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PROJECT DESIGN AND PERFORMANCE OF HOUSING AND WATER PROJECTS IN NAIROBI CITY COUNTY, KENYA

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Abstract: **Effective waste management services can save organization money and benefit the environment at the same time. Organizations have a legal obligation to effectively manage and dispose of their waste. The study examined how project design influence performance of housing and water projects in Nairobi City County, Kenya. A descriptive survey research design was used. 95 housing and waster construction projects formed the target population and the total number of respondents was 285 comprising of 3 permanent staff from each project. A census of 285 respondents was carried out to form the sample size. Questionnaire was used to collect primary data. Descriptive statistics and inferential statistics were used to analyse quantitative data. The study established that project design significantly affects the performance of housing and water projects. The study recommends that waste prevention and reduction in the design phases, project design should focus on reuse and recycling, waste-efficient procurement, materials optimization, off-site construction; and deconstruction and flexibility.**

Keywords: **Project Design, Project Performance, Housing and Water Projects.**

1. INTRODUCTION

The construction industry is mostly concerned with unique projects which creates difficulties for effective management control (Aretoulis, Kalfakakou & Striagka, 2010). Adeyinka, Jagboro, Ojo and Odediran (2013), highlight to the complexity of construction projects because they bring together professionals within the industry to form an organizational team. The construction industry is one in which significant amounts of waste are generated which have deleterious effects on the health and safety of persons as well as the environment.

Lu and Yuan (2011) report waste levels of 15-25% common in the literature pertaining to construction industry's contribution to industrial waste. Common waste generated by the construction sector include; solid waste such as concrete, brickwork, stone, metals (particularly steel), timber and glass. These wastes are generated in workshops where work is being prepared for construction sites, at construction sites and by the activities of the consumers of construction products (Medineckiene, Turskis and Zavadskas, 2010).

Cheung (2013) indicates that waste from construction in the end product produced and taken away from either the site of construction, demolition, area of renovation buildings and structures of civil engineering. Formoso Isatto and Hirota (2014) argue that lack of efficiency which leads to the utilization of machines, raw materials, workforce or finance in large amount of quantities compared to the ones which are important in coming up with a building. Mistakes lead to the generation of wastes in a construction industry together with the activities which are not in operation, inputs which take longer time to be completed and offering products and services that never satisfy the requirements of the clients.

2. STATEMENT OF THE PROBLEM

Management of wastes in the construction industry is an initiative carried out for sustainable development that is driven by the high alarming environmental hazards caused by the activities of a man. Developments around the developing countries have increased the activities of construction which in turn have led to increase on wastes from these construction activities. Effective waste management services can save your business money and benefit the environment at the same time. However, the Nairobi City County has been challenged in the management of how to dispose waste

coming from the construction sites. This has been attributed to lack of proper legislation, enforcing of laws, lack of adequate facilities, lack of creating awareness to the public, local contractor negligent behavior and poor monitoring and evaluation practices within the county.

Studies that have been done include for instance, Berry and McCarthy (2011) study on energy effectiveness of materials used in a project but the study did not cover all the aspects of material management. Groove (2012) conducted a study on reduce, reuse, recycle of waste materials. The study failed to look on procurement, material cost, energy effectiveness. Mule (2013) study examined influence of household solid waste disposal and management in Garissa County. This study examined how project design influence performance of housing and water construction project in Nairobi City County, Kenya.

3. LITERATURE REVIEW

A study carried by Osmani (2012) observed that waste from construction which account for thirty three percent is attributed to factors related to project design. This shows that construction waste can be managed at design phase. Similarly, Osmani (2012) observe that legislation on managing waste has been avoided at design stage without the knowledge that waste is managed by consideration of factors related to project design.

Love (2010) in their study noted that a mistake made in design could result in errors in procurement and construction, thereby leading to rework and subsequent waste generation. It is, therefore, important that construction project lifecycle is evaluated from system perspective in order to develop causal loops and feedback system of such interdependent processes. This could help in understanding impacts of one activity on the others, as well as on the overall project outcome.

Osmani (2013) in their study found that the best approach for tackling waste is through dedicated efforts at the design stage of building delivery process. The study concluded that there is still low acceptance and use of recycled products within the construction industry due to a low commitment from designers who drive materials selection and sustainability practices within the industry. Based on these findings, and in order to understand the procedural approach to designing out waste through dedicated design effort, this study focuses ways to seek to aggregate the design factors capable of influencing waste in construction projects.

Lopez and Love (2012) study which surveyed 139 projects found that the errors in design whether directly or indirectly contributed to 6.38% and 7.36% of the cost of the project respectively. Identification of errors and omitting them can result to project conflicts. The quality of design and assurance, proper communication and inspecting specification of project design after the completed projects are the best practices the result to the success of the project. Yu *et al*. (2010) through their study in Hong Kong on design build projects reveal that existing systems for project development have limitations. Lack of impartial agents and improper timing for raising requirements by key stakeholders are problems with existing systems.

4. RESEARCH METHODOLOGY

This study was carried out through a descriptive survey research design. The target population under study comprised of 95 housing and waster construction projects in Nairobi County. The study involved 3 permanent staff from each construction project. The sample size was 285 respondents. This study used questionnaire as a data collection tool. The study utilized both descriptive and inferential statistics to analyse data.

5. FINDINGS

The study sought to establish the extent to which project design influence the performance of housing and water projects in Nairobi City County, Kenya. The findings are presented in Table 1

Table 1: Project Design and Project Performance

		Specify durable materials to avoid need for early replacement	Specifications are detailed and devoid of under/over ordering	Waste management plan is prepared along with the design	Knowledge and ability to design for standard materials supply	Ability to coordinate dimensions of building elements and components	Awareness of material quantity, quality and durability	**Aggregate Score**
N	Valid	212	212	212	212	212	212	

	Missing	0	0	0	0	0	0	
Mean		3.02	4.11	3.78	3.22	3.11	3.47	**3.45**
Std. Deviation		1.539	.994	1.217	1.525	1.385	1.436	**1.349**

Source: Survey Data (2018)

From the findings, the respondents agreed that project design influences performance of housing and water projects in Nairobi City County, Kenya to a great extent as shown by aggregate score of 3.45 with significance variance of 1.349. The respondents strongly agreed on the statements that specifications are detailed and devoid of under/over ordering and waste management plan is prepared along with the design as expressed by a mean score of 4.11 and 3.78 respectively which and standard deviation of 0.994 and 1.217 respectively. Osmani (2013) in their study found that the best approach for tackling waste is through dedicated efforts at the design stage of building delivery process. .

The respondents also agreed on the statements that awareness of material quantity, quality and durability and knowledge and ability to design for standard materials supply influences performance of housing and water projects to great extent as shown by mean of 3.47 and 3.22 respectively with a respective significance variance of 1.436 and 1.525. These findings are in line with the findings of Love (2010) in their study noted that a mistake made in design could result in errors in procurement and construction, thereby leading to rework and subsequent waste generation.

The respondents also indicated that ability to coordinate dimensions of building elements and components and specify durable materials to avoid need for early replacement influences performance of housing and water projects to a moderate extent as represented by a mean of 3.11 and 3.02 respectively and a significance variance of 1.385 and 1.539. These findings contradicts with the findings of Osmani (2013) who established that the best approach for tackling waste is through dedicated efforts at the design stage of building delivery process. Love (2010) also noted that a mistake made in design could result in errors in procurement and construction, thereby leading to rework and subsequent waste generation.

6. CONCLUSIONS AND RECOMMENDATIONS

The study concludes that project design has a positive and significant effect on the performance of housing and water projects. The project design improves the control of the owner in the whole process of designing and reduces financial risks and a productive attention paid to resources regarding effective cost solutions that focuses on the best project quality and value.

The study recommends that project design is an important influencing factor as to why waste is produced in construction projects. Ensuring design decisions prevents waste from being produced in the first place and also positively improves the recycled content and future recyclability of a project. Waste prevention and reduction in the design phases, project design should focus on reuse and recycling, waste-efficient procurement, materials optimization, off-site construction; and deconstruction and flexibility.

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