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The Significance of Facilities Management Aspect in Developing Maintenance Management Plans During Pre-Development Stages of Educational Private Finance Initiative (PFI) Projects

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ABSTRACT

Facilities Management (FM) is one of the essential aspects that needs to be considered in the building maintenance management plan. Generally, the scope of FM involves thorough and effective administration, finance, operation and maintenance of the building. In the context of the Private Finance Initiative (PFI) projects, the operation and maintenance stage is longer compared to the design and construction stages. Therefore, the focus during this stage should be emphasised proactively. This research aims to determine the significance of FM aspect towards maintenance management plan of PFI projects during pre-development stages. This research used previous literature, mainly from journals articles to construct the models and formulate the literature reviews. Additionally, a quantitative approach was employed as the research methodology. A questionnaire survey was distributed to the maintenance personnel involved in the PFI projects in Malaysia. The survey was conducted towards the educational PFI projects only. This research also used Partial Least Square-Structural Equation Modelling (PLS-SEM)

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software to perform data analysis. There are two constructs in this research which are the FM aspects and maintenance management plan. The measurement and structural models were developed to determine the significance of the FM aspect towards the maintenance management plans. There are five indicators that represents FM aspects and six indicators of maintenance management plan highlighted in this research. All these indicators are proven to be reliable and valid through the internal consistency, convergent validity, cross loading value. The Fornell Lacker Criterion was conducted to prove discriminant validity between FM aspect and maintenance management plan. The findings of this research found that the FM aspects are very significant towards the maintenance management plan of the PFI project during the pre-development stages. It was proven through structural model analysis using p and t-value. This research can be beneficial for better implementation of maintenance management.

INTRODUCTION

FM is a term that is related to the scope of building operation and maintenance. FM is an organisational function which integrates people, places and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business (International Organization for Standardization, 2024). It also offered various career paths in real estate, security, sustainability, facility planning, and operation and maintenance (Roper, 2017). FM is also accountable for the building life cycle, especially during the operation and maintenance stages. In the context of the PFI project, FM acts as a service provider responsible during the operation and maintenance stages. FM is associated with the end user, building and the services provided. PFI is a long-term contract between the private and public sectors, in which the private sector is responsible for the overall life cycle of public infrastructure, and the public sector responds by making regular payments as operating costs for a period specified in the contract (Ismail, 2011). There are four stages in PFI project which are strategy formulation stage, procurement stage, construction stage and operation and maintenance stage (Ismail et al., 2019). During the operation and maintenance stages, the FM consultant is accountable for ensuring all the building services and facilities are taken care of and maintained before handover.

Due to the long-term period of operation and maintenance stages, a proper maintenance management plan with FM aspects embedded is requisite. FM output specifications and FM service standards are the two recommended areas to overcome barriers to implementing FM in PFI projects (Public Private Infrastructure Advisory Facility, 2016). Apart from that, one of the success factors of PFI project implementation during the pre-development stage is to ensure thorough output specifications and requirement standards according to service (Khaderi et al., 2018), which are related to FM. There is strong justification for FM during the pre-development stage of the PFI projects. However, there is a lack of involvement of FM during the design stage of the PFI projects (Ismail et al., 2019). The operation and maintenance are less given attention during this stage. The focus is on design and construction (Martinez & Walton, 2015). Therefore, this research aims to seek the significance of the FM aspect towards the maintenance management plan during the pre-development stage of the PFI project. Pre-development stage in this research refers to the stage before the construction starts.

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MAINTENANCE MANAGEMENT

Proper maintenance management is necessary to extend the lifespan of a building. Maintenance management should be planned proactively during the pre-development stages. This is because the main problem in today's maintenance management is the reactive approach (Khalid et al., 2019) as it is making it more difficult to execute when the maintenance problem occurs. Poor maintenance management practices often cause a lot of problems, such as defective buildings, poor building functionality and others (Ali et al., 2010). Many maintenance managers view planned maintenance as a wise investment since it is likely that the current cost of money and resources invested today will be lower than the costs of reactive maintenance in the future (Pitt et al., 2016). Furthermore, organisations prefer to outsource their maintenance-related work to the maintenance management team in order to meet the maintenance needs of the building (Yong et al., 2017). There are many maintenance initiatives to improve maintenance management practices. Thus, a proper maintenance management plan during the pre-development stages is needed to better implementation of maintenance activities.

PFI Project and Maintenance Management During Pre-Development Stage

PFI projects in Malaysia is done by under Unit Kerjasama Awam Swasta (UKAS). A PFI project can be identified as a financing initiative of a public project through a private company. In terms of maintenance management, the private sector is responsible for maintaining the building in terms of facilities and services during the operation and maintenance stages, and in return, the public sector will pay a lease charge to the private sector for operation and maintenance costs. The operation and maintenance stages for the PFI project took minimum twenty (20) years. Under the PFI, three parties are involved in the PFI process, which are the client, financiers and operation team (Garis Panduan PPP, 2009). FM consultant and contractor is under the operation team responsible for design, construction, operation and maintenance until the handover. PFI has been recognised in many countries as an option for modern procurement strategy as a method for the public sector to use the capital and expertise from the private sector in delivering world-class facilities (Musawa et al.,2017). Apart from that, the benefits of the PFI project include better risk transfer.

In the nature of the PFI projects, a maintenance brief is already given during the pre-development stages. It was given through the output specification by the public sector. An output specification is an important document that specifies what is expected from the project rather than how it should be delivered by the private sector (Lam & Javed, 2015). The public sector does not take charge of the project's design but describes its service through an output specification (Alshawi, 2009). All the operation and maintenance aspects and facilities services are described through the output specifications. The FM consultant must fulfil all the requirements stated in the documents throughout the operation and maintenance period. Any breach of duty may be subject to payment deduction by the public sector. Meanwhile, the public sector should provide clear output specifications to the pre-qualified bidders, as suggested by Osei-Kyei & Chan, (2017) during the pre-development stage of the PFI project.

Despite having good practice in maintenance management, there are still maintenance management issues related concerning during this stage, such as difficulties in identifying output specifications for soft services (Robinson & Scott, 2009) and unclear output specifications (Oyelede, 2013). Apart from that, the focus on design and construction (Martinez & Walton, 2015) and lack of FM involvement of FM during the design stage (Ismail et al., 2019). Furthermore, there is inadequate adoption of maintenance elements and lacking of output specifications (Khaderi & Abd Shukor, 2016). The consequences of these issues will cause a burden, especially during the operation and maintenance stages, such as improper maintenance charges (Laporan Ketua Audit Negara, 2019), unclear guidelines and standard operations (Ismail et al., 2019), the performance of FM in PFI (Kipli et al., 2016), incomplete contract (Rybnicek et al., 2020) and maintenance implementation. All of these issues are related to FM. Therefore, the role of FM should be emphasised during the pre-development stages. As mentioned by Ismail et al., (2018), the role of FM should

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be considered an important aspect during the strategy formulation stage to ensure the PFI projects can deliver good performance.

FM Aspect During Pre-Development Stage of the PFI Project

In the development of the PFI project, the FM consultant is a part of the operation team that acts as a service provider responsible towards the operation and maintenance aspect during the operation and maintenance stages. The function of FM in the PFI project is to ensure that all the building operations, facilities, and services are taken care of. There are many suggestions regarding to FM aspect during the pre-development stage including, having a functional helpdesk during the operational phase, active involvement of FM during the design stage (Oyelede, 2013), and design input of FM in terms of maintainability and availability (Baldwin, 2003), consider the functions of FM in the early stages of PFI project (Ismail et al., 2018), consider FM input in terms of maintainability and operability in the early stages of PFI projects (Hashim et al., 2016), dedicated team for maintenance (Mohd Rahim et al., 2018), and FM output specifications and FM service standards (Public Private Infrastructure Advisory Facility, 2016). Based on these FM aspects, this research has identified five possible indicators for FM aspects during the pre-development stage of the PFI project. The indicators are the existence of a functional helpdesk during the operational stages, FM input in terms of maintainability, availability and operability, FM function at the early design stages of the PFI project, FM strategies during the operational stages and the existence of a dedicated team for maintenance. All of these FM aspects will be discussed further in the next subtopic.

Existence of a Functional Helpdesk During the Operational Stage

The functional helpdesk is the first point of contact for the end user which helps in receiving complaints and service requests. It can help the private sector avoid payment deduction in PFI project by helping the end users report any performance failure they come across so that the FM consultants can carry out maintenance immediately (Oyelede, 2013). Although the functional helpdesk can be conducted during the operation and maintenance stages, it can be included as a part of the FM aspect during the pre-development stages for the maintenance management plan. This is to ensure maintenance management plans are implemented proactively.

FM Input: Maintainability, Availability and Operability

One of the responsibilities of FM during the bid development and design process includes reviewing and assessing the design from a maintainability, maintenance operability and serviceability point of view (El-Haram & Agapiou, 2002). FM input in terms of maintainability, availability, and operability is refers to the FM input that is related to design and facilities operation. These inputs ensure better operational performance of the PFI project. Thus, these inputs can be considered a part of the FM aspect during the pre-development stages of the PFI projects.

FM Functions at The Early Design Stage

FM functions should be considered at the early design stage of PFI project (Ismail et al., 2018). In PFI, FM can actively engage with the building contractors and design team through meetings to review detailed design, design and service life and specification decision (Enoma, 2005). This is to ensure the provision is made for future maintenance of the facility (Enoma, 2005). Apart from that, the involvement of FM during this stage helps to predict and estimate the necessary cost that related to operation and maintenance. Thus, the involvement of FM is needed during pre-development stage of PFI projects.

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FM Strategies During Operational Stage

One of the responsibilities of FM during this stage is identification and selection of the optimum maintenance and replacement strategies for facility (El- Haram & Agapiou, 2002). Defining overall FM strategies is one of the FM sub-functions of the PFI project (Hashim et al.,2019). FM strategies are essential, especially in building operation and maintenance. In relation to this, effective maintenance planning is required. It can be achieved through proper maintenance objectives, and strategy at the early stage (Khalid et al., 2019). Hence, FM strategies such as planning and policy are needed. Therefore, FM strategies must be planned ahead and aligned with the PFI project performance.

Existence Dedicated Team for Maintenance

The FM consultants should be competent, experienced and capable of fulfilling all the requirements in the output specification as highlighted by the public sectors. Poor performance by FM consultants might lead to payment deductions (Lop et al., 2017). The dedicated team for maintenance refers to the FM consultant that able to monitor all the FM aspects in PFI projects. This is because FM is responsible towards a wide range of tasks in the planning, design and management of facilities, including operation and maintenance, project planning and management, communication, finance, quality assessment and facility function (El-Haram & Agapiou, 2002).

Proposed Model

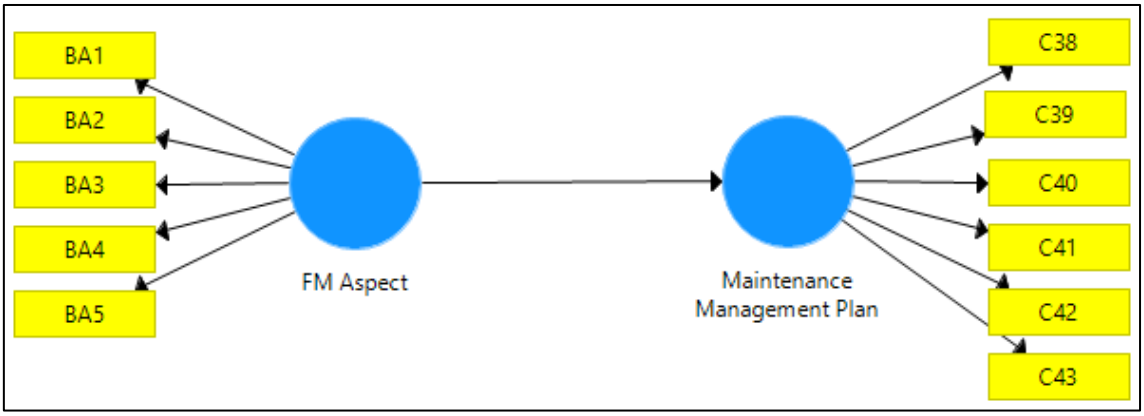

Fig. 1. Proposed model the significance of FM aspect towards maintenance management plan during pre-development stages of PFI projects

Source: Authors, 2024

Based on Figure 1, the figure shows the proposed model of the significance of the FM aspect towards maintenance management plan during the pre-development stage of the PFI project. There are five indicators for the FM aspects and six indicators for the maintenance management plans. Each of the indicators has been mentioned previously. Table 1 below is the list of indicators for FM aspect and maintenance management plan. Apart from that, this research produces one hypothesis to achieve the research objective. The research hypotheses are:

(i) H01: FM aspects are significant towards the maintenance management plan during the pre-development stage of the PFI project

(ii) H1: FM aspects did not have any significance towards the maintenance management plan during the pre-development stage of the PFI project

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Table 1. List of indicators for FM aspects and maintenance management plan

Construct	Indicator	Code
FM aspects	Existence of functional helpdesk during operational stage	BA1
	FM input in terms of maintainability, availability and operability	BA2
	FM function at the early design stage of PFI project	BA3
	FM strategies during operational stage	BA4
	Existence dedicated team for maintenance	BA5
Maintenance management plan	Specify maintenance charge	C38
	Identify contract clause	C39
	Developing output specification	C40
	Maintenance implementation	C41
	Maintenance performance	C42
	Guidelines and standard operation	C43

Source: Authors, 2024

METHODOLOGY

This research used a quantitative approach to gather the data. Before the data was gathered, a pre-test was conducted first to validate all the indicators for FM and the maintenance management plan. At first, there are 11 indicators for FM, then after pre-testing, the indicator became five only. This is due to the same meaning of each indicator. The pre-testing was conducted towards maintenance practitioners and academicians. After that, this research proceeds with a questionnaire survey for primary data collection. For the primary data collection, a questionnaire survey was distributed to the maintenance personnel involved in the PFI projects. The PFI projects involved in this research is an educational PFI projects. This is because the highest number of PFI projects in Malaysia is educational buildings. A list of respondents was gathered first based on the educational PFI project from the UKAS website. After a list of respondents was gathered, the questionnaire survey was distributed via email. Stratified sampling was utilised until a total of two hundred and nineteen (219) possible respondents were identified. Unfortunately, only one hundred and six (106) respondents, or 48% of the total, responded to the survey.

After the questionnaire survey was conducted, analysis was made by using PLS-SEM software. This is because this software can be modelled using the data available. The analysis of this research will start with the Measurement Model Analysis (MMA) then followed by Structural Model Analysis (SMA). In MMA, three assessments will be performed: Indicator and Internal Consistency (Factor Loading, Cronbach Alpha (CA) and Composite Reliability (CR)); Convergent Validity (Average Variance Extracted (AVE)) and Discriminant Validity (Cross Loadings and Fornell-Lacker Criterion). Meanwhile, SMA is used to evaluate hypotheses about the existence of a substantial relationship between FM and MMP. Data from Variance Inflation Factor (VIF) (Collinearity), Path Coefficient for p-value and t-value, Coefficient of Determination (R2), Effect Size (f2) (Significance Testing), and finally Predictive Relevance (Q2) were used to validate the hypotheses.

Measurement Model Analysis (MMA)

Internal Consistency is an assessment used to measure reliability based on the interrelationship of the observed item variable (Ab Hamid et al., 2017). CA and CR are the most common methods used to measure Internal Consistency in PLS-SEM. The guidelines for these assessments are CA (≥0.7), CR (≥0.7), and AVE must be (≥0.5) (Hair et al., 2019). Meanwhile the Factor Loadings must be equal to or greater than 0.7 (Hair et al., 2010). The guidelines for Cross Loading are that the loading of each indicator be the highest for their designated constructs. For Fornell Lacker Criterion assessment, a variable's square root of AVE

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should be bigger than the correlations between the variable and other variables in the model (Hair et al., 2019). Convergent Validity is the ability to assess the level of correlation of multiple indicators of the same construct that are in agreement (Ab Hamid et al., 2017). In this research, the assessments to measure Convergent Validity are Factor Loadings and AVE. These two assessments are common in measuring Convergent Validity by using PLS-SEM. The guidelines for Factor Loading must be equal to or greater than 0.7 (Hair et al., 2010). While the value (AVE) must be (≥ 0.5) (Hair et al., 2019). Discriminant Validity refers to the degree to which indicators differentiate across constructs or measure distinct concepts by examining the correlations between the measures that potentially overlap (Ramayah et al., 2018). When a construct is said to have discriminant validity, it means that there is a genuine empirical difference between one another (Ab Hamid et al., 2017). In order to establish discriminant validity, this research has adopted Cross Loading and Fornell Lacker Criterion assessment. These two assessments are methods to establish Discriminant Validity in PLS-SEM. Based on Table 3 above shows the distribution data for Cross Loading.

Structural Model Analysis (SMA)

For the structural model analysis, five assessments will be conducted in order to determine the significance of each construct. First, the analysis will conduct the assessment for collinearity issues. The collinearity issue is determined by the value of the Variance Inflation Factors (VIF). After collinearity issues are assessed, the relevance and significance of each construct will be determined. The significance and relevance of structural model analysis will be determined by p and t values. After that, the step continues with assessing the Coefficient Determination (R^2). After that, assessment of the level of Effect Size (f^2). Lastly is the assessment for Predictive Relevance (Q^2). The guidelines for these assessments are that VIF must be less than (≥5), according to (Hair et al., 2017a). For p and t value, 1) p-value (< 0 .01), t value > 2.58 (two-tailed), t-value > 2.33 (one-tailed), 2) p-value (< 0 .05), t-value > 1.96 (two-tailed), t-value > 1.645 (one-tailed), 3) p-value (< 0 .10), t-value > 1.645 (two-tailed), t-value > 1.28 (one-tailed) (Hair et al, 2017b). Regarding of R^2, the guideline is 0.75, 0.50, 0.25 describing substantial, moderate, or weak levels of predictive accuracy (Hair et al., 2017). For f^2, the guidelines for f^2 to R^2 are 0.35, 0.15 and 0.02, which describe substantial effect size, medium effect size, and small effect size (Cohen, 1988). Lastly, for Q^2, it should be greater than 0 to indicate predictive relevance (Fauzi, 2022).

DATA ANALYSIS

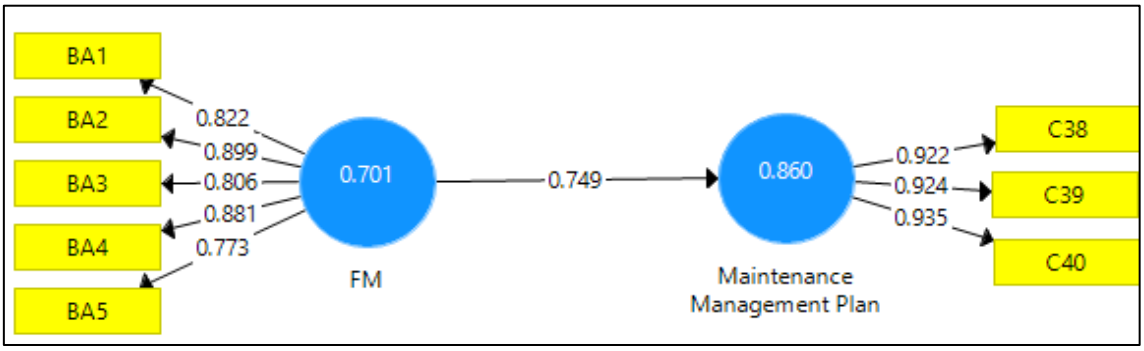

Fig. 2. Measurement model analysis

Source: Authors, 2024

Figure 2 shows the MMA for this research. Based on Figure 2, the yellow box is represented as an indicator, the blue circle is represented as the construct, and the arrows represent the relationship between the indicator and the latent variable. The value that is located in the blue circle is the value of AVE for each construct,

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while the value that is located in the arrow represents the value of loadings for each indicator and the latent variable. The tabulation data for these assessments is shown in Table 2, 3 and 4 below.

Table 2. Convergent validity and internal consistency

Construct	Indicator	Indicator and Internal Consistency			Convergent Validity
		Loadings	CA	CR	AVE
FM	BA1	0.822	0.892	0.921	0.701
	BA2	0.899			
	BA3	0.806			
	BA4	0.881			
	BA5	0.773			
Maintenance Management Plan	C38	0.922	0.918	0.948	0.860
	C39	0.924			
	C40	0.935			

Source: Authors, 2024

Table 3. Cross-loading value for each indicator

Indicators	FM	Maintenance Management Plan
BA1	**0.822**	0.584
BA2	**0.899**	0.687
BA3	**0.806**	0.596
BA4	**0.881**	0.663
BA5	**0.773**	0.596
C38	0.714	**0.922**
C39	0.707	**0.924**
C40	0.658	**0.935**

Source: Authors, 2024

Table 4. Fornell Lacker Criterion

	FM	Maintenance Management Plan
FM	**0.837**	
Maintenance Management Plan	0.749	**0.927**

Source: Authors, 2024

FM construct has a CA value of 0.892 and a CR value of 0.921. Meanwhile the Maintenance Management Plan construct has a CA value of 0.918 and a CR value of 0.948. Both constructs have passed the threshold value of (≥0.7). Table 2 shows that, the values of factor loadings are more than 0.7. The factor loading BA1= 0.822, BA2= 0.899, BA3= 0.806, BA4= 0.881, BA5= 0.773, C38= 0.714, C39= 0 .924 and C40= 0.935. For AVE, both constructs have passed the threshold value of (≥ 0.5), which is the FM aspect has an AVE value of 0.701 and the Maintenance Management Plan has an AVE value of 0.860. The value of each indicator for each construct is the highest among the other indicators. This shows that, all of the indicators are represented by a valid construct. The value for each indicator BA1= 0.822, BA2= 0.899, BA3= 0.806, BA4= 0.881, BA5= 0.773, C38= 0.714, C39= 0 .924 and C40= 0.935. Apart from Cross Loading, Table 4 shows the reading for the Fornell Lacker Criterion. Based on Table 4, the box highlighted in yellow has the biggest value that correlates with the other constructs in the table. FM aspect a construct has a value of 0.837, and the Maintenance Management Plan construct has value of 0.927. In order to improve the value of measurement model analysis data, some indicators were deleted. This improves the

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reading of Internal Consistency, Convergent Validity and Discriminant Validity. The process of deleting an indicator starts by checking the Factor Loading. Factor Loading below than 0.5 (≤ 0.5) are subject to deletion if the indicator is not affected by the AVE value. Originally, this research consisted of 11 indicators, however, after several deletions of indicators, this research only has eight of indicators. The value of AVE also improved after the deletion of these indicators. The indicators that have been deleted are C41, C42 and C43. It can be concluded that all the data generated for measurement model analysis can fulfil all the requirements. This shows that the data produced are reliable and valid. The data have gone through Internal Consistency, Convergent Validity and Discriminant Validity assessments.

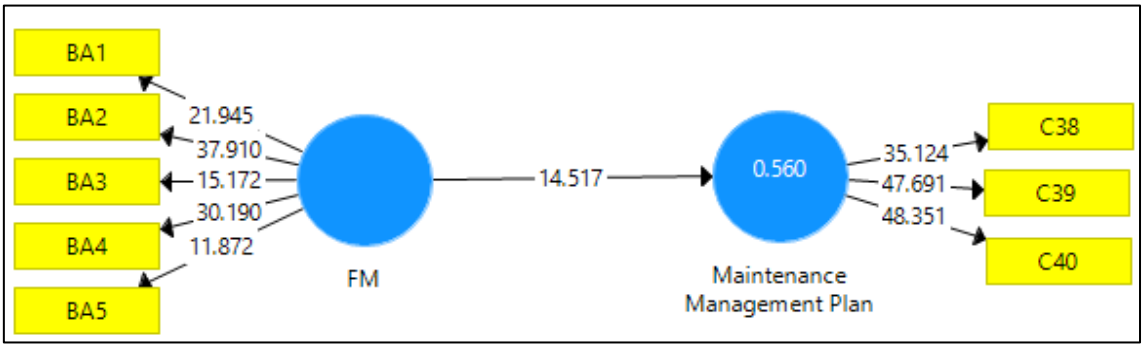

Fig. 3. Structural model analysis

Source: Authors, 2024

Figure 3 shows the SMA for this research. Based on Figure 3, the yellow box is represented as an indicator, the blue circle is represented as a construct, and the arrows represent the relationship between the indicator and latent variable. The value in the blue circle is the R^2 for each construct, while the value in the arrows represents the t-value for each indicator and the latent variable. Table 5 below is the tabulation data for SMA.

Table 5: Tabulation data for SMA

	VIF	t-value	p-value	Decision	R^2	f^2	Q^2
FM → Maintenance Management Plan	1.000	14.517***	0.000	Supported	0.560	1.275	0.474

Source: Authors, 2024

The collinearity issue is determined by the value of VIF. Based on Table 5, the VIF value for the FM aspect construct is 1.000, which is less than 5. From the bootstrapping result, the path coefficient will be analysed to examine the relationship that links the construct. To assess the significance and relevance of the structural model, the p and t values will be measured. Based on the Table 5, the FM aspect construct has a p-value of 0.000 and t-value of 14.517. It shows that the FM aspect construct has met the guidelines of p-value (< 0 .01), t-value > 2.58 (two-tailed), t-value > 2.33 (one-tailed). Based on the Table 5, the FM aspect construct has R^2 value of 0.560. It shows that the FM construct has moderate predictive accuracy. Based on result on Table 5, the value of f^2 for the FM aspect construct is 1.275, which indicates substantial effect towards the Maintenance Management Plan. Result on Table 5 has shown that, the value of Q^2 of the FM construct is 0.474 which is greater than 0. This indicates that the FM aspect construct has Predictive Relevance. The significance of the FM aspect towards the Maintenance Management Plan was tested in order to achieve the objective of this research. The hypothesis of this research as follows:

(i) H01: FM aspects are significant towards the maintenance management plan during the pre-development stage of the PFI project

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(ii) H1: FM aspects did not have any significance towards the maintenance management plan during the pre-development stage of the PFI project

The analysis showed that the value of (ß) of the FM aspect construct towards the Maintenance Management Plan is significant. The value of (ß) = 0.749, t value = 14.517, and ***p value = 0.000 ($p<0.01$) which are meet the significance value. Thus, H01 is accepted and H1 is rejected. It can be concluded, that the FM aspect towards the Maintenance Management Plan during the pre-development stage of the PFI project do benefit in maintenance charges, developing output specifications and identifying the contract clause.

Discussion

Based on the data tabulation in Table 5, the FM aspect is significant to the Maintenance Management Plan. It can be shown by a p-value of 0.000 ($p<0.01$). FM aspect is essential to the Maintenance Management Plan of the PFI project. In addition, the operation and maintenance phase of the PFI project is about 25 -30 years. The FM consultant acting as service provider during this phase need to take care the building as stated according to the requirement stated. Due to this situation, the FM aspect needs to be highlighted and discussed during the pre-development stages of PFI project. In this research, there are five FM aspects that have been discussed. As for FM consultants, these aspects should not be overlooked as it has significant impacts towards the operation and maintenance phases of the PFI projects. These aspects will help the FM consultants in developing a maintenance management plan. After all, these five aspects are essential towards the Maintenance Management Plan during the pre-development stage of the PFI projects.

CONCLUSION AND RECOMMENDATION

Based on the analysis made in the previous subchapters, it can be concluded that the FM aspect is essential for the Maintenance Management Plan during the pre-development stages of the PFI projects. Proper action during the pre-development stages could improve the efficiency and maintenance management for the building itself. In this research, there are five indicators of FM aspects that can be stressed out during the pre-development stages of the PFI project. The first FM aspect is the existence of a functional helpdesk during operational stage. Although it's for the operational stage, the existence of a functional helpdesk can be planned during the pre-development stage. Functional helpdesk needs to be proactive in managing complaints and monitoring the operational and maintenance aspect to reduce the negative effects towards the PFI projects.

Apart from that, FM input in terms of maintainability, availability and operability, FM must be involved during the pre-development stages of the PFI project. During this stage, FM needs to give advice, especially on the designs, building services and operational aspects. This is because the FM consultants will take care of the building during the operation and maintenance stages over a long-term period of the PFI projects. In terms of FM functions at the early design stage of the PFI project, the role of FM should be considered during this stage. The focus function of FM during this stage is to actively engage with the building contractors and design team for the provision of future maintenance of the PFI projects. Furthermore, to strengthen the maintenance management plan during the pre-development stage of the PFI project, FM strategies can be planned proactively for the future operation and maintenance activities of the PFI projects. This could make the maintenance management effectively planned. Last but not least, a dedicated team for maintenance is needed for better operational and maintenance performance of the PFI projects. The FM team needs to be experienced to manage the buildings during the operation and maintenance stages. It can be concluded that the FM aspects are very important for formulating a Maintenance Management Plan.

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CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests at all. The authors declare that they have no conflict of interest in producing this article.

AUTHORS' CONTRIBUTIONS

The main author carried out the research, wrote and revised the article. The main author also and provided the theoretical framework. The corresponding author critically revised the research especially focus on methodology and data analysis. The co-authors of this research reviewed before submission.

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