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Model of Fire Safety Management for the Assessment of an Office Building in FCT Abuja Nigeria

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Abstract

Fire safety management is essential in the aspects of achieving absolute fire safety standards in a building. Various Fire safety assessment methodologies and fire risk evaluation process has been developed over time, in spite of this, the fire risk keeps increasing, which implied that, there is a poor fire safety management. This study proposes a model of fire safety management for the fire risk assessment of an office building in Nigeria. The ten components of fire safety management were selected from the literature review, which was later structured to form criteria. The relative importance index was used to rank the level of compliance of fire safety management base on their influence. The questionnaires were the distribution to 30 fire safety practitioners and experts with substantial experience and knowledge in fire safety management. The data were analyzed using the relative importance index analytical approach. The evaluation model was suggested base on fire safety practitioners and experts' perceptions. The inspection/observation of an office building was conducted in Nigeria in order to validate the model. The findings revealed that there is higher fire risk due to non-compliance with the standard fire safety management.

Keyword: Office Building, Component of FSM, Relative Importance Index, Assessment.

Introduction

Approaches differ from inspection checklists, point scheme (Society, 2015) . Fire is critical for human development, national and society and it is an essential aspect of social development among several kinds of disasters fire constitutes a significant threat to life, property, and environment. The report from fire services department in 2018, shows a total of 51400 numbers of fire calls and 934 fire death (NFPA, 2018) , building fire particularly in public buildings remain a critical concern as the fire outbreak revealed between 2013 and 2018 indicate the significant increase in the fire disasters and the numbers of death (Emmanuel, Tulasie, & Jeboah, 2016) . The government and other stakeholders have a responded to an increase in fire risk using several approaches, which include building regulations, fire safety code, fire safety training, and holistic fire safety management and construction/design to prevent fire occurrences.

The specific intervention of the Nigerian government is to encourage the development of fire risk management systems in buildings, prevent, protect, and effective management of fire, to reduce the risk to lives, property destruction, and business continuity. Hence, ensuring buildings fire safety.

Despite several interventions by the stakeholders by conducting an evaluation of fire safety in the existing building, especially office building, the problems of fire safety management are not adequately addressed (Chen, Chuang, & Huang, 2012). According to (Service, 2015), evidence has shown the significant factors contributing to incidences of fire outbreak or disaster (Badger, 2017), as several researchers proved that the highest percentages of the catastrophe were caused as a result of human errors. While, lower rates show to be a technical failure. In addition, the primary sources of several building fire disasters are fire safety management which usually not properly not implemented (G, 1999), fire safety regulation did not adequately address; the code contained minimal aspects of fire safety management and did not take into consideration the significance of fire safety management at the post-construction stages of the building. As a result, practical fire safety management could not be fully enforced as an aspect of fire safety regulations.

However, the existing fire safety regulation and provided aspects of management issues in specific buildings. Therefore, it is not adequate to achieve fire safety objectives (Malhotra, 1993). Fire safety management was also provided in the health and safety at work act, but only captured the aspect of the safety of employee (Porter, 1990)

Even though the safety of occupants is essential, protection against the destruction of property and closures of business because of fire, disaster is also paramount because fire disaster can result in total destruction like the collapse of buildings (Wong & Xie, 2014). In the UK tower, fire outbreak in the 14 June 2017 in the 24 stories Grenfell Tower, a block of office buildings in North Kensington, West London, United Kingdom. The authority confirmed that 80% of occupants died due to the fire disaster

Therefore, the event will be remembered in history as one of the historical fire disasters alongside the Shanghai apartment fire in 2010. Furthermore, the report from the UK revealed that direct materials damages because of the fire are nearly 0.21% gross of domestic product annually. In addition, fire disasters could result in significant losses to buildings, which can be so complex to evaluate. Thus, these comprise social-economic damage, closure of daily business activities, and loss of a job.

Fire safety management can be described as an application by the manager of policy, standards, tools, information, and practice to the task of analyzing, evaluating, and controlling fire safety (Howarth & Kara-Zaitri, 1999). Therefore, the management of fire is a whole process throughout the life cycles of buildings in order to achieve the acceptable level of fire safety objectives Chow (2001), According to (Wardani & M.Dachyar, 2018), describe the management as an act of managing human and materials toward achieving the organizational goals and objectives, the studies declared that its task is to carry out the necessary action to achieve the fundamental purpose of the organization

However, it can be concluded that fire safety management in the organization aims at preventing fire disasters and damage to property, environment, and occupants' death or injuries because of fire (Wambugu, Mburu, & Galebe, 2016). Fire safety management is developed primarily on subjectivity, as the assessment of one person is applicable based on his knowledge and experience if the evaluation is good or bad, unlike objective evaluation, which is based on a particular guideline. However, in ensuring that a subjective is satisfactorily understood, it must be expressed in number

(Kodur, Kumar, & Rafi, 2019). Hence, this is closer to objectives judgment/ comprehensiveness of fire safety management.

Because of this, the assessment of fire safety management in office buildings using quantitative data analysis is critical, particularly in developing countries where proper fire safety management was not considered. In Nigeria, fire safety in a public building, especially office building, is generally poor. Therefore, fire safety management evaluation can provide better approaches to determining the level of fire safety in office buildings. Office buildings are under high fire risk. Thus, determining the level of potential fire risk is critical in achieving fire safety objectives.

Methodology

The research selected ten components (as shown in Table) of fire safety management from the literature review Howarth (1999), and the components adopted were used to prepare a questionnaire using likers scale. Thirty (30) fire safety practitioners and experts in the field of fire with knowledge and experience were selected to participate in the aspect of fire safety management; the thirty experts were involved in the survey. The fire safety experts were asked to rank the ten components of fire safety management components selected for the survey according to their level of importance. The expert's response was collected and analyzed using the relative importance index. The physical inspection was then conducted in one of the office buildings using an observation checklist based on the ten components of fire safety management. The ranking value from the physical inspection with the correspondent relative importance index of each component obtained from the perception of the fire safety experts were presented in Table,1,2 and Figure 1

Table 1. Physical observations Checklist

Evaluation Criteria	Observation result		Observation result %	
	YES	NO	YES %	NO %
Adequate fire safety system in place	-	1	0	10
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Qualify fire safety management appointed	-	1	0	10
⊗ Does occupants aware of fire safety	1	-	10	0
Are the fire safety system maintain	-	1	0	10
Implementing emergency incident and post event	1	-	10	0
Is there risk training conducted on regulation bases.	1	-	10	0
Good fire safety policy	-	1	0	10
Are incidents of fire reported and investigated	1	-	10	10
Total level of compliance:	4	6	40%	60%

The Results and Discussion

The results from the physical observation shown in Table 1 indicate that the level of implementation of adequate fire safety management components is 40%, as against 100%, benchmark which implied that the level of compliance with the standard fire safety management system is inadequate.

However, the acceptable results for the fire safety management compliance should range from 50 - 100%. The evidence from the result show that urgent improvement is required in the office building in terms of fire safety management system. In addition, the finding from the physical observation also implied that the level of fire risk expose to by the occupant of the building, which could eventually lead to death, injury in the event of fire is very high.

Secondly, the table (2) and figure (1), shows the finding from the level of importance of the components of fire safety management from the perception of fire safety practitioners and experts from Lagos state Nigeria. The results from these sections of the study are contrary to the finding from Aminu (2014), (Baker & Bouchlaghen, 2013) with the most influential components of fire safety management as fire risk assessment, emergency plan/procedures. While, maintenance of fire equipment and standard, become the most influential components in the study as indicated in the figure (1), this is because of differences in the background of the experts that participated in the survey, furthermore, the method used in the data collection, analysis region in which they were conducted.

Table 2 the level of FSM component importance

s/no	Components of FSM	Relative important index	Items means	Ranking	Status
1	Fire risk assessment	0.49	2.5	6 th	Low-effective
2	Fire Safety organization	0.60	3.0	2 rd	Highly effective
3	Compliance with fire safety regulation	0.42	2.1	8 th	Non-effective
4	Emergency plan/fire safety procedure	0.45	2.3	7 th	Non-effective
5	Fire safety communication/information	0.49	2.5	6 th	Low-effective
6	Reporting and investigating fire	0.57	2.8	3 th	Moderately Effective
7	Fire Safety Training	0.53	2.6	5 th	Moderately -effective
8	Maintenance of Fire equipment and standard	0.65	3.2	1 st	Highly effective
9	Fire Safety Audit	0.56	2.7	4 th	Moderately -effective
10	Fire Safety Budget	0.60	3.0	2 rd	Effective

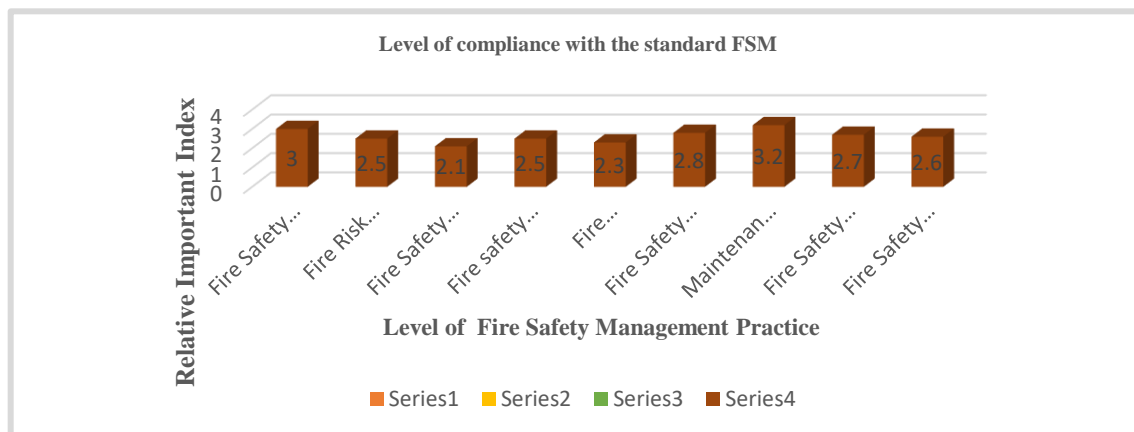


Figure 1: showing the results of level of FSM practice

Fire Safety Management Evaluation Models Component

The model was developed from the ten most influential components of fire safety management the observation checklist and questionnaires survey was distributed to the nominated fire safety experts, and fire safety practitioners were the principal foundations of the model, which generate the ranking results and the result of relative importance index from the participant’s perception respectively.

The results were used to assess the level of fire risk of one of the Nigerian office buildings. Figure (1), represent the evaluation process.

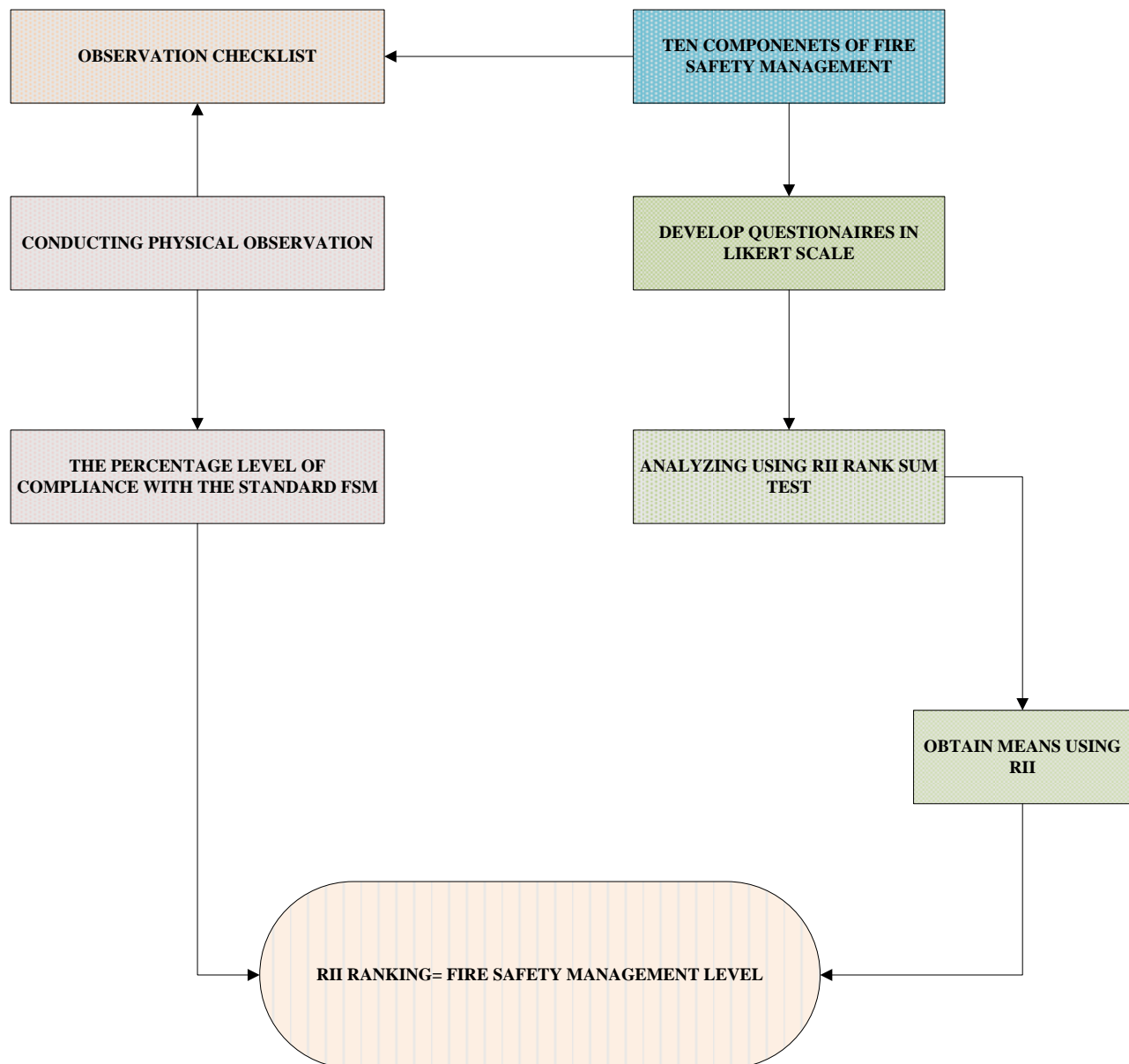


Figure 2: Model of Fire Safety Management

Conclusion

This research was carried out to propose a model for fire safety management evaluation of existing public office buildings in Nigeria. Therefore, analyzing the level of compliance of the office building with fire safety management through observation checklist and examined the fire safety level of the office buildings based on the ten most influential fire safety management components adopted from the literature.

However, several studies have revealed that the experts' perception survey and conducting an observation a prove that evaluation of fire safety management in any buildings should be based on numerical interpretation. Hence, the model of fire safety management evaluation developed from this research can be applied to any other types of buildings, provided that the ten components of fire safety management program are useful for all buildings types. Thus, the study comes up with a fire

safety management evaluation model for an existing buildings in Nigeria, thereby contributing to the scholarly literature requesting for the development of strategies for determine the level of fire risk in buildings, particularly in Nigeria, and it has exhumed the strategies necessary for the achievement of fire safety objectives by the building managers, and fire safety practitioners in Nigeria at post-construction stage of the building.

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