



The Impact of Material Management on Construction Project Delivery in Somalia

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Abstract: Materials management practice is a procedure that coordinates planning, requirement assessment, sourcing, purchasing, transporting, materials storing and controlling, wastage minimisation and cost reduction for profit optimization. Material management have been a great problem to most firms in the construction industry due to a tendency of mismanagement of materials. The scale of activities concerning materials management increases as the size of the contract increase. This study centered on the impact of materials management practices in the Somalia construction project delivery. The objectives of this study are to investigate the current practice of material management at construction projects, to identify the causes of ineffective material management, and to examine the impact of material management process to the construction project delivery. A questionnaire survey was conducted to collect data from Grade A contractor company in Mogadishu, Somalia and the respondent consist of project managers, civil engineers, architect and site managers. The findings revealed that current practice of material management in construction projects in Somalia include identifying the needed materials, consideration of site layout and location, material available close to site, material conform with specifications and material supplied on-time. The study also found that most common root causes of ineffective material management were undefined scope, incomplete drawings, inadequate information on material supply, poor scheduling of material on site, no determination of what and when the material needed and lack in determining the quantity of material needed. Furthermore, the respondents of this research indicated that the occurrence of cost overrun and delay in progress of the work are the major impacts of ineffective material management that bring negative impact to the construction project delivery in Somalia. The research concludes that effective material management practice can improve the overall handling of material and smooth project delivery on site. A proper planning of material management practice right from the start of the project execution should be practiced on site in order to ensure timely execution of the project and standard of the work delivery within reasonable cost, time and quality.

Keywords: Construction project, materials management, impact, project delivery, Somalia

1. Introduction

The construction sector holds a critical part in the development of the country's infrastructure. However, one of the major issues confronting is the waste of construction materials. Construction activities produce more waste material compared to other industries. All materials used during construction activities are wasted, which greatly raises or accelerates the cost of the project, decreases the profitability of the contractor and has a negative effect on the

environment. Material management is a method for the construction industry to organise, execute, and control field and office activities (Thakur, 2017). Construction projects delivery issues appear in many different forms. Many construction projects have failed due to inadequate material management, while others have failed due to cost overruns and failures in other performance indicators. This situation happened due to numerous evidentiary reasons, such as client obstacles, non-availability of materials, road closures, amendment of the design and drawing, additional works, decision waiting, handing over, variation order, amendments in the Bill of Quantities and delay in receiving drawings, the majority of these projects end up in poor project delivery (AECOM, 2012).

According to Ahmadian et al., (2014), construction contractors are engaged in the supply of construction material where statistics have shown that more than 65% of a construction project budget is spent on the procurement of construction material. The objective of materials control is to keep construction materials to be delivered on site at their point of use when required. The Material Management System aims to ensure that the appropriate quality and quantity of materials are properly selected, purchased, delivered and processed on-site in a quick and efficient manner and at a reasonable cost. Material management is a framework for planning and controlling all necessary efforts to ensure the right quality and quantity of materials are properly specified in a timely manner, are acquired at a reasonable cost and, most crucially, are available at the time use and where needed (Chetna M. Vyas, 2011). As a result, materials management is an important aspect of construction project management. Because materials are such a large part of the construction budget, lowering procurement prices increases the chances of lowering overall project expenses. Therefore, due to the involvement of various elements of the project, the management of materials in complex construction projects needs an adequate consideration (Kasim, 2008).

Materials resource management has been the backbone of every construction project. According to studies, material accounts for 60 % to 70 % of the total project cost, with 5 % to 27 % of the total material purchased going to waste (Agyekum, 2012). The wastes generated are mostly materials and products. The wastage may be due to a lack of improper planning by the contractor. At the earlier stage of the construction period, this will not be noticed or realised. The impact is felt when coming to the final or later stages of the construction period. Effective minimisation of material waste will contribute in the increment of the profit margin of the contractor (Luangcharoenrat et al., 2019).

The occurrence of this situation had made most of the projects abandoned at the final stages with the complaint of lack of capital. However, even if the materials are purchased, the mode of delivering, handling and storage turn to be a problem. Materials are most at times overestimated and bought, this will lead to a problem for storing and proper keeping. They are placed in the yard at the chosen location any how without any surface preparation on the floor and always get contaminated with foreign materials. Most completed projects have heaps of sand, chipping, quarry dust, rusted steel rods, and rotten timber, broken down vehicles left at the site. The contractor ignores these materials at the site with the idea of using them on another project. But the question is what about if no project is not taken in the next 5 - 10 years? what will happen to those abandoned materials? Most project management still doubts whether construction planning is possible to overcome these issues (Gascueña et al., 2011). Therefore, appropriate material management is essential in the construction project at the pre-construction, construction stage and post-construction stage, since most of the materials go waste and hence an attempt to develop an adequate means of storage of materials at the site. Hence, the objectives of this study are to identify the current material management practice, to identify the cause of ineffective material management and to study the impact of the material management process on construction project delivery to overcome the problems that occur in the management of materials. The scope of this study involved personnel namely project managers, civil engineers and site managers in grade a contractor in Somalia. Moreover, it also focuses specifically on construction projects such as residential and non-residential. Particular attention is paid to construction projects in Mogadishu, the capital of Somalia, as most construction projects are located in the urban segment as they recover from the prolonged civil war. Mogadishu and large part of the southern part of Somalia has been affected by the battle between the forces of the Federal government of Somalia and the Islamist group of al-Shabaab. This has resulted to the city severe damage and since the government has defeated those groups, the residents of the city have started reconstructing their houses. In the last ten years many mega projects have been reconstructed such the airports, ports and many residential buildings including hotels and houses.

2. Literature Review

2.1 Materials Management in Construction Projects

Material management is a construction process that involves planning, executing, and controlling field and office activities. Material management's purpose is to ensure that construction materials are available when they are needed. Material management is a method for planning and controlling all of the efforts required to ensure that the correct quality and quantity of materials are specified in a timely manner, procured at a reasonable cost, and, most importantly, available when required (Patel & Vyas, 2016). Study by the Construction Industry Institute (CII) have shown that materials and installed equipment can make up 50- 60% of the total project cost and impact 80% of its schedule (Caldas et al., 2014). Therefore, there is a need for efficient materials management to control cost and productivity delivery of construction projects.

2.2 Materials Management Process

Material management comprises a series of processes that need to be well integrated, organised and managed to ensure material is accessible when required. The material management process begins with material request from site, then the information was passed to the storage department, request of resource in the store, and creation of indent. The supplier normally selected for the least value and the best materials are obtained in-store and inspection is performed (Patil & Pataskar, 2013).

2.2.1 Planning

Construction material preparation is the initial step that must be performed precisely to guide all subsequent activities. According to Gulghane & Khandve (2015), Quantification, ordering, and scheduling are all aspects of material planning. The cycle of materials preparation includes records system maintenance and establishes the target rates and pace of delivery. Materials are requested only after approval has been received (Low & Ong, 2014). A comprehensive review of the various materials is necessary to ensure the final product's quality and endurance. An effective construction plan is a basis for the development of the budget and the work schedule. Developing a construction plan is a crucial step for construction projects, even when it is not clearly stated or otherwise formally recorded.

2.2.2 Stock and Waste Control

Wastage of material is a major aspect of inefficient construction cost. According to Calkin (2009), in Dutch construction industry, wastage of material was 9% by weight and 20-30% of the 18 materials purchased in the Brazilian construction sector. Wastage of material in construction project was produced from several sources, namely due to ineffective design, procurement, storing and implementation, and so on. Therefore, construction material waste can be reduced through careful consideration of the need for minimisation and better usage of construction materials during both the design and construction phases. According to Patel & Vgas (2016), the material strategic plans have been illustrated in 8 major areas including planning, benchmarking, purchasing, receiving, inspection, storage, issuing materials and inventory control. Other factors that influence material management procedures are such as culture, work environment, ideology and so on. In addition, different groups have found a way to deal with uncertainty in different ways since they normally confronted with vastly different risk and uncertainty (Patel & Vgas, 2016).

2.2.3 Procurement

Procurement is a critical first step in material delivery process which involve contractors appointment and contract documents preparation. Procurement as it is now conducted does not meet market requirements. A variety of alternative models have been practiced across the industry since there is a pressing need to improve the present construction procurement model. Furthermore, to successfully deliver a project, it is not a question of adopting a procurement system with the best framework to solve all problems, but of implementing an approach that has the best-fitting strategies that get the job done most efficiently and productively (Gascueña et al, 2011).

2.2.4 Handling

Handling of materials is the flow of elements that provides for their movement and placement. The importance of appropriate handling of materials is highlighted by the fact that they are expensive and involves important decisions. Proper protection during storage is frequently neglected, resulting in poor material quality or degradation of the material. Therefore, it is also recommended that the storage loading and unloading of material should not be carried out in the rain. It is also advised that the storage area should be closed, clean and dry with good air circulation and should be stacked on pallets for certain materials, not more than a certain safe height to prevent dampness and so on (Keith, B et al.,2016). Material handling equipment selection is critical because it may enhance the manufacturing process, improve worker utilisation, increase productivity, and increase system flexibility. In order to improve the production process, provide effective manpower utilisation, raise productivity, and improve the system, materials handling equipment selection is a key function in the design of a material handling system.

2.2.5 Logistics

Logistics is described as a system that encompasses movement which may include planning for implementing and controlling the movement and storage of all goods from raw materials to finished products to fulfil customer needs and expectations (Low et al., 2014). Storage must be carefully allotted for material handling equipment, access roads, warehouses, workshops, and layout materials at the construction site in order to manage materials efficiently (Pellicer, et al., 2013). The logistics concept in construction projects is primarily concerned with improving coordination and communication among project participants during the design and construction phases, especially in the materials flow control process. For efficient material management, the best possible predictions for material movement, as well as

planning for access and routing of goods at construction sites, must be included during the logistics phase. (Mahdjoubi & Yang, 2001).

2.3 The Importance of Materials Management

Problems related to managing the flow of materials can be identified in every organisation. The competent management of materials plays a key role in the successful completion of a project. Organizing material is a critical and essential subject for every company, and it must be handled well to ensure a project's success. Consequences of material departures are deviations in time, deviations in quality, deviations in quantity, and deviations in product (Eshofonie, 2008). Materials are vital to the procedures of every industry, since the unavailability of materials can hinder production. Material unavailability is not the only stage that can cause problems. Excessive quantities of materials could also pose serious problems for managers. Material storage may increase the cost of production and the overall cost of any project. According to Petra Turnbull, material is fundamental expenditure in construction industry so the ability of contractor to manage flow of supplies and his team will have an impact on productivity of the project at all since effective and efficient material management will reduce the production of hazardous waste and the cost of disposal. The total cost of construction consists of the following costs: materials, labors, equipment's, site expenses, head office and profits (Calkins, M., 2009).

2.4 Causes of Ineffective Material Management of The Construction Industry

Construction material management covers a large part of the construction project management since material covers around 60% of the project cost and the building construction need many different types of materials. This wide area of management faces different problems. Some of the most common challenges of construction material management described as follows:

Kasim (2008) pointed out that problems might arise as a result of human mistake, particularly because some construction companies still employ manual material management systems that rely on paper-based methodologies. She also claims that the problematic usage of paper-based reports for communicating information with the supply chain on materials components might lead to misunderstanding and poor coordination.

In another research done by Gulghane & Khand (2015), a few problem and its cause were identified namely (i) overstock of materials due to improper planning, (ii) damaged of materials due to improper logistics, handling or in its application, (iii) loss of materials due to improper supervision, (iv) long wait for materials arrived due to improper tracking system, (v) frequent movement of materials due to improper site layout, and (vi) material changes in buying or purchasing situation starting from the prepared cost estimation.

Patel and Vyas (2011) took an unusual method to identifying issues in the material management process in their study. They utilised three projects from Hyderabad, India, to uncover material management issues. Initially, they divided the material management process into 4 main phases, which are material identification, vendor selection, procurement of material and material handling during construction phase (Phu et al., 2014).

2.5 Impacts of Materials Management process on Construction Projects Delivery

The successful execution of a project relies heavily on effective materials management. The impact of effective materials management practices on construction projects includes:

2.5.1 Environmental Impact

This includes the conservation of natural resources, the reduction of energy consumption, the conservation of landfill sites and the reduction of environmental impacts over the life cycle by reducing demand for virgin products (Van Ewijk, & Stegemann, 2016).

2.5.2 Economic Impact

This includes lower disposal costs and possibly lower transportation costs, resulting in lower overall project costs; lower purchase costs because non-virgin materials are often less expensive than virgin resources; make contractors more competitive with their bids at lower costs; and create opportunities for employment and economic reuse and recycling industries (Beamon, 2008).

2.5.3 Performance Impact

This includes recovery of recycled or recycled materials that can perform as well as or better than virgin products in many applications, reduction of overall material costs, better handling of materials, reduction of duplicate orders, on-site materials where needed and in the quantity required, improvement of labor productivity, improvement of project schedules, Quality control, improved field material control, better relations with suppliers, reduced material surpluses,

reduced material storage on site, labor savings, stock reduction, savings on purchases and improved cash flow management (Jensen, 2014).

Other benefits of materials management practises for the construction industry include: lower material costs, increased productivity, on-time or on-budget construction, purchasing savings, adequate material storage on site, improved project schedule, and efficient site design to assist in the identification of materials on site. Material hoists installed on site to assist in material transportation, effective relationships with suppliers, effective material handling, on-site material control, quality work, decreased material waste, and enhanced cash flow management (Albert, 2014).

3. Research Methodology

Research methodology is defined as the method that used to get, for collection and to analysis data and then founded investigation and the result is carried out (Lewis, 2015). This research was quantitative in nature. A questionnaire was distributed among the construction contractors that are registered with the Ministry of Public Work & Reconstruction under Grade A in Mogadishu, Somalia. In this study, the unit of analysis is construction personnel namely project manager, civil engineer, site manager and others. The data was collected and then analysed using SPSS version 22.0 to conduct the tests required for the achievement of the research objectives. The descriptive analysis was used to present the background details of the respondents, the mean and standard deviation analysis. A pilot study was undertaken to test the questionnaire's validity, to ensure that the questions involved are sufficient to fulfil the objectives of the study, and to add or improve on the content, organisation, simplicity, and grammatical mistakes of the questions. The pilot test is a small study done before the real distribution of the questionnaire (Janghorban, 2014). In this case, the pilot study was conducted among the construction personnel whose involves in Grade A contractor in Mogadishu. In this research, random sampling was utilised. This type of sampling is very good in making sure that a large number of populations are represented. The population of this study is defined as the contractors registered under Grade A and the number of registered contractors in Mogadishu is 127 according to the Ministry of Public Works & Reconstruction in Somalia. Thus, the sample size for the population of 127 are 70 respondents (Krejcie and Morgan, 1970).

4. Result and Discussions

The pilot study was performed by the researcher for enhancing the structure and consistency of the survey and receives any inquiries. A pilot test is a test that is done to find out whether the questionnaire operates properly before the study can be continued. This test must be conducted with a minimum 5 or 10 individuals, which are having the similar to those who will be in the research (Blumberg et al., 2014). The result of this pilot test showed that there is no difficulty of understanding the questionnaire by the respondent, and positively improved of questionnaire quality in term of content, language and design. The questionnaires were distributed online and 40 responses were received. All questionnaires were considered as they show that the respondent answered properly. Thus, the total number of questionnaires that were analyzed is 40, which represents a 57% return rate. According to Fellows (2003), the normal expected useable response rate ranges from 25% to 35%. Therefore, the total response received has considered sufficient for the purpose of this research. The data and response rate is summarised in Table 1.

Table 1 - Response rate

Population	Sample Size	Questionnaire Returned	Questionnaire Not Returned	Return Rate
127	70	40	30	57%

4.2 Reliability Test

The objective of reliability measurement is to test if the data in the questionnaire is reliable or not so that an accurate result can be generated. As a result, Cronbach's Coefficient Alpha is used in this study to determine the research's reliability.

Table 2 - Cronbach's alpha coefficient (Zikmund et al., 2010)

Alpha Coefficient range, α	Level of Reliability
0.80 to 0.95	Very Good Reliability
0.70 to 0.80	Good Reliability
0.60 to 0.70	Fair Reliability

Table 3 - Reliability test result

Cronbach's Alpha	N of Items
0.883	81

As shown in Table 3, 81 questions of the questionnaire items have been included to test the reliability of the variables. According to Table 2, the value of alpha below 0.6 is considered poor. Alpha coefficient value from 0.6 to 0.7 is considered fair. Furthermore, if alpha coefficient from 0.7 to 0.8, the reliability is good and very good reliability is shown if an alpha coefficient between 0.8 and 0.95. According to Table 3, the Cronbach's Alpha coefficient of reliability of the study has a value of 0.883, which is considered very good reliability.

4.3 Respondent's Background

Table 4 shows the majority of the respondents are project manager with 18 respondents. It made up 45% of the total respondents. Civil engineer takes 35% percentage with 14 respondents. Next is construction site manager with 5 respondents representing 12.5% of respondents, and lastly, other position namely architect has the lowest number of 3 respondents with percentage of 7.5%. Secondly, the qualifications of the respondents were divided into five categories. Based on the collected data, the majority of the respondents have Bachelor's degrees. Their number was 18 respondents which account for 45% of the overall number of the respondents. This was followed by those who have master's degrees with 14 respondents and account for 35%. The number of respondents who have PhD degrees was only 3 respondents which accounts 7.5%. Diploma holders were 5 respondents which are only 12.5%. Thirdly, the questionnaire has also asked about the experience of the respondents. Based on the collected data, most respondents have experience of 6 to 10 years in the construction industry. Their number is 21 respondents and their percentage is 52.5%. The second category as those who have experience of below 5 years working in the construction industry with a number of 13 respondents, and their percentage accounts for 32.5%. Finally, the number of respondents who have experience of 11 to 15 years and above were 6 respondents and their percentage was 15%.

In addition, the respondents were asked about the type of projects conducted by the firm. Based on the collected data, the majority of the respondents are from companies that conduct construction projects in the private construction sector with 24 respondents representing 60% of overall respondents. This was followed by the government only whose number was 12 respondents representing 30%. Meanwhile, the number of respondents who undertaken a project in both government and private sector was 4 which is 10% of the overall respondents.

Table 4 - Summary of respondent demographics

		Frequency	Percentage
Work Position	Project Manger	18	45
	Construction Site Manager	5	12.5
	Civil Engineer	14	35
	Others (Architect)	3	7.5
	Total	40	100%
Academic Qualification	PhD 3	3	7.5
	Master Degree 14	14	35
	Bachelor Degree 18	18	45
	Diploma 5	5	12.5
	Others	0	0
Total	40	100%	
Years of Experience	0-5 years	13	32.5
	6-10 years	21	52.5
	11-15 years	6	15
	Total	40	100%
Types of Projects Are Under Taken by The Firm	Government	12	30
	Private	24	60
	Both government and Private	4	10
	Total	40	100%

4.4 Current Practice of Material Management at The Construction Projects in Somalia

Based on Table 7, the highest ranking of the current practice of material in construction projects in Somalia is identifying material needed on the site which indicates the importance of material identification with the mean score value of 4.64. Based on the average mean index, the mean score value lies in the range of $4.0 \leq \text{Average Index} < 5.0$, which is under strongly agree category. That means most of the respondents are sure that it is to identify the material needed at the site before the construction phase starts.

The second rank in the current practice of material management of construction projects in Somalia are site layout and location to be considered in the supply of material and availability of material close on the site with the equal mean score value which is 4.62, with only 0.02 differences with the first rank of identification of material needed. This indicates that the importance of accessibility of the construction material to the site when it is required. The third ranking of the current practice of material management in construction in Somalia is that material supply should be in conformance with specifications with an average mean score of 4.57 which followed the second rank with 0.05 differences. This shows that it's one of the factors that cause poor logistics among the current practice of material management in construction projects in Somalia. The fourth rank of the current practice of material management in construction projects in Somalia is supply material management on time with a score of mean 4.45, which followed the third rank with only 0.12 differences. The fifth current practice of material management in the construction projects in Somalia is accurate plan cost of construction material management system with an average score of mean 4.40, which followed the fourth rank with only 0.05 differences.

For all the remaining ranking which are ordering estimated material in bulk, storage of material should be free from harsh weather, ordering estimated quantities base on the degree of the work, effective communication between parties in storage of materials, verifying the material supplied in the conformance with estimation, proper handling material on site have slightly difference in the mean score value. However, the average means score value for all the ranking has scored mean value of 4.032 and lies in the range between 4 to 5 Average Index's, which is under agree and strongly agree categories (refer Table 5). The finding of this section and this objective is the respondent's response that these factors cause poor material management and inappropriate handling among the current practice of materials management in construction projects in Somalia.

Table 5 - Average mean index scale (Likert, 1932)

Average Index	Rank
$1.0 \leq \text{Average Index} < 1.50$	Strongly Disagree
$1.50 \leq \text{Average Index} < 2.50$	Disagree
$2.50 \leq \text{Average Index} < 3.50$	Neither Agree nor Disagree
$3.50 \leq \text{Average Index} < 4.50$	Agree
$4.50 \leq \text{Average Index} < 5.00$	Strongly Agree

Table 6 - Current practice of material management in construction projects

No	Questions	Mean	Rank in the group	Overall Rank
Planning of Material Management				
B1	Identifying the material needed	4.64	1	1
B2	Plan accurate cost of construction material management system.	4.40	2	6
B3	Plan appropriate material management in construction industry.	4.36	3	8
B4	Generating preliminary material order	4.14	4	11
Procurement of Material Management				
B5	Material supply should be in conformance with specifications	4.57	1	4
B6	Requesting material directly by site person.	4.26	2	9
B7	Purchasing material from previous supplier	4.19	3	10
B8	Ordering estimated material in bulk	3.62	4	16
Logistics of Material Management				
B9	Ordering estimated quantities base on the degree of the work.	3.81	1	15
B10	Verifying the material supplied in the conformance with estimation.	3.24	3	20

B11	Selecting the winner supplier base on lower price	3.45	2	18
Handling of Material Management				
B12	Site layout and location to be considered in the supply of material.	4.62	1	2
B13	Availability of material close on the site.	4.62	2	3
B14	Supply material management on time.	4.45	3	5
B15	Material should not be wasted on site.	4.36	4	7
Storage of Material Management				
B16	Storage of material should be free from harsh weather.	3.52	1	17
B17	Effective communication between parties in storage of materials.	3.31	2	19
B18	Proper handling material on site.	3.19	3	21
Stock and Waste control of material management				
B19	Reporting problems (e.g. shortage of material delivery, material breakage).	4.10	1	12
B20	Requesting quotes from several suppliers in order to obtain a reasonable price.	3.98	2	13
B21	Recording material variations through market survey.	3.85	3	14
Average Mean		4.032		

4.5 Discussions on Current Material Management at Construction Projects in Somalia

The first objective is to identify the current practice of material management at construction project in Somalia. Among all the questions have been asked in this section, it is obvious that the average mean of all answers is 4.032, which is located under the “Agree” category of mean which led us to the following findings:

The findings related to the current practice of material management at Construction Project in Somalia on the planning of material management was positive from respondents where most of them agreed that the importance of identification of the material right from the execution of the project. Regarding to planning of material management the second highest is that planning the accurate cost of the construction material management system. This finding supporting a previous research by (Gulghane al al., 2015) which indicated important parts of the overall material management process especially the planning process which are the task of identification and determination of required materials, set up and maintain the materials records. The finding supporting another previous research by Gulghane & Khandve (2015) which he presented the material planning process which includes quantification, ordering and scheduling of material. Furthermore, the finding regarding to the Procurement of material management was also positively were most of respondents responded to the importance of procurement and how it is an essential point of delivering the project. Procurement of material management includes the supplying material should be in conformance with the specification, request of material direct by the site person and purchasing of material from previous supplier. This finding is consistent with Morris & Pinto (2007) where the process of procurement and how effective procurement can significantly enhance the competitive advance of the project.

Moreover, the finding related to storage, stock and waste control material management, as well as previous process of material management were also positive. Most respondents agreed proper storage of material management includes storage should be free from harsh weather, effective communication between parties in storage of materials and proper handling material on site. While the respondents agreed the importance of the waste control of material which are reporting problems (e.g, shortage of material delivery, material breakage), Requesting quotes from several suppliers in order to obtain a reasonable price and recording material variations through a market survey. This finding is in line with Calkins (2009) which indicated the material waste as major cost aspect of construction where he compared the Dutch and Brazil construction industry. Almost 30 of material purchased has been wasted and material waste is coming from several sources such as design, procurement, storing and implementation. Finally, there are many researches support the improvement of material management at construction projects in Somalia.

4.6 Causes of Ineffective Material Management at Construction Projects in Somalia

The second objective of this research to study the factors of in ineffective material management in the construction projects in Somalia. The result of the data analysis was tabulated in Table 7 with the ranking of the causes of ineffective material management at Construction Project in Somalia from base on the questionnaire sections. The highest ranking has the mean of 4.59, while the lowest ranking is 3.78 with 0.81 differences in mean score value. This ranking provides

an indication of the causes of ineffective material management at Construction Project in Somalia, which faced during constructing the projects.

Based on Table 7, the highest ranking of the Challenges of Construction material management at Construction Project in Somalia is undefined scope with the mean score value of 4.59. Based on the average mean index in Table 5, this means score value lies in the ranking of 4.50 Average Index 5.00, which is under “Strongly Agree” category. This ranking category means most of the respondents are sure that undefined scope of the project is the main challenges of material management at construction Project in Somalia. Following the first ranking with 0.09 differences, the second rank in challenges and causes of in effective material management at construction Project in Somalia is incomplete drawing. This challenge staying in the second rank with average mean score of 4.50. The third ranking of challenges material management at construction Project in Somalia is inadequate information on material supply with a mean average score of 4.45, and poor scheduling of material on site with a mean average score of 4.45, these two challenges have no differences of average score of mean and it is same rank, which followed the second rank with 0.05 differences. The fourth rank in challenges and causes of ineffective of material management at construction Project in Somalia is not determined what and when the material needed with score of mean 4.43, which followed the third rank with only 0.02 differences. The fifth of causes of ineffective material management at construction Project in Somalia is lack of benchmark for measuring quality material. with average score of mean 4.40, and lack of determining the quantity of material needed with average score of mean 4.40, these two causes of ineffective material management have no differences of average score of mean and it is same rank, which followed the fourth rank with only 0.03 differences.

Finally, all other causes of in effective material management at construction Project in Somalia of means score value lies in the range of 3.5 Average Index 4.50, which is under “Agree” category (refer Table 5). The finding of this section and this objective is the respondents agreed that the problems and causes of ineffective material management at the construction projects in Somalia has faced and experienced in the industry so many times many times.

Table 7 - Causes of ineffective material management practice in the construction projects

No	Questions	Mean	Group ranking	Overall Rank
Material Identification				
C1	Undefined scope	4.59	1	1
C2	A lack of communication	4.21	5	12
C3	Incomplete drawing	4.50	2	2
C4	Nonstandard specification	4.33	4	8
C5	Not determined what and when the material needed	4.43	3	4
Planning of Material Management				
C6	Lack of list material schedule for procurement.	4.21	3	12
C7	Inadequate information on material supply.	4.45	1	3
C8	Poor scheduling of material on site.	4.45	2	3
Procurement of Material Management				
C9	Lack of determining the quantity of material needed	4.40	1	5
C10	Poor material verification base on quantities ordered	4.24	4	11
C11	Improper tracking of material supply on site.	4.38	3	6
C12	Lack of benchmark for measuring quality material.	4.40	2	5
Logistics of Material Management				
C13	Poor communication parties in supply of material.	4.26	2	10
C14	Too many suppliers which is not easy to select.	4.38	1	6
C15	Incomplete late drawing of details drawings.	4.26	3	10
Handling of Material Management				
C16	Poor material supervision.	4.29	4	9
C17	Material exposes in the harsh weather.	4.33	2	8
C18	Wastage of material in the site.	4.33	3	8
C19	Oversupply of material on site.	4.36	1	7
Storage of Material Management				
C20	Poor storage system of material on site	4.38	1	6
C21	In adequate stocking of material.	4.01	5	17

C22	Storage of material should be free from harsh weather or climate.	4.15	3	14
C23	Insufficiency storage facilities.	4.14	4	15
C24	Storage facilities expose harsh weather.	4.20	2	13
Stock and waste control of Material Management				
C25	Lack of required information about supplier.	3.93	2	18
C26	Poor storage facilities of material.	3.78	3	19
C27	Improper arrangement of material.	3.78	1	19
Average Mean		4.274.		

4.7 Discussion Related to Causes of Ineffective Material Management at Construction Projects in Somalia

Among all the questions has been asked in this section of the study, it is obvious that the average mean of all answers is 4.274, which is located under the “Agree” category of mean. In another words, most of the respondents “agree” about the sentences given, which lead us to the following findings:

The main causes of ineffective material at construction Project in Somalia is material identification problems. The findings about challenges of material management at construction project in Somalia particularly on the identification of the material was positive from respondents where most of them agreed that the existence of these challenges at construction project in Somalia. Regarding to identification of material, the main challenges is undefined scope with the mean score value of 4.59, which is the highest mean score of all the other challenges. The next material identification challenge is incomplete drawing with the mean score value of 4.50, followed by not determined what and when the material needed and nonstandard specification respectively. This finding is consistent with Patel & Vyas (2011) which associated the problems of material management at the construction projects where they found that material identification is one of the main four phases along with the procurement and construction phases.

Furthermore, the finding regarding the planning material management challenges was also positive where most of the respondents “agreed” that the existence of these material management challenges at construction project in Somalia. Most of the respondents also agreed that there is a lack of list material schedule for procurement, inadequate information on material supply and poor scheduling of material on site at construction Project in Somalia. This finding is in line with Gulghane & Khandve (2015) which indicated the existence of these challenges for the material management at construction Project in Somalia especially those are due to overstock materials because of improper planning.

The last two challenges of material management at construction Project in Somalia are storage, stock and waste control of material management. The findings of challenges of material management at construction project in Somalia particularly on both challenges were positive from respondents where most of them agreed on the existence of these challenges at Construction Project in Somalia. Regarding to the storage of material management, the main challenges are poor storage system of material on-site and storage facilities expose harsh weather. The stock and waste control challenges are due to the lack of required information about supplier and improper arrangement of material. This finding supports Kasim (2008)’s result where he found that major issues reported include material management activities related with site storage constraints, site logistics pertains to material handling and distribution.

Finally, there are a lot of different challenges of material management at construction Project in Somalia. The respondents of this research indicated the main challenge at material management at construction project which are material identification, especially for the undefined scope, incomplete drawings followed by challenges of planning and procurement of material management. The third and the fourth are logistics and handling material problems. Following that by storage and waste control problems of material management. there is a lot of researches supporting the existence of these construction material management challenges at construction project in Somalia.

4.8 The Impact of Material Management Process on Construction Project Delivery in Somalia

The third objective of this research to study the impact of the material management process to project delivery at construction projects in Somalia. The result of the data analysis was tabulated in Table 8 with the ranking of the strategies to improve material management at the construction projects in Somalia from sections of the questionnaire. The highest ranking has a mean of 4.25, while the lowest ranking is 3.70 with 0.55 differences in mean score value. This ranking provides an indication of strategies to improve the material management practice at the construction projects in Somalia. Based on Table 8, the highest impact of the material management process at the construction project in Somalia is that cost overruns bring about fewer returns on investment with the mean score value of 4.25. Based on the average mean index. this means the score value lies in the ranking of 4.0 Average Index 5, which is under “strongly Agree” and “Agree” category (refer to Table 5). Following the first ranking with 0.1 differences, the second rank in the impact of material management practice to the project delivery at construction projects in Somalia is a to the contractor, cost overruns could lead to loss of profits with an average mean score of 4.15. The third ranking of the impact of material management process to the

project delivery is that delay in the progress of the work with an average mean score of 4.05, and Cost overruns prevent planned increase in property and Service production from taking place with an average mean score value of 4.05, these two impacts of material management practice to the project delivery have no difference in the mean score value and it is the same rank.

The fourth rank in the impact of material management practice to the project delivery is that at construction projects in Somalia is Increased time can result in third-party claims and contract abandonment or termination with score of mean 4.03, and Late completion of project with score mean value of 4.03 which followed the third rank with only 0.02 differences. The fifth impact of material management to the project delivery at construction projects in Somalia loss of productivity of work with an average score of mean 4.00, which followed the fourth rank with only 0.03 differences. The 6 rank is rework due to the design error at construction projects in Somalia with an average score of mean 3.95, which followed the fifth rank with only 0.05 differences. The 7 rank of impact of material management to the project delivery at construction projects in Somalia is that cost overruns imply added costs over and Above those initially agreed upon at the onset with an average score of mean 3.91, with only 0.04 differences on the 6 rank of the impact of material management to the project delivery on time with the budget frame.

Finally, the 8 impact of material management at construction projects in Somalia is to the end users, the added costs are passed on as higher rental/lease costs or prices with an average score of mean 3.88. All the remaining of the impact of material management practice to the project delivery at construction projects in Somalia have mean score value lies in the range of 3.5 Average Index 4.50, which is under “Agree” category (refer to Table 5). The finding of this section and this objective is that respondents agreed that the impact of material management practice to the project delivery at construction projects in Somalia contributes to the success of construction project are reduced cost of materials, quality control, better field material control, better handling of materials.

Table 9 - Impact of material management practice to the project delivery on the construction site

No	Questions	Mean	Rank in The Group	Overall Rank
The occurrence of cost overrun				
D1	Cost overruns imply added costs over and above those initially agreed	3.91	4	7
D2	Cost overruns bring fewer returns on investment	4.25	1	1
D3	Added costs cause higher rental prices to the end user	3.88	5	8
D4	Cost overruns could lead to loss of profits to the contractor	4.15	2	2
D5	Cost overruns bring project abandonment and a drop in building activities	3.76	6	9
D6	Cost overruns prevent planned increase in property and service production from taking place	4.05	3	3
Time				
D7	Delay in progress of the work	4.05	1	3
D8	Increased time can result in third-party claims and contract abandonment or termination	4.03	2	4
D9	Late completion of project	4.03	3	4
Quality				
D10	Loss of productivity of work.	4.00	1	5
D11	Rework due to the design error	3.95	2	6
D12	Construction equipment poor quality	3.70	3	10
Average Mean		4.00		

4.9 Discussions of The Impact of Material Management Process on Construction Project Delivery in Somalia

The third objective is achieved as among all the questions that have been asked in this section of the study, and the average mean of all answers is 4.0, which is located under the “Agree” category of the mean. The finding shows that the material management process has an impact on project delivery in construction projects in Somalia. Furthermore, the majority of respondents think that material management has a significant influence on project completion and handover. One of the most important factors to consider throughout the construction process is the cost. Unfortunately, the majority of projects failed to complete according to contract cost owing to ineffective material management. Project managers and

civil engineers firmly believe that efficient material management in construction projects can lower the total material costs. Thus, by minimising the procurement cost of materials, the higher chances for reducing the overall project cost and concurrently increasing company profit. The occurrence of cost overrun can bring fewer return on investment and may cause abandonment of the total project. It is an essential part of a construction contract, thus most of the contract has a similar provision regarding finishing time that indicated clearly (Ren et al., 2011).

The result reinforces the findings of Kuebutornye et al., (2018) where they revealed that the benefits of the material management approach which have a strong positive effect on construction project delivery success in terms of project schedule, the overall cost of materials, quality of the project and reduction of accidents rates on-site will elude most of the firms since material management techniques is not properly practice.

Construction project finished on time is important. In addition, time is commonly regarded as one of the major project delivery criteria and the minimal performance measured and the finding of this section and this objective respondent agreed that unsuitable material management could result in the project falling behind schedule and late completion. This increased time can eventually result in a third party claim. Following that respondents agreed that lack of proper materials management is a primary factor that had a moderate to strong effect on productivity and it can result in loss of productivity. Material management has an impact on quality, and one of the variables that contribute to quality performance and The availability of resources such as materials and equipment as planned throughout the project duration is critical to successful project delivery (Mat Jusoh et al., 2017).

5. Conclusion

In conclusion, this study has examined the impact of material management practice in the Somalia construction industry. A few conclusions were drawn from the findings of this study. First of all, materials management processes require a transformation to improve the overall process in materials handling for more efficiency and effectiveness on the construction project sites. This is because inadequate construction material handling has an impact on the entire cost, time, quality, and productivity of construction project. It is critical to reduce material waste during the construction phases in order to avoid loss of profits. Secondly, a few potential cause of project delay due to material management are including late purchase, late delivery, weak transport system, and stringent public procurement procedures. Lastly, only by proper management of materials in construction sites can bring benefits to construction project management, as it assists the speedy completion period, saves time of execution, gives high quality works and reduces the materials wastage, and also improve the project cash flow management.

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