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Conceptualizing a Strategic Facilities Management Decision Framework for Heritage Building Maintenance Management

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Abstract: Heritage buildings (HBs) as structures with historical and architectural relevance that form an integral part of contemporary society. HBs deserve to be protected for as long as possible to retain their significance. Therefore, prioritizing HB maintenance management (HBMM) is pertinent. However, the decision-making process of HBMM can be relatively daunting. The decision-making challenge may be attributed to the multiple 'stakeholders' expectation and requirement which needs to be met. To this end, professionals in the built environment have identified the need to apply the strategic concept of facilities management (FM) in decision making. However, studies exploring the application of FM in decision-making seem lacking. To bridge this gap, this study focuses on developing a framework for strategic decision-making HBMM, which helps achieve HBMM sustainability. At the study's inception, relevant works of literature in the domains of HBMM and FM were conducted. This review helped identify contemporary maintenance practices and their applicability to HBMM. Afterward, a conceptual framework to aid decision-making in HBMM was developed. This framework integrated the concept of FM scope (people, place, process, and technology) while ensuring that decisions and plans were made at strategic, tactical, and operational levels. The conceptual framework presents a holistic guide for professionals in HBMM to ensure that decision processes and outcomes are practical and efficient. It also contributes to the existing body of knowledge on the integration of FM in HBMM. Furthermore, it will help achieve HB sustainability through an effective decision-making process.

Key words: decision-making, facility management, heritage building, sustainability

1. INTRODUCTION

Heritage Building (HB) preservation plays a pivotal role in actualizing the 2030 Agenda for Sustainable Development. In recognition of the importance of the conservation and maintenance of these buildings, the United Nations (UN) [21] adopted it as one of the sustainable development goals (SDG) - goal 11 target 4, which is focused on making conscious efforts to safeguard world HBs. e Sodangi et al. [1] explained that HB maintenance is vital in achieving a sustainable modern industrial society. Due to the importance attached to HBs, there is a longing to preserve them for future generations. This desire to retain them for long differs from modern buildings [1]. Professionals have realized the need to ensure that maintenance practices respond to the dynamic

building expectations based on users' needs and satisfaction. Hence, the conception of different forms of maintenance such as facility management (FM), sustainable facilities management, and strategic facilities management. These maintenance concepts have evolved to achieve sustainable management of buildings while taking cognizance of the environmental impact of maintenance attention and ensuring that stakeholders' expectations of facilities are met. Studies show that these maintenance practices have been applied in the management and decision-making of non-HBs [2]. However, its application in the maintenance management of HBs is relatively low, as many HBs are still in deplorable conditions [3].

According to Adegoriola et al. [4], it is needful to incorporate stakeholders' concerns in decision making. However, decision-making in HBMM can be a difficult task. It requires consideration of multiple criteria by stakeholders to determine and select the optimum alternative [5]. It requires careful deliberations, as the selection of inappropriate maintenance intervention could lead to loss of the value of HB. The main stakeholders in the built environment and FM sector are building owners, users, and managers. Hence, HB cannot be separated from the built environment. Its stakeholders, including the community, government, and owners, must consider its maintenance and management. Tucker and Pitt [8] believed that performance measurement might not be effective if strategic FM is rarely adopted in the maintenance practices and decision-making of an organization. Thus, incorporating strategic FM in decision-making in HBMM has become imperative. Hence, there is a need to safeguard HBs and ensure they are optimally utilized to achieve sustainability and enhance urban resilience. Thus, the interest of this research is essential to ensure that a strategy to aid decision-making is developed to assist decision-makers in choosing the most appropriate maintenance options for HBs.

Therefore, this study aims to develop a strategic facility management framework for HBMM. This would help in achieving effective and efficient HB use. Therefore the subsequent sections are discussed as follows: section 2: literature review, which discusses the findings from past studies on dimensions of maintenance and their applications; section 3: research process and identification of FM dimensions; section 4: conceptual framework development; and section 5: conclusions and recommendation for future studies.

2. HERITAGE BUILDING MAINTENANCE MANAGEMENT (HBMM)

Maintenance has been considered integral to building survival, regardless of the building type [6]. Given HB's delicate and non-renewable nature, its maintenance needs are to be prioritized. Maintenance is considered the most practical and philosophically suitable conservation method [7]. Zulkarnain et al. [15] asserted that maintenance management provides a platform for service providers and operators to ensure that building components and installation services perform at optimum levels. Allen [20] explained that maintenance management encompasses many operations and functions. It can be described as the effective and efficient utilization of resources to ensure that t facilities are kept to a standard required by the users. This implies that management of maintenance involves determining a series of relative priorities. Setting standards is also clearly identified as a requirement for the appropriate maintenance practice in an organization [17] Sodangi et al. [1] explained the concept of HBMM as all activities that are carried out to ensure that the building fabric and services are kept in a good state of repair to achieve effective and efficient use. In this regard, HBMM is a multidisciplinary approach to ensure the sustainable use of HB to achieve optimum utilization of buildings. Dann and Cantell [17] emphasized that maintaining HBs in suitable conditions is vital. Hence, different dimensions of maintenance concepts can be applied in HBMM to enhance their optimum use. These maintenance approaches help to achieve HB sustainability.

2.1. Dimensions of maintenance

Maintenance is regarded as a dynamic process. It has evolved from simply caring for the physical structure of a building to a holistic approach taking cognizance of stakeholders' needs in various capacities. To this end, various concepts of maintenance have merged. They are discussed as follows:

2.1.1 Facility management (FM)

Facility Management (FM) as an aspect of maintenance has gradually established its presence in the built environment. FM is a multidisciplinary concept that encapsulates procedures and activities to secure optimum facility management. However, studies reveal that these operations can be classified into five distinctive umbrellas: maintenance, facility performance, risk management, development and building upgrade, and facility management. Of these categories, Lai and Man [16] emphasized the importance of operations and maintenance (O &M) as a significant aspect of FM. As such, it should be given attention. Barret [11] introduced having an FM plan in phases, i.e., strategic, tactical, and operational levels. Barrett [11] opined that FM services should be oriented towards providing operational support to the core function of an organization in a strategic context to facilitate effectiveness and efficiency in management.

FM also plays a vital role in supporting non-core activities to enhance the primary business functions. In this vein, Pitt and Tucker [8] define FM as the synchronization of non-core services, including premises-related management necessary to operate and maintain a business to support the realization of the core business function of an organization. Among others, innovations in management, strategic planning, and performance measurement are the features of FM that make it distinct from traditional property management.

2.1.2 Sustainable Facilities Management (SFM)

The impact of building maintenance operations on the environment has been recognized and cannot be over-emphasized. Hence, some scholars have tried to link sustainability to FM; hence, understanding what constitutes Sustainable Facilities Management (SFM) is necessary. Elumalim et al. [9] posit that SFM is an approach that encompasses integrating operations of human nature and their physical environment to achieve harmony of activities in an organization. The distinctive nature of SFM was highlighted by Elumualim et al. [10], who explained that it helps in contributing to sustainable development by mitigating the effects of climate change. Moreover, regarding dealing with non-core services or open facilities management, SFM can be defined as a holistic approach to ensure coordination and management of non-core services of an organization [17].

SFM, apart from providing support to core business functions, also ensures the organization's activities do not harm the local and global environment [18]. From the preceding, it can be deduced that incorporating SFM into the HBMM decision process would be beneficial in selecting appropriate maintenance interventions that can help achieve optimum use of existing HB stock while preserving it for the future generation. Application of SFM to HBs would help optimize traditional building performance, conservation of embodied energy, water conservation, reduction of demolition & construction waste, reduction of pollution, and enhance overall environmental protection [19].

2.1.3 Strategic Facilities Management (StrFM)

Barrett [11] asserted that FM services could only be meaningful if they support an organization's core business. Hence the 'Strategic' FM concept introduces a generic model [11]. The model highlights six principal linkages on operational and strategic levels with regards to supporting core business in an organization. Barrett [11] further explained that maintenance practices and decisions

should consider external factors influencing the FM field's core business. The primary aim of strategic FM is to synergistically create a balance between the current operations and future needs. This can be achieved through interactions between the organization's FM's strategic and operational divisions. StrFM has been applied in different fields in the real estate sector.

Lavy and Shohet [12] developed that integrate the tactical and strategic decision-making processes from the life cycle perspective in healthcare. The study focused on the identification of principal variables affecting the performance and maintenance of facilities throughout their service life. Nielsen et al. [13] asserted that FM could not be practiced in isolation, hence referred to as network management, where social and communicative skills are as critical as technical expertise. The authors opined that strategic FM could be applied to the provision of social housing. This is based on the interrelationship and communication among tenants, administrators, owners, and operators who are part of the decision-making team in maintaining social housing.

3. RESEARCH PROCESS AND CONCEPTUAL FRAMEWORK

This research is part of a going Ph.D. study based on a literature review of relevant articles focused on HBMM and FM. First, the identified works of literature were assessed to extract the significant findings of the studies. This process resulted in the identification of different dimensions of maintenance and their applicability in HBMM, as discussed in section 2. After that, a decision-making framework was conceptualized to aid HBMM based on understanding FM's levels of operations and HBs' idiosyncrasy.

3.1. Conceptualizing the development of a strategic FM decision-making framework for HB

Studies have shown the applicability of Strategic FM in various sectors of the built environment, such as health care [12], residential [13], and commercial [14], among others. For instance, Lavy and Shohet [12] focused on reducing expenditure on non-core functions of health facilities and identified parameters to be considered by FM to improve facility performance. Similarly, Besiktepe et al. [22] developed a multi-criteria decision-making framework to assist facility managers in prioritizing criteria for building maintenance decisions to aid cost optimization.

Further, concerning HBs, researchers have also explored the aspect of decision-making for productive HBMM. For instance, Ferreti et al. [23] proposed an analytical decision-making framework to help alleviate the complexity of selecting HB reuse options. Likewise, Spina [24] developed a multilevel decision-making process able to support the decision-maker in optimizing investment choices for the efficient allocation of public resources, with specific reference to recovery and adaptation to the reuse of unused public HBs. These studies have considered decision-making from the perspective of stakeholders and building components; however, considerations on the impact of the external and internal environment, HB specificity, and FM's operational scope in the decision were not given attention. Thus, it is crucial to develop a decision-making framework to support FM's operation in HBMM based on the perspectives above lacking in previous studies. In this light, a strategic decision-making framework for HBMM was conceptualized based on the key concepts of FM and HBs (Figure 1).

According to Figure 1, when considering a maintenance option for an HB, the characteristics of the HB under investigation should be considered. This aspect is important because it will guide decision-makers on the significant attributes of the HB that needs to be prioritized in maintenance.

The characteristics of HB, whether social, economic, political, aesthetics, physical or environmental, would be considered while making maintenance decisions. For instance, the most dominant characteristics of the HB that stakeholders are identifying would be pivotal in determining maintenance options. Through this identification, preference would be given to maintenance options that would enhance the predominant characteristics of the HB. In addition, it

is essential to take into account the core and non-core functions of an HB being examined when selecting maintenance options. Therefore, the maintenance option selected should prioritize the core functions of the HBs. From the FM perspective, the core business represents the primary function of an organization. Relating to HBs, the core business represents the primary purpose or the most significant function that the HB represents. For instance, an HB whose most significant function is a tourist attraction (economic), its core business is to generate income through tourist action. Hence the maintenance options to be adopted should support this course. Non-core businesses, on the other hand, are the supporting activities that would ensure that the core business is achieved. For instance, providing guest houses and catering services for visitors who visit heritage sites is a non-core service that supports the core business.

Barrett [11] has explained that strategic FM considers the link between stakeholders, total environment (internal and external), and current and future needs with core business activities. Furthermore, decision-making in HBMM involves consideration of the interest of multiple stakeholders and the socio-cultural, economic, and environmental impact of maintenance intervention under consideration. Therefore, managerial decisions should be made by considering the priorities and objectives of different stakeholders groups. Accordingly, this framework took into account the importance of stakeholders' consensus on choosing the appropriate HB maintenance option. The predominant stakeholders in HBMM are the government, HB owners, non-governmental organizations, and community members. Thus, it is essential to deliberate HBMM intervention actions with the concerned stakeholders to avoid chaotic situations that may arise from a lack of cooperation among stakeholders.

In addition, the environment (internal and external) of an HB should be taken cognizance of in HBMM decisions. The external environment represents influences or factors beyond the HB itself, which directly or indirectly dictates the type and success of maintenance options adopted for an HB. Such factors include market forces (demand and supply) and the prevailing economic and political climate. In addition, the general economic conditions influence the real estate sector to which the HB belongs. This needs to be considered by the HBMM decision-maker in selecting the appropriate maintenance options.

Building requirements and user demands are dynamic and should be considered in HBMM. A significant challenge of HBMM is to prevent them from being functional, technological, economic, and physical obsolescence. Since most HB has existed for a long time, maintaining them to keep their relevance in the face of the ever-changing taste preference of buildings can be a daunting task. This is the reason most HB buildings are being adapted and revitalized to meet the current needs while keeping them relevant to remind the people of the past. Decision-makers should consider stakeholders' requirements in strategically choosing maintenance options. Legislative requirements and processes are external factors that influence maintenance options and should be considered when selecting maintenance options. For instance, when implementing adaptive reuse or renovations of an HB, it is vital to ensure that the new use or changes meet the legislative requirements.

Internal Environments are factors or characteristics peculiar to the HB itself which should be considered when making strategic maintenance and management decisions. These factors include but are not limited to the physical condition of a building, building significance, location, and economic potential. In addition, the technological factor of HB is also an essential factor that influences HBMM decisions. The capacity of the building to accommodate modern technological changes, availability of technical equipment, and accessibility of human resources to operate the facilities determines the maintenance options selected. Therefore, HBMM decision-makers should examine the HB environment and its impact on maintenance intervention options to ensure a feasible HBMM operation.

As mentioned earlier, FM operates on three levels of decision planning: operational, tactical, and strategic levels. Operational strategies are often short-term plans to support an organization's operations and primary activities. For HBMM, operational strategies include routine maintenance strategies such as preventive, corrective, or hybrid maintenance. Tactical strategies are medium-term plans to support the administration of an organization. In HBMM, tactical plans may include but are not limited to the following; training and retraining of maintenance staff, benchmarking and upgrading facilities, and obtaining user feedback on facilities, buildings, and services. Finally, strategic plans are long-term plans to achieve effective and efficient administration of an organization. In HBMM decisions, strategic plans may include; funding maintenance and operations, adopting sustainable FM and selecting holistic optimum maintenance options. It is important to note that the strategic selection of the HB maintenance option is case-dependent, i.e., it is based on the circumstances and peculiarities of HB under consideration.

Also, while considering maintenance options for an HB, the decision-making process should be guided by the decision-making steps. These steps include problem identification, the establishment of alternative selection criteria, consideration of all alternatives, identification of best alternatives, development of implementation plan, and evaluation and monitoring of the plan. The initial step of a decision-making process is problem identification. Next, it is vital to identify the issues to be deliberated upon and explore possible solutions to ameliorate the situation. Afterward, the pros and cons of the identified alternatives should be weighed to choose the feasible solution after careful deliberations by stakeholders concerned. For instance, if an HB is in a dilapidated condition, decisions must be made on its maintenance. As such, stakeholders would consider all options available and choose the most suitable maintenance alternative. The alternative should be legally permissible, economically viable, physically possible, and culturally acceptable.

Further, after careful deliberation and consideration of all options, the best maintenance option should be opted for. In order to achieve an effective and efficient HBM operation, the decision-makers should establish an action plan to guide the implementation of the selected maintenance option. While developing this action plan, project time, cost, and quality should be considered. Furthermore, an evaluation and monitoring schedule should be drawn out to ensure that the project is carried out as planned. Suggestions for feedback should also be encouraged to adjust the laid down plan when necessary. The identified parameters in this conceptual framework (Figure 1) would guide HBMM decision-makers to consider HBMM maintenance intervention strategically helpful in achieving sustainable HB use.

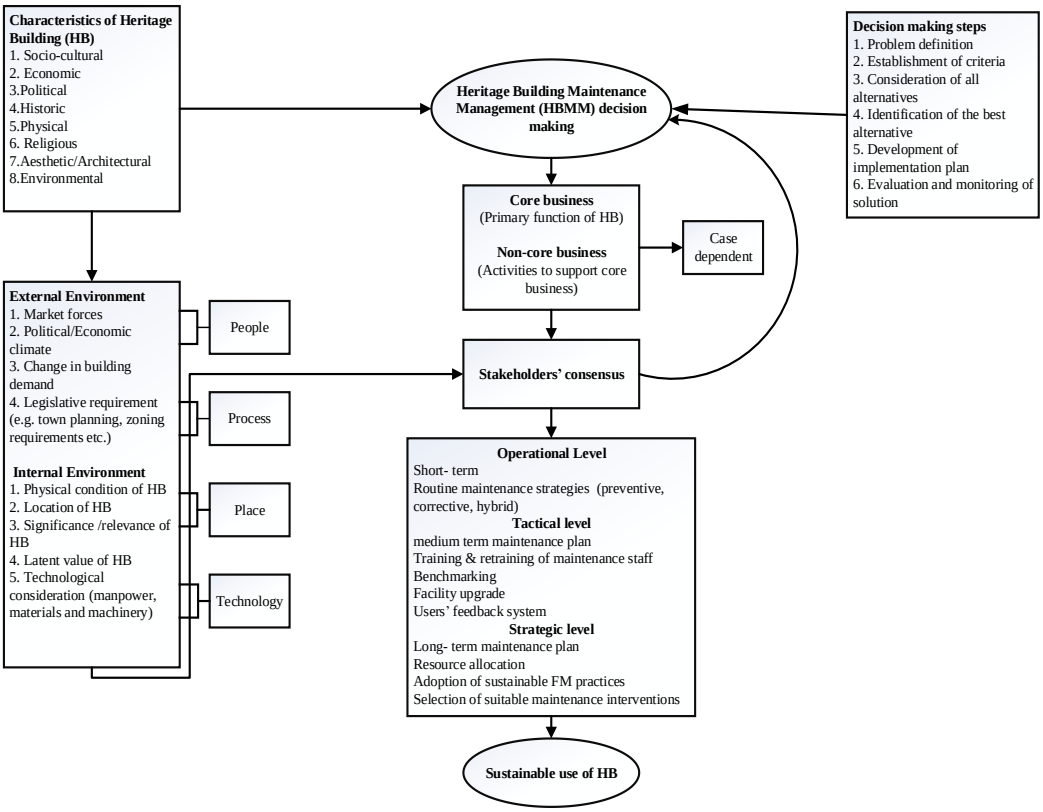

Figure 1. Strategic decision-making framework for HBMM

3.3. Conclusion and recommendation for future studies

This work which is part of a more extensive study (an-on going Ph.D. study), through literature review, identified and discussed the applicability of FM in HBMM. Based on previous studies' findings that have highlighted the benefit of incorporating the various dimensions of maintenance such as facilities management (FM), sustainable FM, and strategic FM to the maintenance management of buildings. Drawing an inference from these, these maintenance management approaches' applicability and relevance to HBMM were discussed. Furthermore, a conceptual framework for decision-making that emerged from this study was developed by integrating FM's concept of planning at the operational, tactical, and strategic levels. In addition, the internal and external environment that may influence HBMM with due consideration within the context of FM's (people, place, process, and technology) was also given cognizance in the decision process. The framework presented a holistic approach to decision-making in HBMM to ensure smooth operations of HBs. The novelty of this study lies in the integration of FM's managerial scope and HB specificity to aid strategic decision-making in HBMM, which is lacking in existing studies.

Based on this current study, further action will be taken in the future to assess the practicability of the framework. This would be achieved in two phases. The first is to validate the framework by seeking the opinions of HB maintenance experts on the robustness of the framework. Furthermore, it would be applied to a real case study to validate practicability and effectiveness after the validation. The findings from these actions will be reported and discussed in the future.

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