

# Culture in Maintenance Management of Public Buildings

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Contributor: Babatunde Ogunbayo, Clinton Aigbavboa, Opeoluwa Akinradewo, Samuel Adekunle

Culture is one of the significant elements that influence the behavior of doing things the right way, without which there is a hindrance to the attainment of set goals. It has also been stated that culture is essential to maintaining public buildings, which is significant to national development. However, the level of abandonment and deterioration of public buildings is high due to a lack of culture among stakeholders in the maintenance process.

Keywords: behavioral change ; maintenance culture ; maintenance management

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## 1. Maintenance Management Concept

Deterioration and decay of the fabric and the services begin the moment a building is completed and occupied. Hence, there is a requirement to undertake maintenance activities to ensure that the facility performs to an acceptable level <sup>[1]</sup>. As defined by Ref <sup>[2]</sup>, maintenance is the combination of all technical, management, and administrative engagements during the life cycle to restore or retain it to a state in which it can perform the required function. Ref <sup>[3]</sup> defined it as the services provided for a structure (building) after completion to replace it to a standard that will make its components stable and serve its required functions without upsetting its functional ability and basic features throughout its entire life span. Ref <sup>[4]</sup> postulated that maintenance is related to redecoration, repairs, and replacement of a structure and its auxiliary facilities. This is to prevent damage and injuries and increase the economic life's usefulness of the structure while improving its functionality and aesthetics <sup>[5]</sup>. These definitions show that the essence of maintenance in a building is to meet its required functional performance and the expectation of the users <sup>[6]</sup>. Thus, maintenance is not just to rectify defects but also to prevent them <sup>[7]</sup>. However, for the effectiveness of the maintenance process, there is a need to incorporate management concepts into it to facilitate how maintenance is carried out in buildings.

Ref <sup>[8]</sup> submitted that for MM organizations to sustain their competitiveness, they need to create a value-based maintenance system better than their rivals in the maintenance industry. Ref <sup>[9]</sup> noticed that maintenance organizations could only have an operational edge over their competitors when deploying a more effective management style to offer superior services to users. Ref <sup>[9]</sup> postulated that formulating maintenance policies and plans within an organization develops a good management strategy for effective maintenance operations. Ref <sup>[10]</sup> asserted further that resource management such as humans, components, and materials need to be given good consideration in developing a viable MM team. Ref <sup>[11]</sup> stated that maintenance operation under viable human resources management would bring together a range of stakeholders' functions to benefit employees and the organization. Hence, Ref <sup>[9]</sup> submitted that MM of buildings is more proficient when suitability and efficient human resources support maintenance personnel toward effective MM through the best combination of cost, efficiency, and quality of the organization. Ref <sup>[12]</sup> maintain that MM is not about keeping the buildings only; it involves the management of the organization's resources and the processes it supports, operating within the realm of available resources based on the organization's corporate culture. Ref <sup>[13]</sup> affirmed that no matter how well-focused an organization might be on its core business, it cannot ignore maintenance issues, especially during maintenance operations.

## 2. Conceptualization of the Maintenance Management Models

Several professionals and studies have defined MM based on how they understand its concept. This, in turn, has influenced the characteristics of the attributes which impacted or determined MM in their respective studies. Among the relative nature of MM is that professionals and scholars use different words to describe similar MM concepts <sup>[14][15]</sup>. The concepts of MM as described by researchers with different terms include maintenance models, maintenance systems; maintenance strategies; maintenance philosophies; maintenance types; maintenance methods, and maintenance techniques. Most literature often describes MM models on the same notion as maintenance studies <sup>[14][15][16]</sup>.

Nevertheless, the variables that determine MM differ from one organization to another and from one nation to another owing to the relative nature of MM studies <sup>[17][18]</sup>. Although, in most studies, MM is well measured in relation to a particular organization in a specific nation within which the maintenance organization or agency operates <sup>[19]</sup>.

The relative nature of variables that determine MM models changes with time as it shifts from one maintenance set objectives to another within an organization, industry, or nation. This is primarily due to changes in operation strategy, economic positions, changes in management, or gaps observed in existing maintenance concepts <sup>[19]</sup>.

As presented by Ref <sup>[10]</sup>, the generic MM model suggests the alignment of the MM process with the three levels of business activities: strategic, tactical, and operational. The model is backed by three fundamental pillars of information technology (IT), maintenance, and organizational techniques. The models show that the process will require a maintenance plan and task scheduling at the tactical level. At the operational level, emphasis is more on maintenance tasks executed by the skilled maintenance technician based on scheduled time, correct procedure, and proper tool usage <sup>[10]</sup>. The strategy-level maintenance information system will be required to document maintenance activities carried out. More so, at the strategy level, data will be necessary to report maintenance activities in the information system <sup>[10]</sup>. While the data provided through the computer maintenance management system (CMMS) will be transformed into information that would be used to make decisions at the levels of the business activities and prioritize actions <sup>[10]</sup>. This will allow effective control of assets and proper monitoring and supervision of maintenance processes and operations. The framework identified a set of key techniques that constitute the maintenance technique pillar: reliability-centered maintenance (RCM), total production maintenance (TPM), quantitative tools, and tactical activity-oriented stochastic tools <sup>[10]</sup>.

Ref <sup>[20]</sup> suggest a maintenance model that contains three simple building blocks. The first block places the MM into the broader business perspective: finance, marketing, and operation. The second block in this MM decision-making level is planning and control, the core element with sub-variables that includes maintenance manager decisions on business functions, performance reporting, and resource management. The importance of training was highlighted to improve the maintenance personnel's knowledge for them to operate in a safe environment <sup>[20]</sup>. The last block was the third block in this maintenance framework is called the MM toolkit, which is the core element. It consists of statistics that focus on optimizing maintenance resources management. The model posits that effective MM depends on resources, task planning control and scheduling, maintenance information system, and maintenance budget <sup>[20]</sup>.

Moreover, Ref <sup>[21]</sup> suggests a generic MM model. The proposed framework contains eight blocks in sequence, covering four functions representing the core element, including effectiveness, efficiency, assessment, and continuous improvement. The effectiveness of the framework covers maintenance objectives. It is related to key performance indicators, appropriate maintenance strategy specified, where assets will be prioritized, and a weak point with high impact will be acted upon <sup>[21]</sup>. The efficiency in the model shows the optimization and design of preventive maintenance plans that include resources schedule and resources <sup>[21]</sup>. Assessment in the model focuses on maintenance control, execution, monitory and supervision, replacement optimization, and asset life cycle analysis. Whereas improvement in the model focuses on issues relating to continuous improvement by integrating new techniques where applicable <sup>[21]</sup>. The framework, however, highlighted the significance of incorporating new techniques and engineering tools with management concepts <sup>[21]</sup>.

Similarly, the management process model for maintenance was developed by <sup>[22]</sup>. The model suggested that a maintenance structure include two management processes <sup>[22]</sup>. The two management processes include analysis of process effectiveness and process efficiency. The model postulated that an effective management process seeks to identify the most critical problems in maintenance activities and identify their potential solutions <sup>[22]</sup>. The efficiency management process focuses on identifying suitable procedures for maintenance operations. The model identified eight stages loops for evaluating the MM process towards achieving effectiveness and efficiency. The model specifies that the first stage determines the maintenance structure's current performance, including planning, supervision, and monitory <sup>[22]</sup>. As identified by the model, the second stage is to analyze the quality and downtime problems achieved through policy deployment and organization <sup>[22]</sup>. However, the third stage of the model shows that there should be an adequate analysis of a potential solution to maintenance problems through continuous improvement <sup>[22]</sup>. The model postulated further that there should be an efficient analysis of maintenance procedures which can be achieved through a suitable maintenance approach <sup>[22]</sup>. The model also identified plan and execution as a stage required for evaluating the MM process, which can be achieved through planning and scheduling. Stage six, seven, and eight of the models emphasize the importance of data collection and implementation actions, data processing, monitory and supervision, and effective information handling procedure <sup>[22]</sup>. The model clearly shows that all this can be achieved through CMMS, which can be used for proper information gathering, process, and sharing to achieve effective and efficient MM <sup>[22]</sup>.

Also, Ref [23] proposes a formal structure model for effective MM. The model starts by identifying maintenance strategies for the asset and associated human resources-related aspects required to produce the needed working culture [23]. The model shows further that the organization gains monitoring and control to ensure the functionality of each asset throughout its life cycle. As stated in the model, this can be achieved by implementing a CMMS, a maintenance function measurement system, and planning and scheduling the maintenance activities [23]. The model posits that depending on the value assets represent for the organization, it is accomplished according to various tactics employed on one or more of the following eight tactics: redundancy; run to failure; scheduled overhaul; scheduled replacement; ad-hoc maintenance; preventive maintenance (use-based or either age-based); condition-based maintenance; and redesign if necessary [23]. The model suggests using two highly successful maintenance methods, TPM and RCM, to realize continuous improvement. The model signifies process re-engineering techniques to sustain improvements already achieved at the top level of the maintenance process [23].

Moreover, as Ref [24] suggested, the maintenance model shows that a preventive maintenance program should be in place before advancing to the next level of maintenance activities. The model posits further that before one considers the implementation of RCM and predictive maintenance programs, there should be CMMS implementation with a suitable work order release system, provision of spare parts, and training of maintenance personnel (maintenance resources management system) [24]. The model states further that there is a need to implement total productive maintenance (TPM). The TPM would help guide the necessary maintenance organization structure configuring and applying statistical tools for financial optimization [24]. However, the model signified continuous improvement in maintenance practices to achieve an effective maintenance management system.

### **3. Culture in the Context of Maintenance Management Study**

Public buildings are developed to fulfill society and organizations' needs. Ref of [25] postulated that public buildings are critical to an organization or nation's resources. Ref [26] observed that the present maintenance problem in public buildings had become an important agenda for developing countries and pressured their government to manage their public buildings. Ref [27] sustain that public assets, especially public buildings, are not maintained properly due to the nonexistence of a maintenance culture. Hence, developing a maintenance culture based on stakeholders' behavior, environmental needs, values, and cultural beliefs is essential [27].

According to Ref [28], maintenance culture is not universal but can be emulated, derived, or learned by others, making maintenance a natural daily practice. The studies of Ref [29][30][31] showed that the cultural aspect that is the basis of a maintenance process and operation is often overlooked. Ref [32] stated that the absence of maintenance culture due to behavior issues among stakeholders has led to an increase in management and maintenance costs to repair damaged buildings and their auxiliary facilities. Ref [25] observed further that maintenance problems could be better solved through the behavior change of individuals in the maintenance process of buildings. Ref [29] state that behavior change is essential to improve maintenance work's tenancy, skills, and diligence. Ref [33] observed that a maintenance culture is not easy to develop. This is due to the fact that keeping up a good maintenance culture takes time and occurs in response to changes in the individual [34].

For societies to exist, there must be a cultural exhibition [35]. The fluid operation of society is supported by cultural norms and cultural values that guide people in making choices [35]. However, Ref [36][37] opined that the culture of maintaining and sustaining infrastructures is essential to national development. Ref [37][38][39] posit that the absence of maintenance culture, especially in the public sector of most developing countries, has been the bane of an infrastructure-driven national development. Ref [40] observed that the development of maintenance culture is one of the significant forces that catalyze the growth of any nation's economic, social, and technological advancement. It has been noted that a paucity of maintenance culture characterizes the MM of public buildings in most developing countries, especially among stakeholders of buildings maintained [32][39]. However, past studies have reiterated the importance of maintenance culture among stakeholders in the MM of public buildings in developing countries [41].

However, studies have differed in views about the specific variables that constitute the determining factors in the development of maintenance culture in the management of buildings. Ref [25] identified effective communication in the MM system; reward systems and recognition; empowerment; motivation; involvement; strategy and work planning; teamwork, good policy system, training and education, and organizational cultures as determining factors in developing a culture-based maintenance model. Nevertheless, there are still challenges in developing culture-based maintenance systems in developing countries [10][42].

### 3.1. Cultural Challenges in Maintenance Management of Public Buildings in Developing Countries

According to Ref <sup>[43]</sup>, the development of maintenance culture is one of the major forces that catalyze the growth of any nation's economic, social, and technological advancement. Ref <sup>[44]</sup> postulated that the deterioration level of public buildings in most developing countries poses a great concern for national prosperity and a healthy environment. Ref <sup>[43]</sup> noted that challenges facing the developing countries' ineffective maintenance culture of their public buildings could be attributed to lack of maintenance policy, lack of professional maintenance practice and ethics, and corruption in the maintenance process. Ref <sup>[44]</sup> also identified a lack of on-job training, lack of awareness of the importance of maintenance, and usage information on maintained buildings. On the other hand, <sup>[39]</sup> identified variables such as corruption, leadership challenge; behavioral issues; lack of policy as factors that cause no maintenance culture within an organization.

Existing literature such as Ref <sup>[32][45][46]</sup> indicated that developing countries lack cultural behavior that ensures effective and efficient functioning of the public buildings and fosters national development. Moreover, provision for adequate care of the hard-earned infrastructure has not gained ground in the consciousness of stakeholders in the country over the years. This is due to the absence of a maintenance culture. For instance, Ref <sup>[32]</sup> observed that poor maintenance culture had become a widely acknowledged problem in Nigeria. This has made the country prioritize property management and maintenance activities <sup>[47]</sup>. Ref <sup>[48]</sup> affirmed that Nigeria has no functional maintenance policy and, therefore, is a dearth of culture toward the maintenance process and the maintained public buildings. Ref <sup>[49]</sup> indicated that inadequate maintenance culture is peculiar in almost every public building in Nigeria. As posited by Ref <sup>[50]</sup>, this is partly due to the problem of maintenance culture based on societal behavior toward the maintenance process and the maintained buildings. Ref <sup>[49]</sup> postulated that the leading factors to Nigeria's ineffective MM of public buildings are the declining maintenance culture, corruption in the maintenance process, and lack of political will. Similarly, Ref <sup>[46]</sup> showed that warranted attention had not been given to maintaining public buildings in Ghana. This has restricted Ghana's development through gaping infrastructural deficit and poor maintenance culture of existing public buildings. This was bolstered by Ref <sup>[51]</sup> that Ghana continues to invest heavily in new public facilities while the sustainability of the existing ones suffers from poor maintenance culture. Ref <sup>[52]</sup> opined that Ghanaians have a growing awareness about the lack of maintenance culture in public buildings. Ref <sup>[52]</sup> stated further that Ghanaians' attitude to public-owned buildings is generally negative, with the common understanding that it is "nobody's property." The study of Ref <sup>[53]</sup> stated clearly that in Ghana, most of the public buildings accommodating public servants had not seen any significant maintenance since they were constructed. Ref <sup>[51]</sup> postulated that owing to a lack of maintenance culture, the maintenance of public buildings is awful in Ghana.

In Kenya, Ref <sup>[43]</sup> observed that public building maintenance had not received much attention since more emphasis was on developing new buildings. Ref <sup>[43]</sup> further posited that due to non-maintenance culture, a crisis is looming in the building stocks. This is due to the fact that existing private buildings and other public infrastructure are running down and losing their utility value due to a lack of maintenance culture. Moreover, Ref <sup>[43]</sup> opined that the maintenance policy in Kenya, based on borrowed cultures from the firmly grounded maintenance culture of developed countries, has proven to be environmentally unfit for MM activities in Kenya. Similar problems of maintenance culture are evident in other parts of Africa, as acknowledged in South Africa. Ref <sup>[54]</sup> study showed that the maintenance problem concerning government buildings in South Africa is not unique. Ref <sup>[55]</sup> observed that due to several structural factors such as lack of MM culture, maintenance of public buildings could not be adequately addressed. Ref <sup>[56]</sup> finding on MM of public facilities in South Africa shows that the maintenance of buildings is mainly based on developed countries' maintenance systems. Ref <sup>[57]</sup> postulated that the inability to meet industry and consumer demands on basic building services is due to ageing caused by the lack of maintenance culture of management of existing buildings. This assertion was buttressed by Ref <sup>[58]</sup> that since 2005, maintenance of most public buildings has been held up due mainly to a lack of proper maintenance plan and culture. Furthermore, Ref <sup>[59]</sup> observed little funds were assigned to maintaining existing public buildings while new projects were fully funded. Due to many years of maintenance neglect and the dearth of maintenance culture, existing public buildings are deteriorating. Also, a study carried out by Ref <sup>[60]</sup> on financing infrastructure maintenance in South Africa concluded that due to years of sub-standard maintenance, majorly due to a lack of maintenance culture, the quality and reliability of most public buildings remain poor.

Thus, in addressing the culture gap in MM of public buildings in developing countries, mainly the behavioral change management theory was engaged in holistically addressing the knowledge gap. The theory covers a broad scope of thought and appears close to containing all of the essential vital skills required for effective management through increased employee loyalty to the organization. It provides a job for life with a strong focus on the well-being of stakeholders that can influence their attitude toward the maintenance process and the maintained buildings.

### 3.2. Behavioural Change Management Theory

As described by [61], change is the crystallization of new possibilities such as new behavior, policies, methodologies, patterns, products, or market ideas based on institutions' re-conceptualized patterns. Ref [62] summarily describes the change as a simple process. Change is about travelling from the old to the new, leaving yesterday behind for the new tomorrow. Nonetheless, implementing change is incredibly difficult. Most people are reluctant to leave the familiar behind. Researchers are all suspicious about the unfamiliar; people are naturally concerned about how they get from the old to the new, especially if it involves learning something new and risking failure or changing the behavior toward achieving a new ideal. Thus, Ref [63][64] postulated that change management is the organizational movement from the existing plateau toward a desired future state to increase organizational efficiency and effectiveness.

Change management can involve technological developments; transformational relationships, organizational control; organizational structure; organizational culture; organizational locations; balance sheets, and others [65]. Ref [66] stated that change within the organization depends on the degree and nature of transformation within the organization. Therefore, an organization needs to strive to change individuals' rites, rituals, behavior, and values in organizations [67]. However, managing and implementing change can be ambiguous [41][67][68]. Additionally, change management ensures that organizational goals are met properly using organization resources.

From the above literature, it can be deduced that to maintain an effective MM of public buildings, changes, especially behavioral change, are a way of life that the stakeholders must embrace. Conversely, change management in maintenance organizations aim to ensure that the set goals are achieved by effectively managing maintenance personnel and other stakeholders. By better understanding their rites, rituals, behavior, and values within the maintenance organization. This will help the maintenance organization gain a competitive edge over its rivals and meet the needs and expectations of the users of their facility. To better understand the change in the maintenance process, Kotter's change model is discussed below in understanding maintenance culture within an organization.

### 3.3. Kotter's Model of Change

Kotter's change model explained that changes are a continuous adaptation process to changing conditions and circumstances. The model approach to change also shows that change should be perceived as a continuous, open-ended adaptation process to changing circumstances and situations [69]. Approaches to this model show that maintenance personnel need to be continuously trained and educated not only on their job but also on innovation, technology, techniques, material selection, job behaviors, and values. Also, the model showed that the maintenance organization should develop a maintenance strategy that will create a benchmark for stakeholders required for both the maintenance process and usage of maintained buildings. In achieving the set maintenance goals of an organization, the model advocates eight steps in the change process.

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