MATERIAL MANAGEMENT AND PROJECT PERFORMANCE OF CONSTRUCTION COMPANIES IN NAIROBI CITY COUNTY, KENYA

Josephine N. Sila.
School of Business, Kenyatta University, Kenya

Dr. Joyce Gakobo.
School of Business, Kenyatta University, Kenya

International Academic Journal of Information Sciences and Project Management (IAJISPM) | ISSN 2519-7711

Received: 3rd June 2021

Published: 7th June 2021

Full Length Research

Available Online at: http://iajournals.org/articles/iajispm_v3_i6_368_391.pdf

Citation: Sila, J. N., Gakobo, J. (2021). Material management and project performance of construction companies in Nairobi city county, Kenya. *International Academic Journal of Information Sciences and Project Management, 3*(6), 368-391.

ABSTRACT

Project failure is largely attributed to the poor material management that results into project bottlenecks limiting project success. The failure of project is attributed to poor material management techniques that can result into poor quality materials, damage to material, poor planning, late deliveries and high costs. Therefore, to prevent project failure proper material management is vital. Research shows that construction materials and equipment constitute more than 70 percent of the total construction project costs. Therefore, in a typical construction project the manager is expected to emphasize on the importance of managing the limited material resources so that the project is not affected in the long run. It has been established through research that poor material management contributes to project failure and abandonment of the projects when the budget is exceeded. The objectives of the study were to establish the effect of materials management on construction projects. The aim was to improve productivity of the project, enhance cost efficiency and also to ensure the project is completed in a timely manner. The study is anchored on agency theory, resource dependence theory, network theory and relational exchange theory both emphasizing the importance of effective management of resources to prevent project failure. The study also aimed at identification of the factors that influence the completion of projects with focus on factors such as the planning, storage, transportation, sourcing and purchasing of material and how they affected project completion. The study adopted quantitative research designing focusing on 40 participants obtained from various construction companies in Nairobi City County. Random sampling method was used in the selection of the participants from the Nairobi City County Construction Companies Database. Regression analysis between the four variables; planning, storage, transport and purchasing was carried out using SPSS software. The study concluded that inadequate management of material has resulted to poor level of material management attributes in construction companies. The problem was found to be more severe on smaller companies. The study recommends that a systematic and integrated approach is needed to manage materials and minimize the costs and effects associated with in adequate materials management.

Key words: **Communication, Inventory Cost, Materials Storage, Material Management, Procurement, Project Management, Quality of Materials, Time Management, Waste Management.**

INTRODUCTION

Background of the Study

Material management is an important function in productivity of projects. Material management strategies are scientific techniques concerned with planning, organizing and control of materials from their initial purchase to destination. Boopathi (2016) conducted a

study on material management using real-time residential projects. The author argued that that the cost of a project increases mainly due to inappropriate material management. In this, project planning, scheduling and budgeting were done. Since he had followed a proper scheduling method there was no increase in the cost of the project. The material cost constitutes 50 % of total cost which is normal.

According to Dipak (2014) for inventory management strategies plays a significant role in planning. The research was focused on determining the cost requisite for project arising from poor planning strategies. The mathematical module of ABC Analysis and EOQ gives the significance of material planning and its effects on cost of construction which translates to either a successful completion of projects or failures. This research concluded that with proper planning on the management of materials, the cost of the project will be saved and hence this will be considered a success.

Construction projects are some of the most common activities we encounter, yet it is known as one of the most difficult human endeavors. Each project consists of sophisticated and complex processes which need to be carried out by different individuals of different professions who have the skills and knowledge. All the talent and skills have to be channeled towards a common goal to producing the project whereby time and money will be required. To ensure effective delivery there has to be good controls and management of uncertainty. Therefore, one needs to identify the uncertainty related to the project and come up with the best strategy to deliver to enhance the chances of success for the project. The focus areas include transportation, sourcing and planning.

Statement of the Problem

Construction companies in Nairobi County suffer from several instances of project failure attributed to poor material management. Project delays occur due to transport delays, material damage due to poor storage facilities, poor initial planning and also inadequate purchasing procedures. These challenges are manifested in projects in form of stoppage of work due to material shortages, surplus materials on site, inadequate storage space for materials, uncontrolled wastage of materials, damaged materials on site and wrongful purchase of materials. The ultimate impact is project failure.

Poor material management techniques adopted in project implementation have contributed to the increased number of abandoned projects due to increased project costs and timelines which are unviable in the long run. Most of these incomplete projects in the construction sector pose a great risk to the livelihoods of the society considering some have collapsed resulting into the loss of lives and property. It is also a major financial risk given the investments put into the construction works. The study by Mac-Barango (2017) revealed that poor material handling and mismanagement was part of the reasons for incomplete projects. He delved into store management but he did not focus on the transport management problems which adversely affect the management of materials. It is also important to establish the relationship between storage and and transport processes. Kioko (2014) on the other hand

reported that material mismanagement had impacted negatively on project completion. He discussed cost variation due to damage to material but did not mention challenges arising from storage and purchasing processes.The research focussed on the Kenya construction industry and the findings revealed that poor planning, unreliable transport, poor storage and purchasing procedures as some of the reasons contributing to abandoned projects. These were however dependent on the planning, storage, transportation and purchasing adopted by the organization. The overall effect of poor materials attributes could therefore significantly lead to increased time and cost overruns, and poor quality for the project. At worst, for the contracted projects, it could also lead to protracted legal battles and arbitration due to cost and time overruns, and bad quality of the project.

Objective of the Study

The aim of this research was to investigate material management and its impact on project performance of construction companies in Nairobi City County, Kenya.

LITERATURE REVIEW

Theoretical Review

Agency Theory

Agency theory was introduced by Stephen Ross and Barry Mitnick in 1973 due to a conflict of interest between owners and managers. Agency theory is relevant for the situations wherein one party (the principal) delegates authority in terms of control and decision-making about certain tasks to another party (the agent) (Eisenhardt, 1989). The Agency theory is particularly effective in planning during project implementation as it ensures duties are delegated to responsible people to make decisions affecting the project. It also underlines the dependent variable which is project performance and how it is affected by tasks such as material transport, storage and purchasing.

Agency theory provides a useful framework to analyze relationships and behaviors in supply chains because these chains are replete with the principal-agent. In the flow of materials from the supplier to the construction site, there has to be a clear flow and communication from the point the materials leave the supplier to when they arrive at the project site. This is to ensure that they are received in the right quality, quantity and also at the minimal cost possible. The theory emphasizes on the contribution of planning, storage and transport in the overall project progress.

Also, to ensure once received they are stored properly to avoid damages and with good coding for easy of retrieval which failure to that can lead to time-wasting. The theory is relevant in this study as there has to be a good relationship between the principal-agent and the other party to ensure swift communication and delivery of materials required in the project.

The Resource Dependency Theory

Resource Dependency Theory was created by Jeffrey Pfiffer and Gerald Salancik in 1987. The theory focuses on a set of power relationships based on exchange of resources (Pfeffer & Alison, 1987). It recognizes that companies do not possess all the resources they might require in the process of value creation, hence will often become dependent on each other (Hunt & Morgan, 1996). This theory is particularly effective in transport and storage of materials. Transportation and storage must be done effectively since the material used in the process is very scarce.

The main issue is how organizations manage their power dependence relationships to maintain their functional and operational requirements (Pfeffer & Salancik, 1978). In this regard, RDT assumes that organizations often form coalitions to increase their power and make other organizations dependent on themselves (Heide, 1994). Resource manipulation and control exertion are the strategies offered by RDT to manage uncertainty and dependence in business transactions. The resource dependency theory is relevant to this study as it highlights the key project aspects such as sourcing materials and transport of the materials from the supplier that directly influence project performance. Therefore, every project is dependent on a good material management to yield the required results.

The Network Theory

The network theory was invented by Émile Durkheim and Ferdinand Tönnies in the 1890s. It provides a broader view of inter-organizational interactions in a network environment. It highlights the dynamics of network environments and recognizes the influence of partner to partner relationships on an organization's operations. According to Halldórsson et al. (2007) by emphasizing the notion of strong and weak ties, the theory states that a network resource view assists manager to develop a more realistic assessment of individual node, resources and their implications for business resource accession and coordination are considered key triggers for inter-organizational connectedness, and are advocated to be embraced in today's turbulent business environment (Fayezi, Zutshi & O'Loughlin, 2010). The theory is relevant to the purchasing variable which influences the flow of materials and also ensuring the right materials for the job are ordered and delivered on time.

The Relational Exchange Theory

The relational exchange theory centres on the idea of embeddedness, which suggests that cooperative parties act based on certain norms, as opposed to contractual obligations (Granovetter, 1985). It emphasizes soft control mechanisms to attenuate opportunism. According to Larson, (1992) the theory predicts that trust-based relationships are less prone to partner opportunism. Besides, trusting relationships assist in dedicating resources to developing and maintaining relationships, rather than managing transactional tensions or abnormal behaviors in the supply chain (Joshi & Stump, 1999). The theory is relevant in this study particularly in the accomplishment of project performance by ensuring mutual trust and

also good relations in all concerned parties are maintained for overall project objective accomplishment.

Planning and Performance of Projects

Waters, (2015) observed that the traditional approaches to material management uses planned operations where managers design a detailed schedule for each distinct activity within the chain. By coordinating these schedules, managers control the flow of materials. The problem with the traditional approach is that it is based on a paper system and even when firms move to automation, they often automate same procedures. This has fundamental weaknesses of taking too long, being expensive, relying on paperwork and physically moving paperwork between locations, having many people doing the administration, being unreliable, introducing errors, having more people supervising and controlling administration. These problems can be overcome when firms move to electronic purchasing and hence adopting material management approach.

Dobler and Burt (2016) postulates that material management provides an integrated system approach to the coordination of material activities and the total material costs. They view it as something that advocates assigning to a single operating department all major activities which contribute to the cost of materials. The objective is to optimize performance of material systems, as opposed to sub-optimizing the performance of individual operating units that are part of the material system. Chase et al (2011) contend that the objective of materials management is to ensure that the right item is at the right place, at the right time and at a reasonable cost. The intention of having material management system in place is for solving materials problems from a total company point of view by coordinating performance of the various materials flow. Fearon (2013) suggested that the introduction of computers was a great boost to the adoption of materials management, as materials function has many common databases.

According to Chary (2015) material inventory is kept in operations for three reasons; transactions, precautions and speculation. While speculative inventory cannot be encouraged particularly in developing countries, there is need for transaction or regular inventory due to the lack of perfect synchronization of inflow and outflow of materials and for precautionary or safety inventory to provide cover of any inability to predict demand of material.

Ramakrishma (2015) identified that half of sales income in affirm is spent on materials. Suppose a firm is spending 50% of its volume on material and the profits are say 10% of sales volume. A 2% reduction in materials cost boosts the profits to 11% of sales or the profits increased by 10%. To achieve the increase in profit through sales efforts, a 10% increase in sales volume would be necessary.

Barnes (2013) defined supply network as the set of interconnected relationships between all the parties that supply inputs to, and receive outputs from an operation. The focus is on a holistic approach which means the entire chain from internal to external customers. The

success of any supply network depends on its ability to satisfy the needs of the ultimate customer, the end-user of its products and services. Therefore, the network as a whole need to be designed and managed in a way that enables it to do so effectively a deficiently as possible. It is not just the firm's own operations that need to be managed strategically to meet customer needs but all the elements of the supply chain, individually and collectively. A key facet of the supply network is the nature of relations between purchaser and supplier.

The benefits of material management to the organization were clearly explained by Siddhartha (2014) through his paper. The author also explained that the objectives of the material management to be regular uninterrupted supply of raw materials maintain high inventory turnover, providing economy in purchasing and minimizing waste, transportation, storage, minimize the overall cost of acquisition and to maintain high degree of co-operation and coordination with user departments. He concluded that major benefits of material management were, excessive investment in stock would be avoided, work continuity assured, improved productivity and minimal inventory losses.

A comparative study was made by Jose (2013) in Analysis of inventory Control Techniques. The various analysis studies in this paper were EOQ analysis, ABC analysis and FSN analysis. From the analysis it was found out that there was a difference in the EOQ and the number of units purchased which means EOQ was practice in the company. Also, the company maintained low percentage in fast concluded that with proper management the cost was saved. He added that the following were done by proper management of waste control, right incoming quantity, materials handling, frequent ordering, accurate forecast and reduced lead time.

A literature review on models of inventory management under uncertainty was done Serhill (2015). This paper analyzed probable parameters of existing models of inventory control. An attempt was made to provide an up to date review of literature, concentrating on the characteristics and types of inventory control models that have been developed. The existence of the models shows that fuzzy set theory is one of the apt methods, which make a great progress in inventory management. The prominence in each review was to identify how the fuzzy set theory was used in the formulation of the inventory theory.

Transport and Performance of Projects

Modelling of inventory management in construction operations which involves on-site fabrication of raw materials was made by Young (2015). The research was done to decide an optimal level of material inventories on considering vibrant variations of resources under uncertainty is very critical for the economic efficiency of construction projects. This paper developed a probabilistic optimal inventory management model on the process of on –site fabrication of raw materials such as iron –rebar process. From the research it was concluded that, the amount of inflow and outflow iron-bars at the temporary shop attained a stability by applying the pull system to the phase of raw material inventory management, moreover average inventory quantity were reducing and by eliciting optimal time lags linking to the

start of fabrication/assembly works. It was likely to reduce the holding time of assembled products and inventory management costs could be reduced around a total of 25%.

S curve analysis was done to check the deviations in the progress of the scheduled project. The tracking should be done then and there to find the fault in earlier stage itself. Pande (2015) carried out S curve analysis using MSP software's curve analysis was done to compare the planned and actual material consumption. The deviations curve in the S shade graph produces by the increasing expenditure of certain parameters against time was the representation of the project path. This analysis was carried for comparison of planned and actual cost for material. The author concluded that due to deviation in items the consequences would be on material procurement which affects the project budget.

Many buildings and projects are springing up in various parts of this country. Every contractor is very keen on completing their projects on time as they seek to make more money. While time is a core aspect of project management, most of the contractors lack proper quality inspection procedures to ensure the quality of the material used. Sometimes the material used is weak ending up causing further damage to the projects. These are process that should be undertaken in the sourcing stages to avoid the issues that arise later in project as it progresses. According to Pancharathi (2013), most of the standards and codes used for construction projects are foreign, mainly obtained from Britain, India and China. Unfortunately, the material used in Kenya and in those countries is not the same. This is an indication that the Kenyan authorities have not invested on studying the codes and giving suitable recommendations on suitable ratios to be used in the construction. This results in substandard structures that end up collapsing.

From the professionals' perspective, limited professionals to offer professional guidance on how the material should be well managed when putting up a structure. For instance, most of the contractors use technical personnel with local training in putting up structures and they lack professional skills for credible decision making. Some end up making decisions based on assumptions and not on the existing professional codes. Besides, the lack of suitable equipment has been attributed to poor material management. The workmen lack a means to measure suitable quantities when mixing up various material in construction. This ends up resulting in weak structures which pose a threat to the lives of the users (Danso, 2014).

Ashwini (2016) explains that construction material constitutes a major cost component in any construction project. The total cost of material can comprise about 70% of the total project cost, hence the need for the contractor to consider timely availability of this material for the successful completion of the project. Madhavi (2015) argued that in construction project operation, there is a project cost variance due to the material, equipment, workforce, subcontractor, overhead cost, and general condition. The failure of most projects is associated with mismanagement of material which results into cost overruns. Due to project cost variance, some contractors tend to limit critical material, which ends up affecting the quality of the structure.

Project costs can be controlled by taking corrective actions towards the cost variance. It is often necessary to dedicate important resources like money, personnel and time to monitor and control the process. Gulghane (2016) describes that materials management processes require a transformation to improve the overall in the handling of materials for more efficiency and effectiveness on the construction site. This is because poor handling of construction materials affects the overall performance of construction projects in terms of cost, time, quality, and performance. However, the researchers associated the failure in projects to poor transportation strategies, inadequate storage facilities, which result in damage to some material such as cement, lack of adequate planning strategies and unsuitable sourcing strategies.

Storage and Performance of Projects

During the past years, various academics researchers have conducted studies investigating to find out the issues causing ineffective materials management in construction projects. A research done by Gulghane & Khandve (2015) state that the problematic management of material are due to overstock materials because of improper planning, damaged materials due to logistics ,handling or in application ,loss of materials because of improper supervision, waiting of the materials to arrive in location due to improper tracking system, frequent movement of materials due to improper site layout, inflation, material changes in buying or purchasing situation starting from the prepared cost estimation, bulk construction material, the shortage and changes of construction materials quantity required, material inefficient on site, stealing and loss of construction material, material shipment, work repairing delay in updating or posting, storage system on site, inaccurate estimation of shipment quantity of materials, uneconomical order quantity of materials, poor shipping times, increasing transport cost of materials, material over usage in location of project, choosing the wrong materials for construction, increasing storage cost of materials, the poor buying ability of managers and delay of payment for materials.

In a study conducted by Wanjari and Dobariya (2016), the highest causing cost overrun in Indian construction industry was identified as price escalation of raw materials. In another study done by Cheng (2014) about an exploration into cost influencing factors on construction projects reveled that material shortage or supply delay is prominent project risk that will influence the project cost. Similarly, a study conducted to identify the delay factors in construction projects of Turkey found out that material is significant factor causing delay (Gunduz, 2013). Furthermore, it was explained that problems such as late delivery of materials, poor procurement of construction material and shortage of construction materials are prime factors causing project delay. Unlike storage and transport costs, time delays and quality which are is more subjective, the factors affecting the quality of a project are perceived differently by the contractor, consultant and client. This is because due to individual interest, knowledge and their judgment. Therefore, the study helped justify the significance of improving material management process in construction industry in Kenya to implement more successful project.

From the literature review it is very clear that material management plays a vital role in the construction field. Whether it is a small firm or large firm the material management should be done. Material management holds a part right from purchasing of materials till its utilization. Moreover, the S Curve analysis should be done to check the deviations in the planned process to avoid the delay of the project. In case of delay, EOQ analysis is recommended to complete the project efficiently within stipulated time and cost. This research was used to identify the effect of material management to 5 criteria of project performance (Ezhimathi & Shanmugapriya, 2016). In conclusion the availability and sufficient materials and equipment have effect on time, quality, productivity and performance. Appropriate quality material has effect on time, cost and quality performance. On time and reasonable time of material procurement have effect on time and cost performance. Efficient inventory system and documentation have effect on time and waste performance. Reasonable changes have effect on time performance. On time delivery has effect on time performance. Minimizing procurement cost has effect on cost performance. Appropriate site storage has effect on productivity and waste performance. Efficient site layout has effect on productivity performance. Easy site access has effect on productivity performance. Unconfined working space has effect on productivity performance. Efficient material controlling has effect on waste performance.

Waste management is the activities and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process. There have been many researchers studied on construction waste minimization methods. These methods emphasized on the use of modern technologies in building construction, such as precast concrete, steel form and scaffold and drywall partition panel. Waste prevention strategies including using efficient purchase and ordering materials, using efficient timing and delivery of materials, using efficient material storage, minimizing material losses, maximizing material reuse, preventing undoing and redoing, reducing packaging waste, and using prefabrication, have also been discussed (Othuman & Cheng, 2014).

Previous studies show that serious construction waste generation partly due to lack of management skills, lack of environmental awareness and structural selecting. Normally, construction organizations only focus on the benefits gained from economic return. Environmental management has rarely been considered. Enhancing on site management systems is one of the recommendations to enhance waste minimization. Reuse of construction materials can effectively minimize waste generation in the construction processes. Implementing responsibilities on waste management with clear directions and adequate supervision to each employee, including technical staff and frontline staff is suggested. Furthermore, reward schemes can be encouraged employees in waste minimization, such as proposing some useful methods which help reducing waste generation, and penalize employees with low environmental awareness. Sorting construction wastes should also be implementing for each construction and demolition site. This can improve recycling rates, improve management support, reduce waste generation, improve economy, and benefit to the public (Gulghane & Khandve, 2015).

Purchasing and Performance of Projects

Construction materials take up a significant proportion of the total construction cost. Without careful planning and controlling on the flow of construction materials, it is possible that the cost of materials may increase unnecessarily. One of the most important elements of a project cost management tool is cost estimation, which is the practice of forecasting the price of a complete project with a defined scope. There are several types of cost estimation in project management, including fixed, variable, direct, and indirect cost estimation. Because the project scope, project schedule, or other factors can change, it is important to update price estimates with the help of cost management software so you have an accurate idea of how much the project cost (Dainty, 2004).

Mastermann (2014) classified project procurement systems into several categories based on the relationship and critical interaction between design and construction responsibilities. The categorization of the various procurement systems are as follows: Under this system, the responsibilities of designing and construction of the project are separated and are carried out by different independent organizations namely the designers and contractors. It is sometimes called linear or sequential contracting system or multiple responsibilities contracting approach. It is a system where the project development activities that start from feasibility study, preliminary design, documentation to construction and hand over, are carried out sequentially one after another.

Improving communication with construction organizations can effectively reduce conflicts among parties Tam et al (2003), especially those with several layers of contractors. Most subcontractors argued that they did not voluntary exchange information with other subcontractors. However, this phenomenon sometimes caused unnecessary waste generation. For example, a contractor in a project with frequent variations in design drawings did not communicate with other contractors with the change of dimensions of holes for equipment and dimensions of concrete walls, other contractors have to cut their materials to suit reserved holes or reorder their materials, thus generated some unnecessary waste on site.

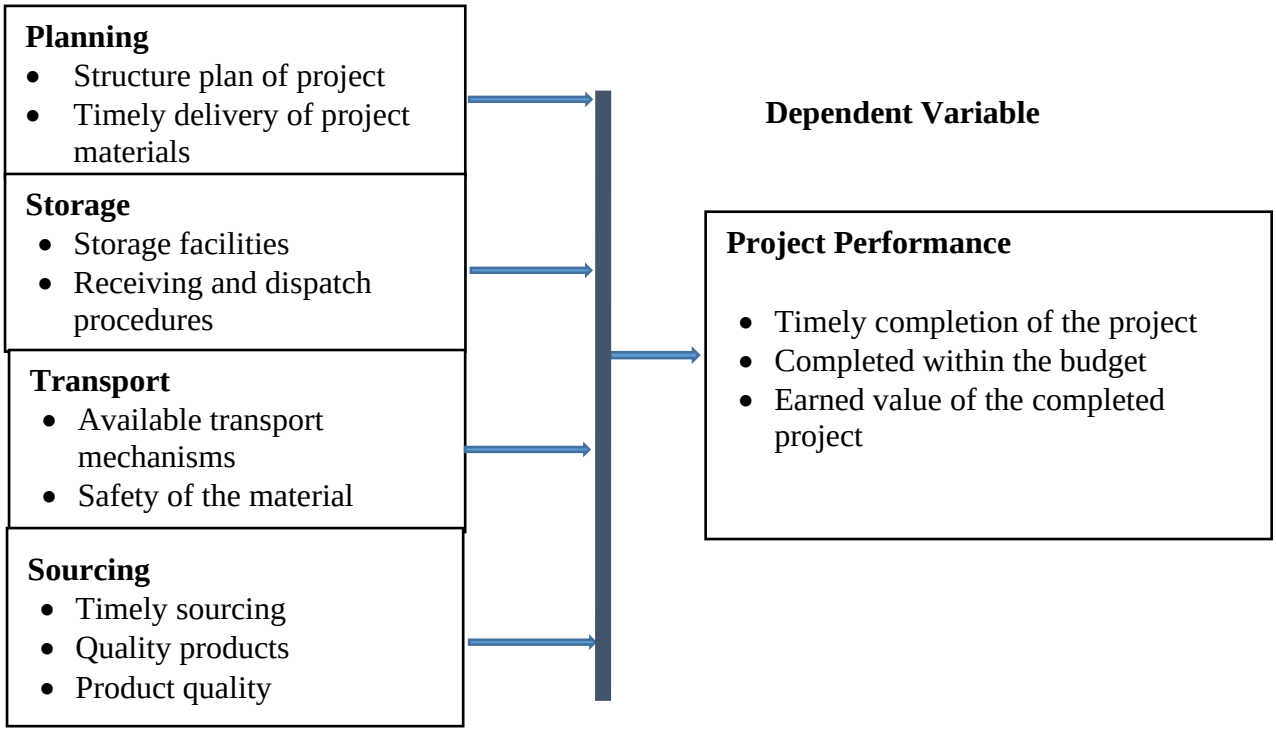
Material storage management focuses on starting material into the built-up site to be recorded, the material layout and stored over a certain period until it is taken out of the storage area to the work site and the process is repeated. The emergences of new technologies that are not integrated and have no efficient management methods as well as inexperienced management negatively affect the storage management of overcrowded sites. There are four categories workflow of material storage management namely planning and arrangement, implementation and handling, control and monitoring and supervision. Planning matters involving the determination of material requirements for carrying out production and other related work processes such as determining the types of materials to be used in construction works, quantities and specifications to carry out construction work. Material managers should play a role in determining the storage locations, layouts and all necessary equipment including coding and cataloguing, material acceptance, material inspection, storage safety, stock records (Agarwal, 2001). Appropriate storage facilities should be provided for the

onsite materials. Also stored materials should be well monitored to detect quantities and avoid theft cases.

Construction quality is a critical factor in determining project acceptance and resultant contractual payment levels. Participants in the construction industry have become notably conscious of the role of quality as an essential means to achieve client satisfaction and gain a competitive advantage. Acceptable quality levels in construction have long been a problem to attain on time and within budget in a highly dynamic, complex, and competitive environment. With inefficient or non-existent quality management procedures, significant expenditures of time, money, and resources are wasted on construction projects (Rounds & Chi, 1985). This lack of quality due to deficient construction quality management is detected through non-conformance to established requirements.

Conceptual Framework

Independent Variables



RESEARCH METHODS AND MATERIAL

Research Design

This study employed the descriptive survey method whereby data on the various subjects was gathered. Since the study was focused on identification of material management strategies adopted in construction projects (Tochim, 2006). The research focussed on planning, transportation, storage and purchasing strategies that contractors use in the management of materials in projects. This design was important and would help to indicate the nature of the

cause-and-effect relationship (Brains, Willnat, Manheim & Rich, 2011). This approach was suitable for this study as it indicates how the independent variable directly affects the dependent variable and explains the patterns of relationships between variables.

Target Population

The target population refers to the complete set of individuals, cases or objects with some common observable characteristics (Mugenda & Mugenda, 2003). The target population for this study was all the 20 construction companies in Nairobi City County as at 31st December 2018. The project managers and engineers from the various companies represented the companies in responding to the questions posed by the questionnaires.

Sampling Design

Sampling techniques provide a range of methods that facilitate to reduce the amount of data needed to be collected considering only data from a sub group rather than all possible cases or elements. In this study the researcher adopted systematic sampling method in the identification of the contractors and consultants.

Validity and Reliability

Validity refers to the extent to which the tool used in conducting the study measures what we actually wish to measure. The content validity was used in examination of whether the content under study represented a sample of the domain under measurement. A rational analysis of the instrument was done by raters familiar with constructs of interest.
The researcher used the most common internal consistency tool known as Cronbach's Alpha. This usually indicates the extent to which a set of items can be treated as measuring from a single latent variable. Items with a reliability value of 0.7 were used in conducting the analysis since a high value indicates a higher reliability of the instrument (Polgar & Thomas, 2009). The findings are indicated in Table 1 below:

Table 1: Validity and Reliability Analysis

Strategies	No. of Items	Cronbach Alpha	Minimum Factor Loading
Planning	4	0.713	0.774
Storage	3	0.714	0.718
Transport	5	0.716	0.849
Sourcing	3	0.719	0.633

From Table 1 above, the values are higher than the recommended value of 0.7 which is an indication that the values are justified and the data used is valid.

In assessing the reliability of the study, the minimum factor loading was used. When data has 4 or more loadings each of 0.6, this data is considered to be reliable. Drawing comparisons from the above table, it is clearly evident the data is reliable since in the four strategies the data achieved a minimum loading of at least 0.6.

Data Collection Procedures

The primary data was collected through a structured questionnaire that was prepared. The questionnaires used both open ended and closed ended questions. The researcher distributed the questionnaires to the various offices of the companies. The respondents self-completed the questionnaires and they were collected within two weeks of delivery. The data was then subjected to analysis as guided by the research objectives. The questionnaire was designed to help extract information from the various respondents regarding the facts of the projects and the reasons for the slippages they may have experienced. In order to determine the validity of the research the researcher consulted with experts to ensure the validity of the data collection procedure.

3.8 Data Analysis and Presentation

The data was analyzed by the use of descriptive statistics. The analysed data was presented in graphs, frequencies, charts and tables for interpretation and to draw conclusions and recommendations thereof. The researcher used mean, pearson constant and standard deviation to aid in the analysis. The reliability of the questionnaire was censured by carefully structuring of the question and confirming the layout.
The researcher conducted a multiple regression analysis to establish the relationship between the variables of the study. The equation of the regression model is indicated below:

$$\hat{Y} = b_0 + b_1X_1 + b_2X_2 + \ldots + b_pX_{p+} \text{ e}$$

Where:

Y=Project Performance
X1=Planning
X2= Storage
X3= Transport
X4= Purchasing
B0= Constant
E= Random error

RESEARCH FINDINGS

Response Rate

The researcher targeted 20 Project Managers and 20 engineers from 20 construction companies. However, out of the 40 questionnaires that were issued to these respondents, 36 of them were duly filled and returned to the researcher. This represented a response rate of 90%. This response was good enough and representative of the population and conformed to Mugenda and Mugenda (2003) stipulation that a response rate of 90% is excellent

Table 2: Response Rate

Response Rate	Frequency	Percentage
Response	36	90%
Non-Response	4	10%
Total	**40**	**100%**

Project Performance

The study sought to establish how material management strategies affect project performance. The findings are indicated in subsequent sections.

Timely Completion of the Project

The respondents were asked whether effective use of material management strategies helps in the timely completion of the project. See Figure 2

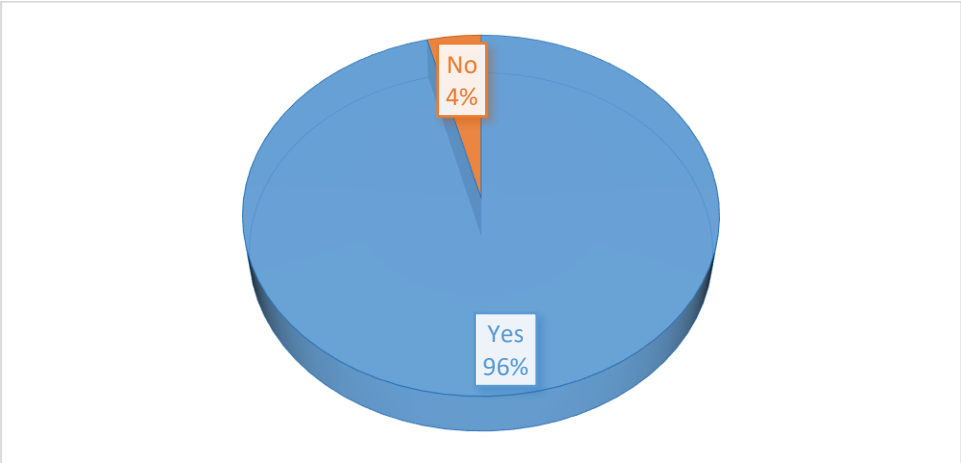


Figure 2 Improvement in Performance

From Figure 2 above, 96% felt that effective allocation and management of material used in construction played a significant role in the completion of the projects. Materials are accessible at the time they are needed hence delays are eliminated allowing for timely delivery. Besides, they are transported safely and stored under suitable conditions where their quality cannot be compromised. On the other hand, 4% of the respondents felt there was no association between timely completion of projects and effective allocation and management of material (Gulghane and Khandve, 2015). However, based on the compact majority represented by 96 percent it can be argued that material allocation is a key player in timely completion of projects.

Project Completion within the Budget

Completion of the project within the budget is highly dependent on efficient material management and the ability to cut costs. The findings were as reported in table 3 below:

Table 3: Project Completion Budget

Project Completion Budget	Mean	Std. Dev
Has efficient material planning strategies contributed to completion of projects within the budget	4.25	0.437
Does material management help in reduction of the total project cost	4.23	1.026
Waste reduction has been achieved through suitable storage and transportation in the management of materials.	4.07	1.12

The findings in the table indicate projection completion within the budget as a result of effective material management strategies.

Planning Strategies

The study sought to establish how planning strategies affect project performance. The findings are indicated in the subsequent sections.

Timely Planning

The study sort to determine whether plans prepared on time on access, transportation and utilization of material resources contributed to timely completion of projects. See Figure 3

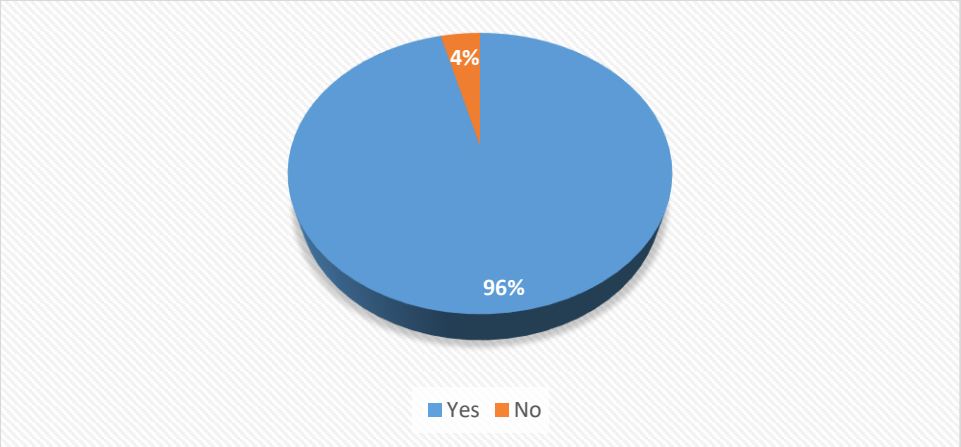


Figure 3: Timely Planning of the Project

From the findings in Figure 3 above, majority of the respondents 96% agreed that preparing plans on the materials to be used in the construction companies play a critical role in the timely completion of the project. According to Kasim and Anumba (2015) proper planning is dependent on identification of objectives and targets that must be achieved within this period. When the plans are strictly adhered to it contributes to the reduction of the delays that result in additional project costs. Therefore, the research findings agree with the findings by Kasim and Anumba (2015) that the timely planning is an important strategy in delivery of projects.

Material Delivery Planning

Several statements that describe how plans on the delivery of project materials affect project performance were carefully identified by the researcher. Respondents were then requested to indicate the extent of their agreement with each of these statements using a scale of 1-5 where 1 strongly disagrees, 2 disagree, 3 neither agree nor disagree, 4 agree and 5 strongly agree. See Table 4

Table 4: Planning on Delivery of Projects raw data

Planning on Delivery of Project Materials	Mean	Std. Dev
Proper planning minimizes delays in project delivery	2.65	0.617
Proper planning ensures timely delivery of material which directly influences project success	3.66	0.472

Material Storage Strategies

The study sought to assess how the material storage strategies contribute to the performance of a project. Storage of construction is dependent on other factors such as storage costs, availability of resources and nature of the material being stored. The findings are presented in the subsequent sections.

Budgeted Cost of Storage

The study sought to examine whether the budgeted cost of storage of construction material affects project performance. See Figure 4

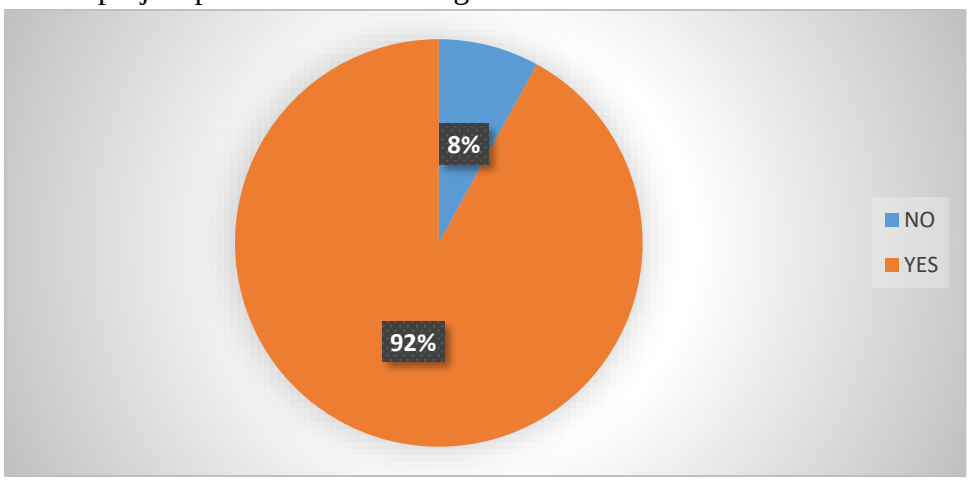


Figure 4: Budgeted Cost of Storage

From the findings from the data collected in the field, it is clearly evident that 92% of the respondents agree that costs associated with the storage of material affected the completion of projects. Only about 8% felt that costs associated with the storage of construction material had no effect on the success of the project. They argued that failure of construction companies was affected by other factors such as quality of the material but not the variation in the costs of storage of material.

Earned Value of the Project

Several statements describing how project costs translate to ensuring the desired value of the project is achieved were carefully identified by the researcher.

Table 5 Earned Value of the Project

	Mean	Std. Dev
Changes in Project Cost	4.05	0.71
Desired value of Storage Costs Impact on Project Cost	3.4	0.663

From the findings in Table 5, it is clearly evident that changes in storage costs and the desired value of the project directly affect the earned value of the project. The ultimate impact is a negative effect on the project.

Transport of Materials

The study sought to investigate how the transportation of materials to site affects final project completion in terms of success or failure.

Transport mechanisms that meet desired Requirement of the Project

The study sought to determine whether the right transport means affects project performance. See Figure 5

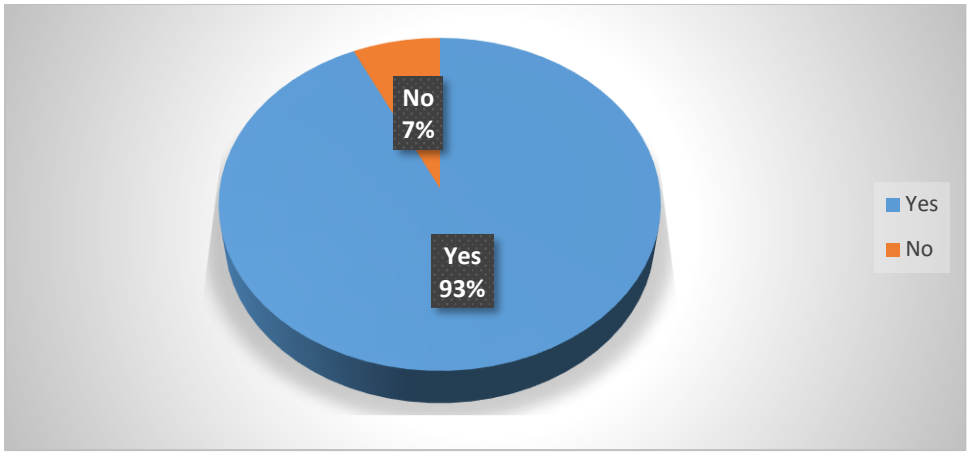


Figure 5: Transport mechanisms that meet desired Requirement of the Project

From the findings in Figure 5 above, the use of the right transport methods in material transportation influences the successful management of the final project. 93% agree transport affects successful completion of the project while 7% argued that the method and quality of material transportation had a minimal impact on the project cost.

Standard of the Project Materials

Different sectors have set specific standards of the materials to be used. Several statements concerning the standards of the project materials were carefully identified by the researcher.

Table 6: Standard of the Project Materials Raw Data

	Mean	Std. Dev
Specified Standard of Project Materials impact on project performance	2.85	0.792
Impact of Lower Transport Standards on Project Success	3.85	0.726

The study revealed that the use of specified transport methods in transporting material standards of project materials affects project performance. In comparison, the standard of the project materials was very important in the success of the project. This was also influenced by the standards of transport which similarly impacted on the quality of the material hence affecting project success.

Sourcing and Purchasing Strategies

The study was established to investigate the relationship between purchasing/sourcing strategies and project performance. The findings are indicated in the subsequent sections.

Timely Sourcing/Purchasing

The study sought to find out whether timely sourcing/purchasing affect the project performance. The findings are indicated in Figure 6.

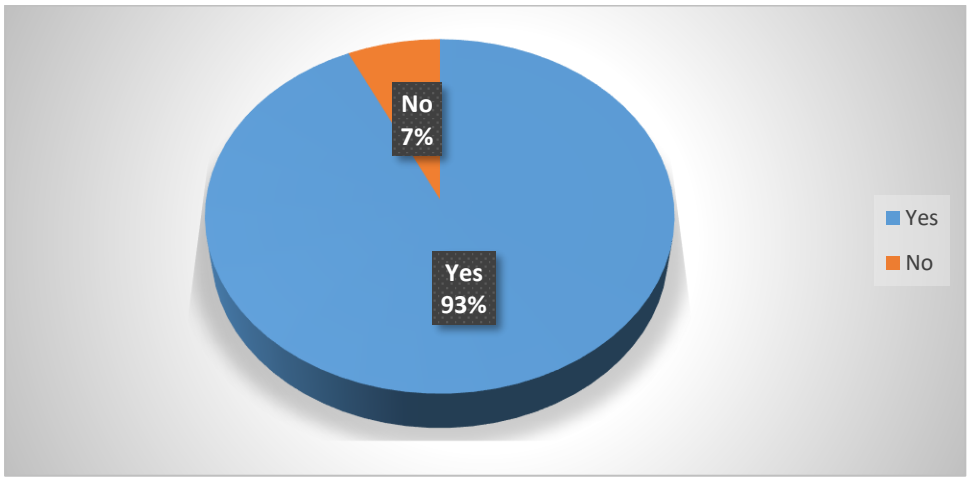


Figure 6 Timely Purchasing and Sourcing of Materials

From the findings in Figure 6 above, the majority of the respondents, 93% agreed that timely sourcing/purchasing affect the project performance. According to Winch (2010), most quality problems arise right from the beginning of the sourcing process which is a very sensitive process. Therefore, there is need for timely planning to avert any new challenges that may arise later after project commences.

Regression Analysis

The researcher conducted multiple regression analyses to establish the relationship between material management strategies and project performance. The findings are indicated in subsequent sections.

Table 7 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1.00	0.877a	0.77	0.766	0.67

The table implies that 76.6% of changes in project performance are explained by the independent variables of the study. There is however, other factor not covered within the model that accounts for the rest of 23.4%. R-value of 0.877, on the other hand, signifies a strong positive correlation between the variables of the study.

Table 8 ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	447.754	4	111.938	246.353	.000b
Residual	134.043	295	0.454		
Total	**581.797**	**299**			

Since the value of F calculated is greater than F critical (246.353 >2.402), this signifies that the overall regression model was significant and therefore a reliable predictor of the study findings. In terms of values, the study indicated 0.000 which is less than 0.05 and therefore statistically significant.

Table 9 Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	4.310	0.893		4.828	0.000
Planning Strategies	1.400	0.058	0.976	24.303	0.000
Storage Strategies	0.048	0.037	0.047	1.293	0.000
Transport Strategies	0.856	0.033	0.929	26.111	0.000

Sourcing /Purchasing	0.270	0.037	0.231	7.380	0.000

The resultant regression equation becomes:
Y=4.310+1.4X1+0.048X2+0.856X3+0.270X4
Where Y is project performance; B1; B2; B3 and B4 represent regression coefficients, and X1, X2, X3, and X4 represent planning, storage, transport and purchasing respectively.

This implies that when all the variables of the study were to be held constant, the performance of construction companies in Kenya would be at 4.310. A unit increase in project planning while other factors held constant would increase project performance by 1.4. A unit improvement in material storage would increase project performance by 0.048. A unit increase in material transport would increase project performance by 0.856 and finally a unit change in purchasing procedures would increase project performance by 0.270. This is an indication of the interdependence of the various variables directly influencing construction project performance. Form the formula, an improvement of a single variable from the formula will positively influence the performance of the other others. Similarly, if one of the factors for such as transport underperforms then that means the impact will be ultimately felt in the entire project resulting in failure. Regression builds on the relationship between planning, storage, transport and purchasing; and it is justifiable to argue that project success in construction companies is dependent on how these projects are aligned.

In view of significance at 0.05 levels, the study documents the significance of each individual variable. For planning, the p-value was 0.000, which is less than 0.5 and therefore time management was significantly affecting the project performance. According to Udo (2012), the magnitude of a successful project depends on proper time management.

With regards to storage, the p-value was 0.00, and there it was statistically significant in affecting project performance. In respect to quality of materials, the p value was 0.000 and therefore significant in affecting project performance.

On transport, the p values were 0.000 and therefore timely and clear communication was significant in affecting project performance.

Okorocha (2017) argued that construction companies are affected and their success in executing their projects is directly influenced by their strategic planning. This has also been justified in the study results which indicate that project performance would improve to 4.3 with proper implementation of planning. The findings also underline the significance of transport and storage in project success. The sentiments have been supported by the findings by Kasim (2016) who revealed that transportation and storage of material determines the success of a project. Poor handling of construction materials affects the overall performance of construction company projects in terms of time, budget (cost), quality and productivity. Therefore effective storage and transport are meant to ensure that losses are avoided, the project is completed on budget and within the required timelines.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Material planning was identified to directly affect project performance. Effective material planning ensured that projects commence on time and that completion was within the budget. Sufficient planning helped ensure the projects were completed on time which helped prevent increase of the budget which mostly affects the project negatively.

Material transport was also identified as a key aspect influencing project completion. Transportation of material must be done effectively such that the materials are not damaged in the process as this may interfere with the quality of the project. Additionally, it was also determined that transport directly affects completion of projects within the specific timelines and budget.

Storage of materials must be done in safe facilities capable of ensuring the quality is maintained and that the materials are safe from external threats. Proper storage is important as it ensures the structural integrity of the material is maintained during project implementation. The storage rooms should be properly reinforced to avoid theft of the material which can result into additional losses to the project which may end up inflating the costs of implementation and delaying the project further.

Purchasing is a critical process that involves the identification the right material, right supplier and right price for material. The right purchasing procedures ensures the purchase of high quality material, purchase of the material on time and purchase at the right cost. Construction companies should be keen on this strategy by ensuring adherence to these principles to enhance project performance.

The study concludes that proper planning, storage, transport and purchasing procedures alongside qualified personnel contributed directly to enhanced project management. This is lacking in many formal companies despite the significant role they play in effective material management.

Recommendations

From the findings most of the companies lack adequate planning of the material with only a small percentage adopting an integrated management plan. A systematic and integrated approach is therefore needed to manage materials and minimize the costs associated with poor materials management. All materials management functions should be well integrated and not performed in isolation since they are interrelated and their performance affects each other. This should be implemented by the project managers to minimize on overhead costs and risk of project failure.

Transport and storage was found to be a major concern in most construction companies. Most of them preferred ordering goods in the last minute such that the material could be used up

almost immediately for construction processes. Project managers should ensure minimized delays in construction works by arranging for effective transport means on time. Construction companies should also invest more on storage spaces through containers where the material can be kept safely and this will cut costs incurred in material damage.

The study also established that despite the advancement and widespread use of computer software globally in material storage management, the same is not used in most of the construction companies. On the formal sites only charts and tables with none of them were using computer software. The study recommends enhanced use of computers in management of materials since they can easily be used in the planning and monitoring of materials management. This can be done by engineers and project managers in charge of the various projects. Codification of the materials should also be encouraged to make use of computers effective. This will help ensure effective handling of materials and projects in line with the existing standards.

REFERENCES

Agarwal, A. (2001). Benchmarking wastage control of Construction materials. *NICMAR journal of Construction Management, 16*(1).

Charoenngam, C., Ogunlana, S. O., Ning-Fu, K., & Dey, P. K. (2004). Re-engineering construction communication in distance management framework. *Business process management Journal*, *10*(6), 645-672.

Dainty, A. R., & Brooke, R. J. (2004). Towards improved construction waste minimisation: a need for improved supply chain integration?. *Structural Survey*, *22*(1), 20-29.

Danso, H. (2014). Poor Workmanship and Lack of Plant/Equipment Problems in the Construction Industry in Kumasi, Ghana. *2*(3).

Ezhimathi, P., & Shanmugapriya, D. (2016). Study on Material Management - An Art of Review. *International Research Journal of Engineering and Technology (IRJET), 3*(11).

Gulghane , A. A., & Khandve, P. V. (2015). Management for Construction Materials and Control of Construction Waste in Construction Industry: A Review. *Journal of Engineering Research and Applications*, *5*(4), 59-64.

Kioko, J. M. (2014). Causes of building failures in Africa: A case study on collapsing structures in Kenya. *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), 11*(3).

Mac-Barango, D. (2017). Construction Project Abandonment: An Appraisal of Causes, Effects and Remedies. *World Journal of Innovation and Modern Technology, 1*(1).

Othuman, M., & Cheng, K. J. (2014). Construction Waste Material Management and Logistic System. *ANUL XXI, NR.*

Pancharathi, P. K. (2013). Concrete technology class-notes on major causes of building failure through various case studies on durability of concrete structure.

Sambasivan, M., & Soon, Y. W. (2007). Causes and effects of delays in Malaysian construction industry. *International Journal of project management*, *25*(5), 517-526.

Shakantu, W., Muya, M., Tookey, J., & Bowen, P. (2008). Flow modelling of construction site materials and waste logistics: A case study from Cape Town, South Africa. *Engineering, Construction and Architectural Management*, *15*(5), 423-439.

Wang, J. Y., Kang, X. P., & Wing-Yan Tam, V. (2008). An investigation of construction wastes: an empirical study in Shenzhen. *Journal of Engineering, Design and Technology*, *6*(3), 227-236.

Winch, G. M. (2010). *Managing construction projects*. John Wiley & Sons. Projects in China. *International Journal of Project Management*, *25*(6), 601-614.

Yeheyis, M., Hewage, K., Alam, M. S., Eskicioglu, C., & Sadiq, R. (2013). An overview of construction and demolition waste management in Canada: a lifecycle analysis approach to sustainability. *Clean Technologies and Environmental Policy*, *15*(1), 81-91.

Yuan, H., & Shen, L. (2011). Trend of the research on construction and demolition waste management. *Waste management*, *31*(4), 670-679.

Zou, P. X., Zhang, G., & Wang, J. (2007). Understanding the key risks in construction