuss from previous researches. The outcomes from literature input and interviews will assists the conceptual model to develop a final survey instrument for this research. The results from the final survey will determine that consideration of knowledge sharing component element at early and operational stage of project; and maintenance operation can create an opportunity for early conflict perseverance significantly contributed to the enhancement level of overall building performance. Therefore, a significant component of knowledge sharing applied in facilities management protocol for IBS building will help the practitioners to improve related FM services in industry. The findings of this study also provide a theoretical basis, and simultaneously can be used to analyze relationship among knowledge sharing factors, including sharing culture, effective transfer of information, individual attitude and positive interaction and communication and its effect to the maintenance and operation protocol and IBS maintenance. Therefore, this study identified several factors essential to successful knowledge sharing, and discussed the implications of these factor for developing organizational strategies that encourage and foster knowledge sharing in FMP for IBS building.

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