



## Materials Management Concern on Construction Projects

Suzila Mohd<sup>1,\*</sup>, Nursyafiqah Nabilah Kamarularif<sup>2</sup>, Nur Izieadiana Abidin<sup>3</sup>, Zairra Mat Jusoh<sup>4</sup>,  
Juliana Brahim<sup>5</sup>, Rumaizah Mohd Nordin<sup>5</sup>

- <sup>1</sup> Department of Structure and Materials, Faculty of Civil Engineering, UTM, Construction Research Center (CRC), Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia  
<sup>2</sup> Faculty of Civil Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia  
<sup>3</sup> Department of Structure and Materials, Faculty of Civil Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia  
<sup>4</sup> School of Architecture and Built Environment, Faculty of Engineering, Technology and Built Environment, UCSI University, 5600 Cheras, Kuala Lumpur, Malaysia  
<sup>5</sup> College of Built Environment, Universiti Teknologi MARA (UiTM), 40450 Shah Alam, Selangor, Malaysia

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### ABSTRACT

The success of a construction project's execution hinges on efficient materials management. Delays, cost overruns, poor quality, and conflicting views can all result from ineffective materials management. By presenting alternative approaches to material management in building projects, the study aims to enhance its efficacy. To gain insights into the challenges faced in managing materials in construction projects, the research focused on success factors and potential solutions. Data were collected through literature reviews and surveys conducted among construction players operating under organizations graded G7 in Johor Bahru. The analysis utilized the Relative Importance Index (RII) to evaluate the significance of various variables, ranking them based on their perceived relevance or influence. Findings indicated that the most significant challenge in material management was design changes during construction. Effective material planning and the selection of trusted suppliers emerged as critical success factors for successful materials management. Additionally, the study identified proper on-site construction workers' training and the use of technology for monitoring and record-keeping as viable solutions. Construction industry experts can leverage these insights to manage resources more effectively, allocate resources wisely, and improve project outcomes. By comprehending and addressing these challenges, construction stakeholders can enhance project efficiency, reduce expenses, and ensure on-time project completion.

## 1. Introduction

Materials management involves material planning, identification, procurement, storage, receiving, and distribution [1]. The primary components of materials management include planning, identifying, procuring, storing, receiving, and distributing items. The purpose of materials management is to ensure that the necessary materials are available when needed in the appropriate

\* Corresponding author.

E-mail address: [suzila.mohd@utm.my](mailto:suzila.mohd@utm.my)

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quantity and location [2]. Materials management accounts for 50% or more of a project's overall cost [3]. Therefore, it is critical to ensure that materials are available at the point of usage when required.

Material management is critical to the effective completion of construction projects. However, the construction industry continues to experience material management issues, which can result in delays, cost overruns, and disrupted project quality [2]. The construction sector is facing numerous key material management difficulties [4]. Transportation issues, material breakdown owing to poor material handling, and insufficient material planning and purchase all contribute to project delays [5]. These difficulties come because of a variety of causes, including the complexity of construction projects, the involvement of several stakeholders, changing project needs, and the industry's dynamic traits. It is critical to address these concerns to improve the outcome of the project, increase efficiency, and develop successful project outcomes. Effective material management strategies, such as organized procurement processes, accurate planning and forecasting, improved communication and coordination, efficient inventory management, proper handling and site logistics, and proper handling and site logistics, can reduce these difficulties and lead to successful construction projects [6].

Material management is very unpredictable since it is reliant on several other elements and is interconnected with other processes and phases of building projects [7]. Several typical challenges frequently develop, affecting project duration, expenses, and overall efficiency [5,7]. According to Yigrem [8] among the biggest obstacles to a construction project in Rwanda are the following: lack of experienced workers; over-dependence on outside experts; lack of domestic construction materials and suppliers in the market; absence of established and modern infrastructure; lack of available space and storage in the country. Addressing these common issues necessitates the implementation of effective materials management strategies, such as robust planning and forecasting, the establishment of dependable supplier relationships, the implementation of efficient inventory management systems, improved communication and coordination among project stakeholders, and the incorporation of sustainability practices into materials management processes [2, 5-6]. By solving these concerns, organizations may increase project performance, decrease costs, and improve overall material management efficiency [2,4]. Therefore, this study aims to enhance the effectiveness of materials management by providing potential solutions to manage materials management in construction projects.

## **2. Success Factors in Managing Materials Management**

The efficient handling of materials is a vital part of successful building projects. It is critical to identify critical material management challenges to adopt successful solutions for improving material management effectiveness [6]. According to Jusoh [9], the basic form of the factors—a negative viewpoint—must be converted to a positive viewpoint. For example, 'inadequate material schedule planning' is transformed into 'appropriate material schedule planning'. According to the author, by doing so, these qualities become significant features that assist successful materials management rather than traits that undermine that efficacy. Aside from that, Vipin and Shabeen [7] studied and classified the factors impacting material management, including vendor analysis, material purchase, storage and inventory, supply, distribution, and onsite. Several elements affecting materials management were found in the research above through literature reviews. However, to identify all the components, they must all be related to the process and function of materials management, including project planning, materials take-off, vendor inquiry, purchasing, materials control, warehousing, expediting, and shipping [9].

### **3.0 Potential Solutions for Materials Management**

A successful construction project requires effective material management. It includes excellent material planning, procurement, handling, and utilization to assure project completion on time, cost management, and quality outputs [4]. However, due to the complexities and problems inherent in materials management, possible solutions to optimize operations and address common challenges must be explored. A professional material manager can be hired in addition to enhancing the management of materials in construction projects [4]. Besides, training construction personnel on-site about material management [8], using technology for monitoring and record-keeping [2], conducting frequent and effective inspections [8], using modern equipment for material handling [3], implementing techniques like Economic Order Quantity (EOQ) [10] and ABC analysis [1] and adopting practices like Just in Time (JIT) [11] inventory management could all be used in construction projects. The efficient handling of materials is a vital part of successful building projects. It is critical to identify critical material

### **4.0 Methodology**

This study consisted of three (3) key activities: research design, data collection, and data analysis.

#### *4.1 Research Design*

This is quantitative research with a survey design. After evaluating numerous pieces of research, a self-administered questionnaire is modified to measure the impact of materials management in construction projects. The questionnaire is divided into four (4) sections. The first component requests demographic information from respondents, while the second piece assesses material management issues that commonly occur on their construction sites. The factors affecting material management on construction sites will be the third category. Finally, the last part will identify the vital approaches implemented to improve materials management in building projects based on published research. Except for the first part, a five-point Likert scale [12] would be used to assess respondents' impressions of construction sites. The Likert scale ranges from 1 (strongly disagree) to 5 (strongly agree).

#### *4.2 Data Collection Method*

In this research, a questionnaire survey was developed and distributed through a Google form. The targeted research area is in Johor, Malaysia, and the targeted respondents for this research are contractors with grades 7 (G7). Based on the Contractor Finder in the CIDB Centralized Information Management System (CIMS), the population of G7 contractors is 515. However, after a screening process, only 270 G7 contractors with complete information such as email, office phone number and address have been included in this research. Thus, based on the Krijie and Morgan sampling method [13], the sample size of this research is 159. As a result, a total of fifty-five (55) respondents successfully responded to the questionnaire surveys within three (3) months. Online Questionnaire Survey Social Science (SPSS) has been used to analyse data collected from the online questionnaire survey.

### 4.3 Data Analysis

Data in this research has been analyzed using descriptive statistics. It assists in determining if the data supports or contradicts the theory and whether it can be applied to a broader population. The respondent's perception of material management in the construction industry was measured using the Relative Importance Index (RII) method. This calculation ranks the variables and shows how much the factor at the top is weighted higher than the factor at the bottom. The extracted data were subjected to ranking on the Likert scale and analyzed by using the RII [14], [15]. The RII was computed as Eq. (1) below.

$$RII = \frac{\sum W}{AN} = \frac{5n_5+4n_4+3n_3+2n_2+1n_1}{5N} \quad (1)$$

where W = weighting given to each factor by the respondents and ranges from 1 to 5 where 1 is not significant and 5 is extremely significant, A = highest weight (i.e., 5 in this case), and N = a total number of respondents [13]. After analyzing the respondents' feedback, the RII method was utilized to rank the responses. As indicated in Table 1, the RII value has been classified into five (5) degrees of importance, with a range of 0 to 1 (0 not inclusive) [14-15].

**Table 1**  
 Relative Importance Index (RII) Value [14-15]

RII Value	Importance Value
0.8 – 1	High
0.6 – 0.8	High-Medium
0.4 - 0.6	Medium
0.2 – 0.4	Medium-Low
0 – 0.2	Low

## 5.0 Results and Findings

### 5.1 Respondents' Demographic

This section aims to gather information on the respondents' demographic. Understanding the demographics of the group of construction industry respondents whose questions are asked is important to understand how different demographic factors may impact survey responses from respondents. Table 2 summarizes the current job position of respondents

**Table 2**  
 Current Job Position of Respondents

	Current Job Position	Frequency	Valid Percent
Valid	Electrical, Mechanical Engineer	2	4%
	QA/QC Engineer	5	9%
	Maintenance Engineer	5	9%
	Civil Engineer	5	9%
	Site Supervisor	6	11%
	Executives	7	13%
	Project Manager	9	16%
	Project Engineer	16	29%
	Total	55	100%

Based on Table 2, 16 (29%) of the 55 returned questionnaires were answered by the project engineer, while 9 (16%) project managers answered the surveys. Site Supervisor (6, 11%), Executives (7 respondents, 13%), and Electrical/Mechanical Engineer (2, 4%) were among other jobs mentioned by the respondents. Meanwhile, the Maintenance Engineer, QA/QC Engineer, and Civil Engineer have the same amount of 5 respondents (9%) each of them. In conclusion, the data show a diverse range of job positions in this study will offer important insights for the research and decision-making in the engineering and construction industries.

While, based on Table 3, it turns out that among the 55 respondents, 23 (42%) had less than 5 years' experience of work experience, 9 (16%) had 6-10 years of work experience, 8 (15%) had 11-15 years of work experience and 15 (27%) had more than 15 years of experience in the construction industry. However, for the years of involvement in managing materials for construction projects. 30 (55%) had 0-5 years of work experience, 6 (11%) had 6-10 years of work experience, 6 (11%) had 11-15 years of work experience and 13 (24%) had more than 15 years of experience in involving of materials management. It was clear from the data that the respondents possessed the necessary skills and expertise to present unbiased, reliable information on material management as they have been involved in material management in construction projects.

**Table 3**  
 Respondent's Work Experience

Characteristic	Category	Number	Percentage
Respondent's experience in the construction industry	Less than 5 years	23	42%
	6-10 years	9	16%
	11-15 years	8	15%
	More than 15 years	15	27%
Respondent's experience in material management	Less than 5 years	30	55%
	6-10 years	6	11%
	11-15 years	6	11%
	More than 15 years	13	24%

Based on the respondents' demographics, it can be concluded that all 55 respondents are familiar with materials management and have vast experience in materials management. Their responses are very important to achieve the aims of this research.

### 5.2 Issue in Managing Materials Management

This section aims to investigate the problems with materials management in construction projects. The respondents were asked to assess how much they agreed with the problems with materials management in construction projects. This part utilized a Likert scale with five possible outcomes: 1 for strongly disagree, 2 for disagree, 3 for neutrality, 4 for agree, and 5 for strongly agree. The results are displayed in Table 4.

**Table 4**  
 Issues in Managing Materials Management

The issues related in managing construction materials management	RII Value	Std. Deviation	Rank
Design changes during construction	0.807	3.60	1
Overdue payment to suppliers	0.760	3.41	2
Delay in approval of material by client	0.756	3.35	3
Over-dependence on outside experts	0.735	3.26	5
Lack of experienced workers	0.727	3.23	6
Insufficient use of digital systems for material management	0.720	3.20	7

**Table 4**  
 Issues in Managing Materials Management

The issues related in managing construction materials management	RII Value	Std. Deviation	Rank
Poor logistic management	0.680	3.06	8
Damage of the construction materials	0.665	3.01	9
Excessive and insufficient materials	0.651	2.90	10
Incorrect order quantity	0.647	2.87	11
Absence of established and modern infrastructure	0.644	2.82	12
Incomplete projects drawings	0.629	2.80	13
Lack of domestic construction materials and suppliers in the market	0.629	2.81	14
Lack of available space and storage in the country	0.564	2.57	15

Based on Table 4, the respondents agreed that design changes during construction pose a significant challenge in managing materials management. This problem stands out as the only one that significantly affects materials management, with a high significance value of RII above 0.807, showing its crucial importance in construction projects. In addition, as shown by an RII value of 0.760, the respondents agreed with the overdue payment to the supplier. Other top problems are delays in client approval of the material and over-dependence on outside experts, listed in order of severity. These concerns all obtained RII values that were relatively high, indicating their significance in materials management. The lack of experienced workers had an RII value of 0.727. However, the least concerning issue in construction projects is the lack of available space and storage in the country with an RII value of 0.564.

Nevertheless, based on the RII value, it is still considered to be of medium importance. As an outcome, the top problems faced in the industry, such as design adjustments, payment delays, and client approval delays, may be prioritized and addressed using the results.

### 5.3 Success Factors Influencing Materials Management

This section aims to identify the success factors in managing materials management in construction projects. The respondents were given a Likert scale-type set of questions for this part. The result is recorded in Table 5 below.

**Table 5**  
 Success Factors Influencing Materials Management

Success factor influencing materials management	RII Value	Rank
Effective material planning	0.818	1
Identifying & selecting reliable supplier	0.818	1
Availability of materials on-site	0.815	3
Sufficient cash flow control	0.804	4
Systematic documentation	0.800	5
Proper material usage	0.789	6
Efficient delivery of materials to site	0.778	7
Sufficient material storage	0.775	8
Competence & expertise of material management team	0.764	9
Availability of modern equipment & methods for handling	0.760	10
Proper material handling on-site	0.538	11

Effective material planning and identifying and selecting reliable supplier had the highest and same RII value, which is 0.818, respectively. The next-ranked factor is availability of materials on-site with an RII value of 0.815. Displaying their significance in successful materials management, factors like sufficient cash flow control (RII = 0.804) and systematic documentation (RII = 0.800) also obtained

relatively high RII value. On the contrary side, variables like proper material handling on-site had a lower RII value, indicating that respondents did not feel as strongly about its significance. Overall, the top five ranked factors have an RII value above 0.8 which implies that the factors are of high importance to ensure successful materials management in construction projects. Analysis results provide valuable knowledge about the success factors influencing materials management. The findings indicate that effective material management depends on a variety of factors, including effective material planning, selecting reliable suppliers, keeping supplies on hand, managing cash flow, and maintaining orderly paperwork

#### 5.4 Potential Solution to Improve Materials Management

This section aims to provide possible solutions to improve materials management in the construction industry. The results are displayed in Table 6 below.

**Table 6**

Potential Solution to Improve Materials Management

Potential solution to improve materials management	RII Value	Std. Deviation	Rank
Train construction personnel on site about material management	0.840	3.73	1
Utilise technology in monitoring and keeping records	0.815	3.63	2
Doing a frequent effective inspection	0.815	3.64	3
Use software in material management	0.785	3.50	4
Applying Economic Order Quantity (EOQ) technique	0.782	3.46	5
Equip modern equipment for material handling	0.782	3.51	6
Implement ABC analysis for inventory	0.764	3.40	7
Implement Just in Time (JIT) system	0.731	3.25	8
Storing extra materials for emergency purposes	0.727	3.29	9
Hire professional material manager	0.695	3.09	10

Train construction personnel on site about material management has the greatest RII value, of 0.840. This shows that most respondents strongly believe that teaching construction workers on the job site is an excellent way to enhance materials management. Next, the approaches of utilising technology in monitoring and keeping records and doing frequent effective inspections come in second and third place, respectively, with equal RII value of 0.815. However, the standard deviation for utilizing technology in monitoring and keeping records is lower. To improve materials management, techniques like using software in material management and applying Economic Order

Quantity (EOQ) technique obtained relatively high RII value. By contrast, approaches like hiring professional material managers had a lower RII value of 0.695, suggesting that respondents felt more neutrally about or agreed with this approach. The data analysis shows that the best ways to enhance materials management in construction projects are to teach workers on-site, use technology, and carry out regular, efficient inspections.

## 6. Conclusions

In conclusion, this research has examined the issues with materials management in construction projects. Several significant conclusions have been drawn after an in-depth review of the challenges, success factors, and potential solutions for materials management. Findings conforming to the objectives of this research can be summarized below:

- The most significant problems with materials management, according to the report, are design changes during construction, late payments to suppliers, and delays in client acceptance of materials. These difficulties may result in project delays, cost overruns, and unsatisfactory project results.
- The use of technology, trustworthy supplier selection, and efficient material planning were shown to be key success factors in managing materials successfully. Implementing these elements would improve materials management practices and optimize project efficiency for construction projects.
- Potential solutions included on-site construction workers' training, the use of technology for monitoring and record-keeping, and the performance of regular effective inspections. These solutions could address the stated problems while also improving the material management processes for construction projects.

Apart from that, this research gives helpful insights into materials management issues in construction projects as well as useful suggestions for improving materials management procedures. Stakeholders can optimise project results, enhance resource utilisation, and support the continued growth of the construction sector by addressing these issues.

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