



## Analysis Of Resource Management Practices In Construction Industry- A Systematic Literature Review

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### **Abstract**

The construction industry is characterized by its complex and dynamic nature, requiring efficient resource management practices for successful project execution. This systematic literature review aims to comprehensively analyze and synthesize existing research on resource management practices within the construction sector. By examining a wide array of scholarly articles, conference papers, and industry reports, this review identifies and evaluates the various methodologies, strategies, and tools employed for effective resource management in construction projects. The review encompasses an extensive analysis of key themes, including but not limited to labor management, equipment utilization, material procurement, and technological advancements in resource optimization. It delves into the challenges faced by the construction industry concerning resource allocation, skill shortages, cost control, sustainability concerns, and the impact of unforeseen disruptions. Furthermore, this review critically assesses the implications of resource management practices on project performance, encompassing aspects such as project timelines, budget adherence, quality control, and stakeholder satisfaction. The findings from this systematic review provide a comprehensive understanding of the current state of resource management practices in the construction industry. Additionally, it identifies gaps in the literature and suggests areas for future research, emphasizing the need for innovative approaches and adaptive strategies to address the evolving demands and complexities within construction project management.

**Keywords:** *Construction Industry, Resource Management, Project Management, Systematic Literature Review, Efficiency, Strategies, Project Performance.*

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## 1. Introduction:

The construction industry stands as a cornerstone of global development, contributing significantly to infrastructure growth, economic progress, and societal advancement. However, its operational intricacies and multifaceted demands underscore the critical need for efficient resource management practices. This study embarks on an in-depth exploration and analysis of resource management strategies within the construction sector, aiming to uncover the nuanced methods and approaches employed in optimizing resources for successful project execution.

Resource management within construction encompasses a broad spectrum, encompassing human resources, equipment, materials, finances, and technological advancements. This investigation seeks to dissect these components, evaluating established methodologies and emerging trends that influence resource allocation, utilization, and optimization. By examining scholarly works, industry reports, and empirical studies, this analysis aims to provide a comprehensive overview of the prevailing practices and their impact on project performance.

The challenges confronting resource management in construction are diverse and complex. From workforce dynamics to the procurement of materials, cost fluctuations, environmental sustainability imperatives, and the advent of disruptive events, such as unforeseen delays or supply chain interruptions, this study aims to uncover the multifaceted challenges faced by industry practitioners. Moreover, this inquiry is not solely confined to a descriptive assessment of current practices. It endeavors to critically evaluate the implications of these resource management strategies on the overall success of construction projects. Key performance indicators, including project timelines, adherence to budgets, quality control measures, and stakeholder satisfaction, will be scrutinized to comprehend the direct impact of resource management decisions on project outcomes.

Through this analysis, the study aims to offer insights into the evolving landscape of resource management practices within the construction industry. It aims to identify gaps in current knowledge, paving the way for future research directions and advocating for innovative approaches to address the ever-evolving challenges encountered in managing resources effectively within construction projects. Ultimately, this investigation aspires to contribute to the enhancement of resource management strategies, thereby fostering more efficient and sustainable construction practices, also to find the relevant literature review on the following subjects.

- Operational competencies of agencies involved in construction activities.
- To find out the common reasons leading to over consumption of raw material.

## 2. Methodology:

We followed the preferred reporting items for systematic reviews guidelines to produce this review. Systematic reviews often present a lack of awareness of shared guidelines that make them replicable and scientifically adequate. PRISMA provides a standard peer accepted methodology that uses a guideline checklist, which was strictly followed on this paper to contribute to the quality assurance of the revision process and to its replicability.

A review protocol was developed, describing the article selection criteria, search strategy, data extraction, and data analysis procedures.

### 2.1. Data Sources and search strategies

A systematic search of electronic database like Google Scholar, Shodhganga, Scopus, Research gate for the year from 2005 to 2023 was done. These are the most valued databases which is why they were used in our study. Articles, Journals, Research Paper, PhD Thesis in English were searched separately.

To identify as many eligible studies as possible, we broaden search terms and strategies. The terms Construction Industry, Resource Management, Project Management, Efficiency, Challenges, Strategies, Tools, SOP's as keywords for the topic was used to find the relevant literature.

## 2.2. Selection of Studies

Titles and abstract were reviewed independently above mentioned criteria was used to determine the paper eligibility to be included in the study. All the potentially available literature was reviewed for final inclusion and all the discrepancies was removed.

## 2.3. Data Extraction process and Quality Assessment

Data extraction and article quality were assessed earlier, and the extracted data were noted in the tabular form from where the data was reviewed for any further discrepancies.

## 2.4. Eligibility Criteria

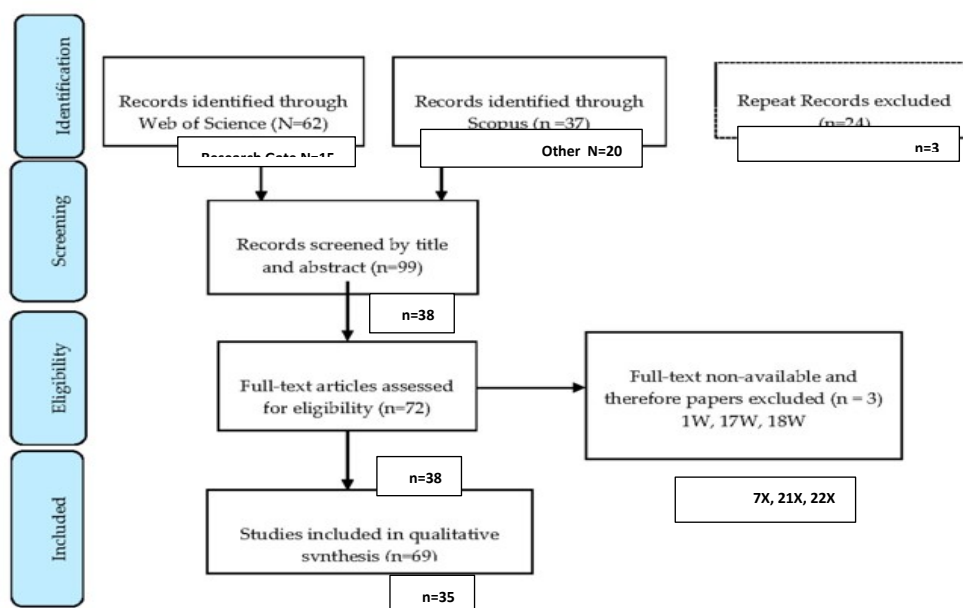
The selection of the article to review was conducted in three stages

- In the first stage of analysis was the screening of the title and abstract was done.
- The second stage was the analysis of the articles where selection criteria were established according to the research question, and the results were organized in a table, here the articles were eliminated with no full text.
- The third stage was to read the article and integrate the all the results in a single document, from here the articles were retrieved for a comprehensive examination in order to decide inclusion in our study. To address our specific research questions, we excluded all papers that did not describe research examining the resource management practices.

## 2.5. Constitution of the Corpus of analysis

The listed studies were organized by year of publication and by alphabetical order of the first authors name. The articles were coded with a number.

The search based on the inclusion criteria yielded a total of 38 articles. After the application of exclusion criteria we narrowed this number to a total of 35 articles relevant to the present systematic review of the literature. Three articles did not contribute to our research directly and were therefore excluded (n=3)

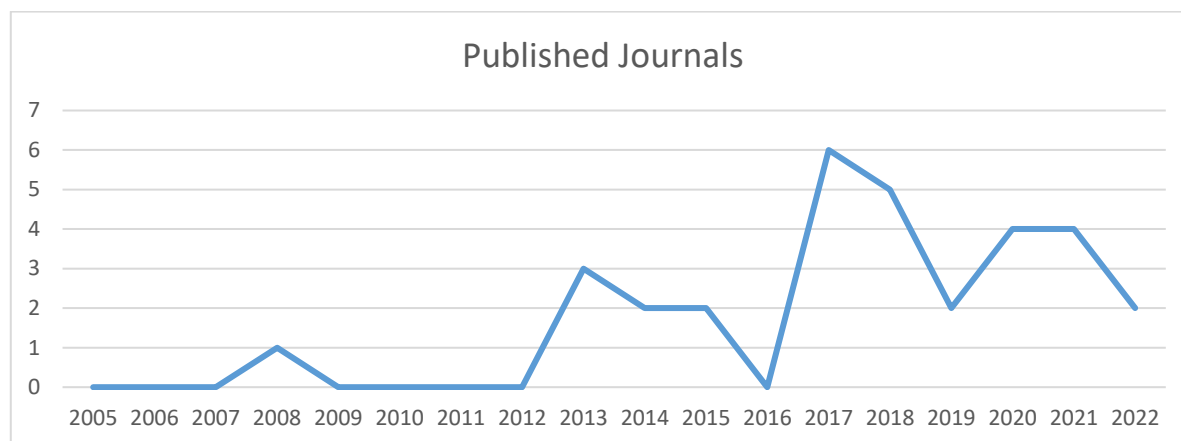


**Fig 1** Reporting items for the systematic review (adapted the preferred reporting items for systematic reviews (PRISMA) statement)

Table A presents all the papers included in the systematic review (n=35) and the codification (number of the paper and its database (R= Research gate, X=Other than Research Gate) used to identify each one of the papers, which will be used in the next section to discuss the results of the analysis.

## 2.6. Characteristic of Included Studies

The year with more studies that entered our search is 2017, as depicted in Fig 2. Our results show a relevant increase in the number of published studies in the last four years.



**Fig 2** Frequency of publication per year.

## 2.7. Strengths and Limitations

In this review, we used PRISMA methodology, and we tried to identify as many eligible studies as possible. We broaden search terms, database, and resolved any discrepancies through active discussion. Despite the fact that we intended to convey an international dimension to our analysis, we chose to limit our search to only four databases acknowledge by their quality.

## 3. Results:

In this section, we present the result found through the aforementioned systematic revision process, organized according to the research questions that guided our search and analysis.

### 3.1. What are the factors that affect the operational competencies of agencies involved in construction activities, such competencies can be identified.

**Operational competencies of agencies involved in construction activities. (4R, 1X, 5R, 4X, 6R, 7R, 6X, 8X, 9X, 11X, 10R, 13X, 11R, 16X, 12R, 13R, 17X, 19X, 15R.)**

One of the main issue associated with operational competencies of agencies involved in construction industry found in the systematic review carried out is the mismatch between the theoretical part and the practical application on the site.

The Paper (4R) focuses on the civil engineering and construction industry is usually highlighted as primary contributing factors for resource consumption and scarcity. Many researchers perceive that as a normal event with the respect to the high demand for construction that comes concerning the growing world population. As a consequence of this demand, a need for resources and energy efficiency becomes extremely critical and vital. The circular economy could be presented as one of the potential factorsto regulate the construction industry with a circular business model. The reason that the professionals highly suggest this mechanism is due to its suitability with the vibrant and dynamic nature of the construction industry that usually causes a communication gap between the main stakeholders. The literature shows that this could be a result of a lack of collaboration and creating unnecessary complex steps that affect the productivity and durability of the business. Hence, a need for a holistic and integrated framework is necessary to regulate and manage the flow work of resources and energy efficiency process. In this study, the Sustainability

Development Goals (SDGs) will be highlighted as major key performance indicators to ensure the accuracy and feasibility of the circular economy. Through this study, the survey and the interviews showed that three areas could be considered as challenging to be applied to circular economy in construction in The United Arab Emirates (UAE): regulatory factors, economic factors, and technological factors.

The Paper (1X) focuses on the the emergence of ecological environment crisis, the topic of sustainable development has attracted people's attention, and it is also the common goal. With the rapid development of the construction industry, there are many problems to be solved because of the lack of social responsibility. For example, frequent engineering quality and safety accidents, huge resource consumption, inadequate utilization of construction waste, and so on. These actions of construction enterprises not only harm the interests of stakeholder, but also seriously disrupt the order of the construction market. With the improvement of social transparency and the enhancement of citizens' awareness of safeguarding their rights, the voice of society requiring construction enterprises to fulfill their social responsibilities is rising day by day. From the view of social responsibility, this paper puts forward some suggestions on promoting the sustainable development of construction industry in the aspects of organizational governance, the environment protection, labor practice and so on.

The paper (6R) focuses on how to minimize the health and safety issues, organizations as a rule executes Occupational Health and Safety (OHS) policies and practices approved by the organization's administration with the obvious details presenting the OHS objectives and showing sense of duty regarding enhance security and safety performance for the workers of the organization. In practical cases or environment, identifying the safety and remedial measures in a procedural way for the organization is quite tough and to build up the measures according to the changes with logical condition is very critical. The safety instruments that add to the improvement of safety performance parameters in a particular circumstance need to be advanced depending upon workplace. Although there has been so many research and inventions have been done in the past time for the development and construction under occupational health and safety, yet there is a lot of work to be done. This review paper includes the summaries and abstracts of all such literature concentrating over the assessing the role of Human Resource Management to ensure Occupational Health and Safety System implementation and quality assessment in the Construction industry

The Paper (7R) focuses on the competitiveness and its complex domain with multiple perspectives and a vast range of definitions, meanings, and measures. Therefore, it is challenging to create an appropriate framework to evaluate the competitiveness of an ever-changing and evolving construction industry. This study captures the contractor's perspectives about the competitiveness of the Pakistani construction industry, underlines the key factors affecting its performance, and proposes a framework for enhancing competitiveness. The proposed framework identifies the areas for improvement and contributes to the development of strategies for adoption. To achieve this, a qualitative approach is adopted which captures the opinion of contractors about the competitiveness and its perception and analyzes it through the fuzzy approach. The results based on 25 expert interviews highlight that the recruitment of well-trained human resource and cutting-edge technologies, the collaboration between academia and industry, investment in R&D projects, and a stable business environment contribute to enhancing the competitiveness of the construction industry and should be adopted to enhance the current state of practice. The study has perks for both academia and industry and requires active participation from both counterparts as well as supply chain actors and regulatory bodies to achieve the holistic goals.

The paper (6X) focuses on investigating the impact of the use of construction technology equipment on the workforce in the construction industry. This study made use of the quantitative approach. Questionnaires were sent out to construction industry professionals, such as project managers, quantity surveyors, engineers, and owners of construction companies. Data received was analysed using descriptive statistics. The findings reveal that the use of construction equipment will have a tremendous impact on the workforce as one equipment would be able to execute work that



could be done by a sizeable number of labourers. It was also found that the productivity of construction projects in South Africa can be increased by making use of construction technology equipment. However, it will be a herculean task to fully adopt construction technology equipment in project execution in South Africa as respondents believe the construction industry is heavily relied upon by the government to generate employment. There is also a perceived lack of expertise and lack of knowledge regarding the use of construction technology equipment among the workforce in the construction industry of South Africa. It is therefore suggested that construction companies invest in these different equipment, which will surely assist labourers and also speed up construction projects. The government must also look for areas of the economy to create jobs instead of relying heavily on the construction industry

The Paper (8X) focuses on poor planning and control of resources makes the projects plunge into crises. The ultimate aim of success or profit of the projects is achieved the objectives of specified performance of scope with in the stipulated time by utilizing minimum resources. Today's open market demands not only cheaper products and services but also better product and services. Increased pressures to reduce the cost have not only led to the migrations of U.S. manufacturing operations to Mexico and Far East but also Singapore and Malaysian manufactures into China and other Asian Countries. The process-based project management system controlled by the quality standards may be viable solutions for the success. In construction sector, rather than adopting the optimum design procedures, the effective construction methodology and planning will result in significant savings in resources. This paper describes the line of balancing techniques to minimize the quantity and maximize the productivity of human resources. The effective utilization of resources by establishing average demand over the maximum project periods by resources smoothening techniques are outlined in this paper.

The paper (11X) focuses on relationship between construction industry and economic market in China has had fundamental changes, and has laid good foundation for updating and reforming of domestic architectural technologies influenced by continuous increase of total market investment. In the construction process of architectural engineering project, as the basic structure of the entire building, theoretical system of construction technologies in civil engineering should be deeply studied in the future to fully satisfy strategic requirements of modern construction system, innovation of original and core technologies should be emphasized to improve civil engineering technology and construction means and play a positive role for maximum construction benefits of civil engineering, and it has great practical significance. The article has made all-round representation on authority and importance of construction technology innovation of civil engineering architecture from the global perspective, discussed and exchanged construction technology features of civil engineering in current period, continuously deep ened innovation and reforming of construction technology of civil engineering to effectively facilitate improvement of natures of the building based on summary of construction experience of engineering oriented with technical innovation.

The paper (10R) focuses on the factor affecting construction productivity and rank them on the basis of the responses given to their impact on the productivity of construction projects in India. Design/methodology/approach- The research was conducted by a structured questionnaire that was sent to 350 professional working in Indian construction industry. This questionnaire requested the respondents to give a score to the 24 attributes identified that cause productivity losses in the construction industry through literature review. They were asked to rate the attributes on a Likert scale rating of 1 to 5. The data collect than analysed using relative importance index and factor analysis. Findings- The research study identifies the top ten attributes having a significant impact on construction productivity using relative importance index and top three of them are: Decision making, planning and logistics and supply chain management. Secondly, there was 7 factor formed out of 24 attributes using factor analysis/principal component analysis and the total variance explained by them is 74.58%. The factors are Poor site coordination, Lack of competency, Fragmented supply chain, lack of commitment, Improper planning, Lack of commercial management and Inefficient site management. Research limitations- The

research focused on the responses received through the questionnaire and the number of respondents is 140 with a response rate of 40%. A further more detailed research is required to suggest the control measures for the top three significant factors identified from the research

**To find out the common reasons leading to over consumption of raw material.(1R, 2R, 3R, 2X, 4X, 8R, 9R, 5X, 10X, 12X, 14X, 15X, 18X, 14R, 20X,16R)**

Paper 1R focuses on recent trends a wide range of building materials is available for the construction of civil engineering structures. The total cost of materials may be up to 60% or more of the total cost incurred in construction project dependent upon the type of project. Effective construction materials management is a key to success for a construction project. Construction waste is another serious problem in construction industry. A large and various types of construction waste with different characteristics are created at all the stages of construction. Construction industries have a larger part in contributing environmental problems. The economic and environmental benefits must be gained from construction waste minimization. This paper presents a review on systematically investigation of the management of construction materials and construction waste, material management techniques, control of construction waste and existing situation of construction management and construction waste in the industry.

Paper 3R focuses on the economic activity of building and civil engineering works (Bon & Crosthwaite, 2000b). Many authors agree that the construction industry is crucial for the growth of developing economies (Ndaiga, 2014; Giang & Pheng, 2010; Muiruri & Mulinge, 2014; Wachira, 1999; and Cytonn, 2016 among others). This criticality of the construction industry calls for efficient execution of construction projects which are the backbone of the industry. Resource Planning and Leveling has been attributed to improved project performance in terms of cost, time and even quality (Newell, 2002; Mendoza, 1995 and Dubey, 2015). For any project to be successful there should be support from top management. According to Schultz, Slevin, & Pinto, (1987), management support during project implementation is a major determinant to the success or failure of the project. Project management could be regarded as one of the means in which the top management implements its goals and objectives for the firm. This study sought to establish the effect of Top Management Support on Resource Planning and Leveling (RP&L) among Contractors in the Kenyan Construction Industry. Results indicated weak negative (-0.038) statistically insignificant (0.736) relationship between top management Support versus age of firm; a weak positive (0.275) statistically significant (0.048) relationship between extent of top management support and extent of carrying out Equipment Resource Planning (ERP); a very weak positive (0.079) statistically insignificant (0.494) relationship between extent of top management support and extent of carrying out Labour Resource Planning (LRP); a very weak positive (0.162) statistically insignificant (0.156) relationship between extent of top management support and extent of carrying out Material Resource Planning (MRP); a weak positive (0.257) statistically significant (0.022) relationship between extent of top management support and extent of carrying out Equipment Resource Leveling (ERL); a weak positive (0.230) statistically significant (0.041) relationship between extent of top management support and extent of carrying out Labour Resource Leveling (LRL); and a weak positive (0.245) statistically significant (0.029) relationship between extent of top management support and extent of carrying out Material Resource Leveling (MRL). The author recommended that there should be more support by top management with regard to Resource Planning and Leveling since the two variables were found to be directly proportional.

Paper 2x focuses on strategic human resource management as a competitive advantage in the construction industry specially to identify factors related to achieving competitive advantage in this industry. The empirical data were drawn from 174 construction companies in Indonesia using questionnaire method. Structural Equation Modeling techniques was used to analyze the conceptualized relationship model. The empirical results reveal that competitive advantage in the

construction industry in Indonesia could be achieved through human resource management practices to build and improve a safety culture which would increase employee productivity. Companies must integrate human resource management practices with safety culture as a priority strategy of the company since based on empirical result, safety culture can be a source of competitive advantage for construction companies in Indonesia. Future studies can use these strategic human resource management models in different industry sectors by adding a number of samples so that the results could be generalized.

Paper 8R focuses on Changing people's wasteful behaviour can make a significant contribution for sustainable growth. This is because wastes are often hazardous in nature thereby making them potentially hazardous to human health and/or the environment. Sustainable livelihood within the environment where the presence of wastes has become a phenomenon makes efforts at addressing this menace a central issue. In the light of this, a strategic solid waste resource management planning approach has been identified as capable of enhancing plausible solutions to take care of its menace. Such planning has to take into cognizance a comprehensive strategy that can remain flexible in light of changing economic, social, material (products and packaging) and environmental conditions.

In relation to the present study, the need for resource conservation in order to minimise the rate of waste generation is being emphasized. The necessity of this revolves around the environmental benefits inherent in such efforts and economic gains it will bestow on the construction industry and other stakeholders within the society.

This paper investigates the management of wastes generated from construction and demolition activities that has wide-ranging impacts on the environment. Waste management is perceived as a low project priority, and there is an absence of appropriate resources and incentives support it. A theory of waste behaviour is proposed for the construction industry, and recommendations are made to help managers improve workers' attitudes towards waste.

Paper 9R focuses on Planning, monitoring and evaluating materials management practices is important for enhancing construction productivity. This study is designed to develop a tool for scoring materials management practices for building projects and, on that basis, build a tool for predicting productivity. The research was carried out in two phases. During Phase I, in-depth interviews were conducted with 19 experts and context-specific materials management practices were identified.

During Phase II, questionnaires were used to collect quantitative data from 39 contractors. To prioritise the practices which were identified during Phase I, the quantitative data was analysed. Based on the analysis, tools for measuring and planning the materials management practices and probability-based regression models were developed. Procurement plans for materials, long-lead materials identification and materials delivery schedule are the three most significant practices. Contractors can use the scoring tool to measure the levels of implementation of the practices and assess the risk of having low productivity by using the predictive models.

This research contributes to the body of knowledge by developing construction materials management practices measuring, planning, monitoring and evaluating tool in the context of building projects. Additionally, the logistic and linear regression models can be used to assess whether a certain level of implementation of the construction materials management practice might be associated with higher or lower labour productivity.

Paper 18x focuses on the problems occurring in the company because of improper application of material management. In construction project operation, often there is a project cost variance in terms



of the material, equipments, manpower, subcontractor, overhead cost, and general condition. Material is the main component in construction projects. Therefore, if the material management is not properly managed it will create a project cost variance. Project cost can be controlled by taking corrective actions towards the cost variance.

Therefore a methodology is used to diagnose and evaluate the procurement process involved in material management and launch a continuous improvement was developed and applied. A thorough study was carried out along with study of cases, surveys and interviews to professionals involved in this area. As a result, a methodology for diagnosis and improvement was proposed and tested in selected projects.

The results obtained show that the main problem of procurement is related to schedule delays and lack of specified quality for the project. To prevent this situation it is often necessary to dedicate important resources like money, personnel, time, etc. To monitor and control the process.

A great potential for improvement was detected if state of the art technologies such as, electronic mail, electronic data interchange (EDI), and analysis were applied to the procurement process. These helped to eliminate the root causes for many types of problems that were detected.

Paper 14R focuses on to answer the problem of measuring waste in companies, which are implementing Lean Manufacturing concept. Lack of complex identification, quantification and visualization of waste significantly impedes Lean transformation efforts.

This problem can be solved by a careful investigation of Muda, Muri and Mura, which represent the essence of waste in the Toyota Production System. Measuring them facilitates complete and permanent elimination of waste in processes.

The paper introduces a suggestion of methodology, which should enable company to quantify and visualize waste at a shop floor level.

Paper 20X focuses on control the cost of the men, material and machineries and finish it on time, within the estimated budget. Reduction in cost of construction is a constant goal for construction industry. In this project we have performed the quantification of the structural elements with regard to dimensional and material properties in order to work out the cost per unit item for various design combinations. This project covers the optimization of design combinations to achieve satisfactory results for economical construction.

### **3.2. Is there a worldwide concern about this topic or its mainly a developing nations problem.**

Operational competencies in construction industry and the reasons why there is overconsumption in the raw material and other resources is not the problem of the developing nations but it is a worldwide problem because the paper from Middle east, China, India, Africa, etc shows its global concern on the issues.

## **4. Discussion:**

This paper provides insight into the operational competencies of the agencies involved in the construction industry, the results reveal that papers are mostly aimed at determining which competencies act as stimulus for the effective working of various agencies in the construction work also the paper aims at the optimum utilization of the resource and the ways to reduce the cost, material and labour overruns.

## 5. Conclusions:

This paper aims to develop a systematic review on the operational competencies and the resource management practices. It also aims to find the ways to enhance the operational competencies of the agencies involved in the construction industry and the better resource management practices.

Also the review was used to find the research gap so that the researcher can further carry the research in the field also the review will help to draft proper SOP's, , policies,etc.

**Table A:** Codification of Papers included in the Systematic Review.

Code	Year	Authors	Journal Name	Title	Ref
1R	2015	Khandve PGulghane AKhandve P	IRJET Journal	Management for Construction Materials and Control of Construction Waste in Construction Industry: A Review	RG
2R	2014	Siew, Renard Yung Jhien	Australasian Journal of Construction Economics and Building	Human resource management in the Construction Industry - Sustainability Competencies	RG
3R	2017	Simon, Shadrack Mutungi	International Journal of Engineering and Advanced Technology (IJEAT)	Effect of Top Management Support on Resource Planning and Leveling (RP&L) Among Contractors in the Kenyan Construction Industry Factors Influencing Adoption of Resource Planning and Leveling among Contractors in the Kenyan Construction Industry View project Development of a Framework for Enhancing the Organizational Performance of Local Contractors in Kenya View project	RG
4R	2022	Ghanim Kashwani	Thesis	Evaluation the performance and implementation of sustainability in theconstruction industry in the UAE	RG
1X	2019	Weiwei Zhao and Ruyi Ye	IOP Conference Series: Earth and Environmental Science	Research on sustainable development of construction industry	
2X	2020	Winda Widyantya*, Apollo Daitoa, Setyo Riyantoa and Dewi Nusraningruma	Management Science Letters	Gaining a competitive advantage through strategic human resource management in Indonesian construction industr	o
5R	2017	Shadrack Mutungi Simon	International Journal of Soft Computing and Engineering (IJSCE)	Exploring the Practice of Resource Planning and Leveling (RP&L) AmongContractors in the Kenyan Construction Industry	RG
3X	2022	Phuthumile Gina, Trynos Gumbo, Nischolan Pillay	University of Johannesburg	Exploring the Role of Digitalisation and Technology Uptake in theConstruction Industry: Lessons from Johannesburg, South Africa	

Table A: continued

6R	2020	Dr. Shivoham Singh, Prof. Dipin Mathur, Dr. Ashish Adholiya, Surbhi Jain.	Mukt Shabd Journal	REVIEW OF ROLE OF HUMAN RESOURCE MANAGEMENT TO ENSURE OCCUPATIONAL HEALTH AND SAFETY SYSTEM IN CONSTRUCTION INDUSTRY	RG
4X	2021	Zhang H, Jia H, Li C, Liu C	IOP Conference Series: Earth and Environmental Science	Research on resource consumption of construction industry in Xining based on material flow analysis	
7R	2020	Moazzam Azeem1, Fahim Ullah*2, Muhammad J. Thaheem3, Siddra Qayyum4	Journal of Construction Engineering, Management & Innovation	Competitiveness in the construction industry: A contractor's perspective onbarriers to improving the construction industry performance	RG
8R	2015	Kareem, W.A., ,Asa, Olusola Adekunle, ,Lawal, Musediq Olufem	Arabian Journal of Business and Management Review	Resources Conservation and Waste Management Practices in ConstructionIndustry	RG
9R	2018	Gurmu, Argav Tarekegn	Journal of Construction Engineering and Management	Tools for Measuring Construction Materials Management Practices and Predicting Labor Productivity in Multistory Building Projects	RG
5X	2020	Raja K, Murali D	International Journal of Scientific and Research Publications (IJSRP)	Resource Management In Construction Project	o
6X	2021	H Agenbag and C Amoah	IOP Conference Series: Earth and Environmental Science	The impact of modern construction technology on the workforce in the construction industry	o
7X	2022	Babalola I, Aigbavboa C	Business	Evaluating Communication Features of Human Resource Management Practices: The Construction Industry in Lagos	o
8X	2008	Jayakumar Muthuramalingam	Modern Applied Science	Effective Resources Management in Construction Industries for Success	o
9X	2017	Mandal, Satya N Sawhney, Anil Singh, Subhav Dixit, Saurav	Article in International Journal of Civil Engineering and Technology	Area of Linkage Between Lean Construction and Sustainability in Indian Construction Industry	o
10X	2013	Shabnam Yazdani Mehr, Abdelnaser Omran	INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH	EXAMINING THE CHALLENGES AFFECT ONTHEEFFECTIVENESS OF MATERIALS MANAGEMENT IN THE MALAYSIANCONSTRUCTION INDUSTRY	o

Table A: continued

11X		XiangliangFU1,MingmingLIU2,XingshengWANG3,JianYIN4,PingSU5	Research Article	ConstructionTechnologyandInnovationResearchofMunicipalCivilEngineering	o
10R	2017	Mandal, Satya N Sawhney, Anil Singh, Subhav Dixit, Saurav	International Journal of Civil Engineering and Technology	A study of enabling factors affecting construction productivity: Indian scnerio	RG
12X	2021	Anthony Baraka <sup>1</sup> , Dr. Jaya Shukla (PhD)	International Journal of Scientific and Research Publications,	Resource Management Practices And Construction Projects Performance In RwandaCase Of Land Survey Engineering Consultancy Limited	o
13X		PengZhao <sup>1</sup> ,XuliangZhuang <sup>2</sup> ,WenzhongLiu <sup>3</sup> ,BingLiang <sup>4</sup> ,XuanYang <sup>5</sup>	Research Article	AnalysisoftheinnovationofconstructiontechnologyinCivilEngineering	o
11R	2018	Shadrack Mutungi Simon	International Journal of Engineering and Advanced Technology (IJEAT)	Factors Influencing Adoption of Resource Planning by Contractors in theConstruction Industry of Kenya	RG
14X	2005	N.B. Kasim <sup>1</sup> , C.J. Anumba <sup>2</sup> and A.R.J. Dainty	Association of Researchers in Construction Management	IMPROVING MATERIALS MANAGEMENT PRACTICES ON FAST-TRACK CONSTRUCTION PROJECTS	o
15X	2011	Khyomesh V. Patel (PG Student) Prof. Chetna M. Vyas	National Conference on Recent Trends in Engineering & Technology	CONSTRUCTION MATERIALS MANAGEMENT ON PROJECT SITES	o
16X	2017	Nabil Al-Hazim, Zaydoun Abu Salem, Hesham Ahmad	Procedia Engineering	Delay and Cost Overrun in Infrastructure Projects in Jordan	o
12R	2021	Agbeche, Aaron; Moni, Mathew Osedebamhen	International Journal of Trend in Scientific Research and Development	Policy Direction and Resource Management Efficiency in the ConstructionIndustry in Nigeria	RG
13R	2018	Christopher Samuel	Jour of Adv Research in Dynamical & Control Systems	Human Resource Management Challenges in the Indian Construction Industry:A Likert Type Survey based Study	RG
17X	2019	Habeeb Kusimo, Lukumon Oyedele, Olugbenga Akinade, Ahmed Oyedele, Sofiat Abioye, AliratAgboola, Naimah Mohammed-Yakub	World Journal of Science Technology and Sustainable Developmen	Optimisation of resource management in construction projects: a big dataapproach	o
18X	2013	T. Phani Madhavi <sup>1</sup> , Steve Varghese Mathew <sup>2</sup> , Roy Sasidharan	International Journal of Research in Engineering and Technology	MATERIAL MANAGEMENT IN CONSTRUCTION – A CASE STUDY	o
14R	2014	Maciej Pieńkowski	International Journal of lean thinking	Waste Measurement Techniques For Lean Companies	RG

Table A: continued



19X	2017	Thordur V. Fridgeirsson Jerzy Roslon	CONSTRUCTION MANAGERS' LIBRARY	OPTIMISATION OF CONSTRUCTION PROCESSES	o
20X	2018	Akalya.K <sub>1</sub> ,Rex.L.K <sub>2</sub> ,Kamalnataraj.D	IOSR Journal of Engineering (IOSRJEN)	Minimizing the Cost of Construction Materials through Optimization Techniques	o
15R	2018	Fadi A. Karaa. and Anas Y. Nasr,	Journal of Construction Engineering and Management	Resource Management in Construction	RG
21X			PublishedAUBEAPaper	Use of reprocessed in construction industry	o
16R	2013	Ashwini R.Patil, SmitaV.Pataskar	International Journal of Engineering and Innovative Technology(IJEIT)	AnalyzingMaterial Management Techniques on Construction Project	RG
22X	2001	Anna Dubois and Lars-Erik Gadde	Paper for the 17th IMP Conference, 9th-11th September 2001, Oslo, Norway	The Construction Industry as a Loosely Coupled System- Implications for productivity and innovativity	o

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