Nat. Volatiles & Essent. Oils, 2021; 8(5): 12755-12762

NVEO
Natural Volatiles & Essential Oils

Comparitive analysis of inventory control techniques in the construction project.

Joshi B.R.[1], Gupta A. R.[2]

[1]Asst. Prof., S.N.P.I.T.&R.C., Umrakh, Surat

[2]Asso. Prof. S.N.P.I.T.&R.C., Umrakh, Surat

ABSTRACT

Inventory control of material plays a pivotal role in any project. Material inventory control of the construction project is very essential to the completionb of the project and the overall cost of the project. In this research area, the absence of large companies, small local companies are practiced in the field of construction due to this, no proper monitoring occurs on inventory. In this research, two inventory management methods ABC and VED are described which are essential for strong monitoring of the materials. The inventory management is adversely affected by the purchasing cost of materials. Important materials are necessary to keep in stock, in this paper an attempt has been made to categories the material by using ABC and VED analysis. The result showed that both approaches have their limitations and benefits but the VED approach is more effective in material inventory management of a construction project as it also gives weightage to the importance of the materials rather than its quantity.

KEYWORDS:

Inventory management, Construction project, Comparison, ABC, VED

INTRODUCTION

Rational allocation of capital is an essential feature of the execution of all coordinated programs, including construction projects (Aziz and Hafez 2013). The inventory of material of the construction project has a large share of overall costs. Inventory is the main component of the upcoming construction projects, accounting for as many as 50-70 percent of the capital spending. It is also important to maintain inventories adequately and efficiently to prevent needless expenditure in them. Modern companies are extremely competitive and demanding, complete with several uncertainties (Elahi 2013). To survive in these difficult circumstances, businesses need to ensure that the quality of service to both internal and external clients is up to the mark, for which successful inventory control is of the utmost importance. Ordering for surplus stocks will also result in higher operating costs (Fu 2015), financial losses due to stocking and zero stock, referred to as short-term or out-of-stock costs (Chopra and Meindl 2013), will result in loss of sales, loss of loyalty to consumers, loss of manufacturing costs, potential increased costs involved with immediate replenishment, etc. In construction project. it is necessary to use the available funds as economically as possible without affecting the quality of the materials (Senay Atabay and Niyazi Galipogullari 2013).

The ability to guarantee the financial viability of projects with a very dynamic, technical, and sustainable nature can only be accomplished by the availability of resources at the correct place, time, size, consistency, and price (Cubillos 2012). To do this, the project has to adapt effective resource management and inventory control system (Ogbo, Victoria, and Ukpere 2014). It is assumed that more than half of the construction budget is consumed on the procurement of resources and provisions. Construction companies also need to adapt effective inventory management strategies to reduce their costs (Burger and Hawkesworth 2011). Savings of 1% to 2% of these costs will lead to a substantial improvement in efficiency, sustainability, financial success, and competitive advantage (Akadiri, Chinyio, and Olomolaiye 2012). Failure to locate the required components could not be detected in the event of inadequate inventory monitoring. This will lead to complications, losses, and capital wastage and lead to a long-term loss of revenue (Kasim et al. 2012). Therefore, it is necessary, at the outset, to define the quantity of the most expensive material that absorbs the bulk of the budget (Bhattacharya 2014). After that, make a plan for further analysis and build a habit of usage that can help to take effective action. Material inventory control leads to a sound distribution of capital to buy them, having in mind their prices and their criticality (Sharif 2012). Therefore, inventory management methods should also apply.

ABC (Always Better Control) and VED (Vital, Important, and Desirable) analysis are the most commonly used inventory management methods (Devnani, Gupta, and Nigah 2010). ABC and VED analyses are two different types of inventory regulator procedures that focus on the cost and criticality of the materials. ABC research is an effective method for determining products that need better management oversight (Ravinder and Misra 2016). In this study, objects are categorized according to their meaning of significance. In this analysis, three categories are formed. Class A denotes 20 percent of inventory materials, accounting for 70 percent of inventory price, where Class B denotes 30 percent of inventory materials, accounting for 20 percent of inventory price, and Class C denotes 50 percent of inventory materials, accounting for 10 percent of inventory price. The drawback of the ABC study is that it is focused purely on the expense and use of the component and not on its importance (Material 2015). So, if the item has a low price and is required in low quantity but is crucial, it will not appear in category A. While, in VED analyses, based on the criticality of the materials, were also used in the classification of building projects.

Classification of the item helps to define the criticality of the item in the process so that the appropriate quality of service can be preserved without contributing to the expense. It is also imperative for companies to identify inventories for effective inventory storage and monitoring (Aro-Gordon and Gupte 2016). Inventory grouping allows businesses to take decisions on the manufacturing plan (Mpwanya 2005) (e.g. make-to-stock or make-to-order), production and inventory control, and customer service for the whole inventory class rather than for each particular product.

In this research, ABC, and VED, the analysis was conducted in Surat City, India., where lack of corporate culture in the field of construction and general practice is made by small companies. It also classifies materials in groups according to the priority of their requirement which is not practices in this semi-urban area.

The purpose of the analysis was to categorize materials based on cost and criticality factors and to classify those that involve strict management controls. This paper aims to present the categorization of available inventory classification techniques. The paper further highlights some of the methods available in the literature for the classification of inventories which is not practices in this area and not mentioned in the past study. The main objective of this study is 1) To identify the categories of controlled material that need severe organization measure. 2) To identify the material classes needful for better managerial observation to reduce construction cost. 3) Application of inventory regulator methods to analyze the actual requirement of the material at the actual time of construction.

METHODS:

The expense and inventory data for each managed material in the construction project were obtained from the receipt-expenditure registry and a survey through the various stakeholders of the project such as architectures, engineers, site engineers, contractors, and site supervisors.

ABC analysis:

The ABC method for the controlled material involved in the project was undertaken. For this function, the overall cost of each commodity was prepared in descending order. The total price of materials was estimated. The combined ratio of investment and the accumulative amount of the materials have been calculated and were subdivided into three categories: class A, class B, and C based on a gross price ratio of 70, 20, and 10% respectively (Kecerdasan and Ikep 2008).

VED analysis:

The VED analysis of entire materials as carried out by categorizing it in the Vital (V), Essential (E), and Desirable (D) categories. The final list of materials arranged based on criticality by experts was tested for competitiveness in classification.

RESULT AND DISCUSSION

SURVEY RESPONSE:

A survey form was distributed to the stack-holders of the construction project such as contractors, workers, engineers, site engineers, and site supervisors. More than 100 survey form was distributed among them. Respond to the survey form was collected and shown in Figure 1. The data was then analyzed in an MS Excel sheet. Mathematical analysis has been carried out using the functions of MS

Excel. It was noted that a total of 104 respondents were collected, of which 42 were mechanics, 17 were contractors, 15 were site engineers, 20 were architects and 35 were supervisors.

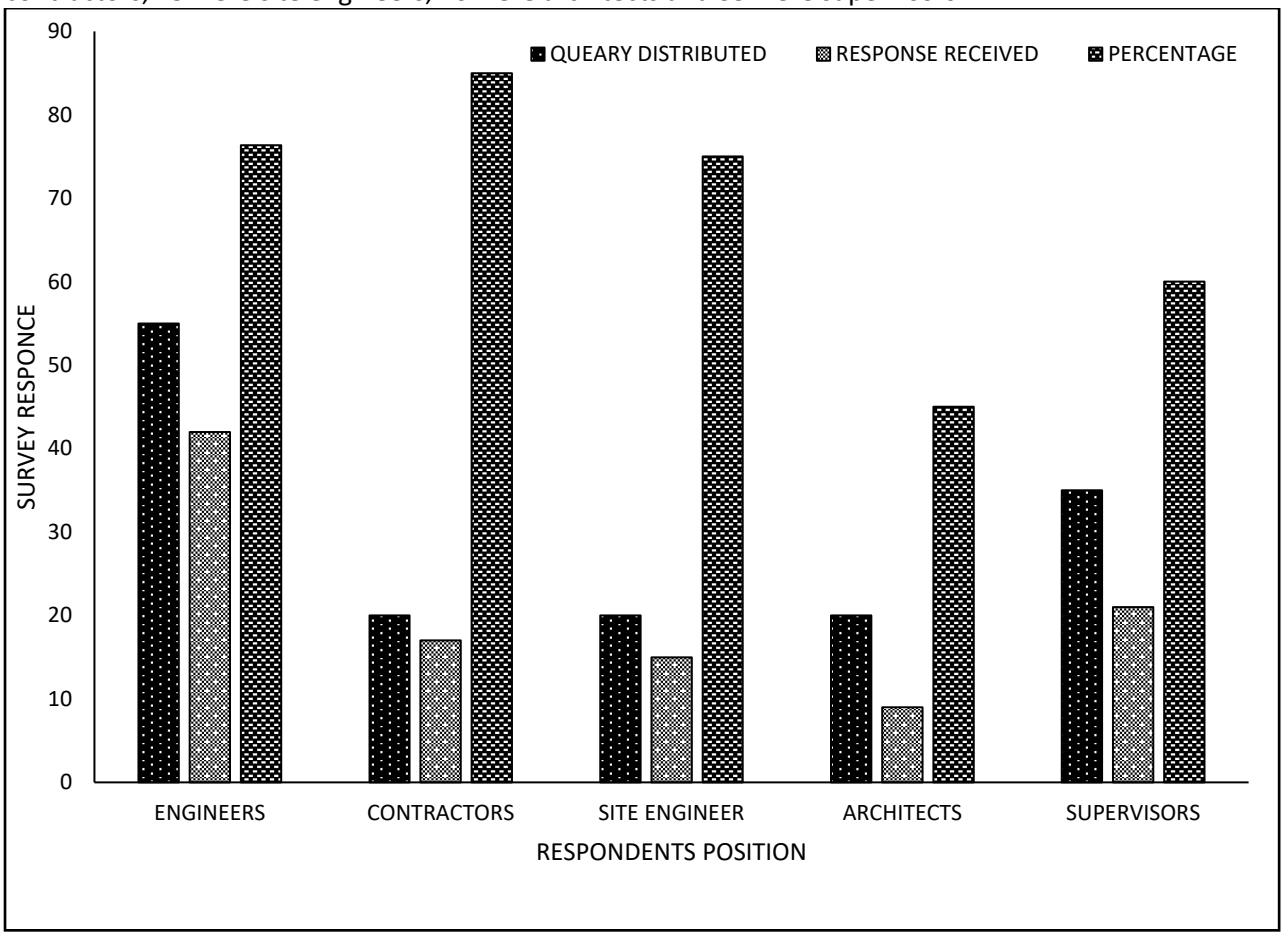

Figure 1 Survey response

ABC ANALYSIS:

n this technique, ac classification was carried out based on cost, therefore, it helps in the construction of building to categorized items of inventory based on cost (Figure 2).

Under this method, we classified the inventory list as subdivided into three more categorized based on 70%, 20%, and 10% ratios as Class A, Class B, and class C (Table 1). These categories were based upon the inventory value and cost impact. It is found that a total of 2 numbers of material come underclass "A" whereas total 2 numbers of material come in class "B" while 3 no. of the material comes in class "C"

Table 1 Reclassified material as per cost and consumption

MATERIAL	RANK	% of TOTAL COST	% CUMMILITATIVE	CLASS
Steel	1	42.22	42.22	A
Cement	2	24.02	66.24	A
Coarse Aggregate (20 mm)	3	10.47	76.71	B
Lime	4	10.32	87.03	B
Sand	5	7.55	94.58	C
Coarse Aggregate (10 mm)	6	3.06	97.64	C
Brick	7	2.36	100.00	C

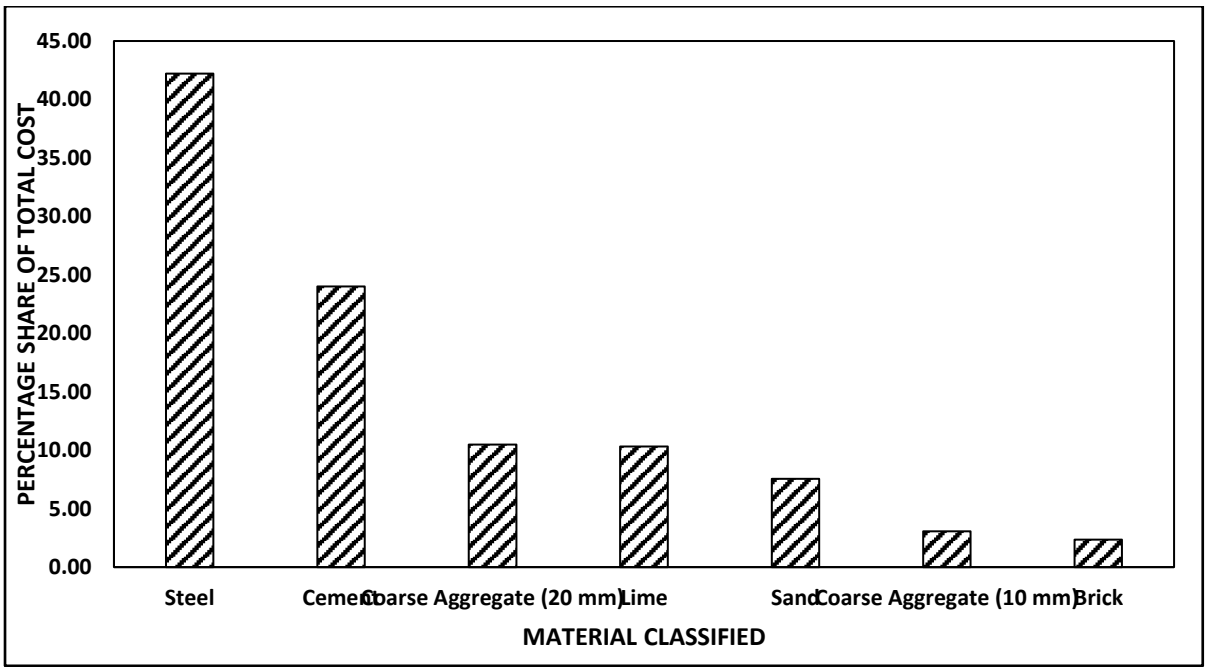

Figure 2 Classification of Material as per the ABC method

Also, the number of items and values of each class is expressed as a percentage of the total. The material Furthermore, classified classes (A, B, and C) have been scaled (Figure 3) for comparison with another method (Table 2).

Table 2 Scaling of material as per the ABC method.

CATEGORIZED	NO. OF ITEM	PERCENTAGE (%)	SCALING
A	2	70	50%
B	3	20	30%
C	3	10	20%

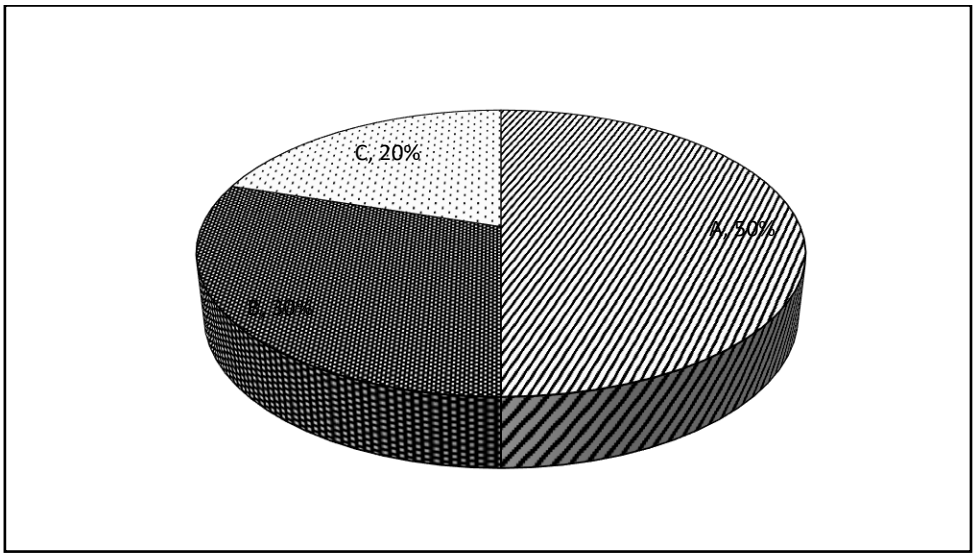

Figure 3 Scaling percentage of classified ABC classes.

VED ANALYSIS:

Materials required for the project and those that must be available at all times in adequate quantities have been included in class V. Materials with a lesser criticality required but must be available in the store have been involved in class E. The remaining materials with the lowest criticality, the shortfall of which would not be a delay in the project, were included in class D. The VED classification of each material was addressed with reason in survey questionnaires.
It was found that Cement and steel come in in V (Vital) category while Sand and aggregates fall in the E (Essential category) and lime and bricks have come in D (Desirable) category (Table 3).

Table 3 VED classification of the materials

V (VITAL)	E (ESSENTIAL)	D (DESIRABLE)
Cement	Sand	Lime
Steel	Coarse aggregate 20 mm	Brick
	Coarse aggregate 10 mm	

The material Furthermore, classified classes (V, E, and D) have been calculated for the cumulative percentage of consumption (Figure 4) and scaled for the comparison with another method (Table 4).

Table 4 Scaling of material as per the VED method

CATEGORIZED	NO. OF ITEM	PERCENTAGE (%)	% CUMMILITATIVE	SCALING
V	2	28.57	28.57	50%
E	3	42.85	71.42	30%
D	2	28.58	100	20%

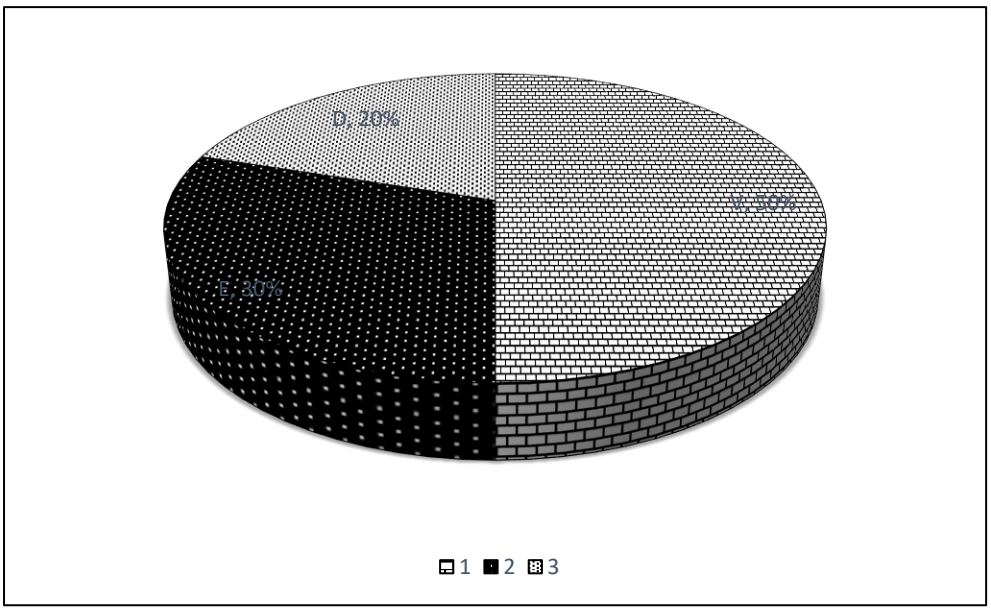

Figure 4 Scaling as per VED analysis

A statically, analysis of the scale percentage of both the methods have been compared as per the weighted scoring method and found that the "VED" method gained comparatively more weighted with compared to the "ABC" method. But practically it is found that both the methods are in practice in the actual field.

Table 5 Weighted Scoring method

Building 1	**50%**	**30%**	**20%**	**WEIGHTED SCORING**
ABC	2	2	3	2.2
VED	2	3	2	2.3

CONCLUSION:

Stock recognition plays a crucial role in having the company recognize products that are vital to its smooth operation and even in optimizing order and inventory costs. Although single criterion-based inventory classification is simple to conduct, it is not as effective and thorough as multi-criteria-based inventory classification, which considers multiple variables that could influence inventory either in isolation or in tandem.

In this research, we have demonstrated that inventory analysis has a significant role in controlling the inventory in a construction project. The better use of inventory models decreases the cost of the project. The present study examined two inventory control models: ABC, and VED. The ABC model is based on the Pareto principle and is widely used in the world. It classifies materials according to their cost in descending order where few items consume the majority of the project's budget. The analysis revealed that 2 materials account for 70 % of the total cost but no mention of the functional importance of these materials. To overcome this issue, it was necessary to apply the VED analysis because it considers the functional importance of the material. Here, the analysis revealed that 2 materials were essential and account for 70 o% of the total cost, which means that the majority of the financial resources are allocated to this class of materials.

Inventory of ABC and VED analysis can determine the primary requirement of the construction project. Thus, the results of this study are used as recommendations for the management of the construction project. For its implementation, it can be done by programs related to providing education. Finally, this study includes the use of inventory resources for the accurate and productive management of the elderly growth program, effective prioritization, purchasing decision-making, and close control of products belonging to main categories. It has been found that both methods have their benefits and limitations but VED analysis is more effective works in construction projects as it also deals with the importance of the material rather than the quantity of the materials.

The paper discusses the application and use of selective inventory management methods in the construction project. The research was performed in the city of Surat with the aid of several architects, site engineers, contractors, and supervisors. From the literature, it is understood that many old businesses face severe inventory issues. Significant issues are attributed to the shortage of modern technology in the material management system and the scarcity of qualified workers in the absence of MNCs in the construction industry in the city of Surat. Since the infrastructure is outdated, there are high inventory issues. The present review indicates that a structured approach has been implemented to recognize the issues of inventory management in the construction project and a few recommendations are proposed to strengthen the current inventory management system. The computer software is designed to measure the probabilistic demand and lead time for the re-order stage. Thus, by using this approach (ABC or VED method), potential demand and lead time uncertainties can be estimated with an optimal order quantity and a minimum overall cost.

ACKNOWLEDGEMENT:

The authors are very much thankful to the architects, engineers, site engineers, contractors, and supervisors who have actively participated and give their valuable feedback for conducting this research.

References:

1. Akadiri, Peter O., Ezekiel A. Chinyio, and Paul O. Olomolaiye. 2012. "Design of a Sustainable Building: A Conceptual Framework for Implementing Sustainability in the Building Sector." *Buildings* 2 (2): 126–52. https://doi.org/10.3390/buildings2020126.
2. Aro-Gordon, Stephen, and Jaideep Gupte. 2016. "Contemporary Inventory Management Techniques: A Conceptual Investigation." *International Conference on Operations Management and Research: "Towards Operational Excellence,"* no. January: 20. https://www.researchgate.net/profile/Stephen_Aro-Gordon/publication/292233793_Contemporary_Inventory_Management_Techniques_A_Conceptual_Investigation/links/56ac408108ae43a39809df8e/Contemporary-Inventory-Management-Techniques-A-Conceptual-Investigation.pd.
3. Aziz, Remon Fayek, and Sherif Mohamed Hafez. 2013. "Applying Lean Thinking in Construction and Performance Improvement." *Alexandria Engineering Journal* 52 (4): 679–95. https://doi.org/10.1016/j.aej.2013.04.008.
4. Bhattacharya, Sanjoy. 2014. *Consolidating Strengths*. *Medical History*. Vol. 59. https://doi.org/10.1017/mdh.2014.75.
5. Burger, Philippe, and Ian Hawkesworth. 2011. "How To Attain Value for Money : Comparing PPP and Traditional Infrastructure Public Procurement By." *OECD Journal on Budgeting* 2011 (1): 1–56.
6. Chopra, Sunil, and Peter Meindl. 2013. *Supply Chain Management, 5th Edition*.
7. Cubillos, Javier Mejıa. 2012. "Sustainability; A New Element of Project Success"." *Mpra*, no. 35423: Paper No. 40041, posted 17.
8. Devnani, M., A. K. Gupta, and R. Nigah. 2010. "ABC and VED Analysis of the Pharmacy Store of a Tertiary Care Teaching, Research and Referral Healthcare Institute of India." *Journal of Young Pharmacists* 2 (2): 201–5. https://doi.org/10.4103/0975-1483.63170.
9. Elahi, Ehsan. 2013. "Risk Management: The next Source of Competitive Advantage." *Foresight* 15 (2): 117–31. https://doi.org/10.1108/14636681311321121.
10. Fu, Mengying. 2015. "Inventory Optimization Based on Purchasing Activities Analysis," no. May.
11. Kasim, Narimah, Siti Radziah Liwan, Alina Shamsuddin, Rozlin Zainal, and Naadira Che Kamaruddin. 2012. "Improving On-Site Materials Tracking for Inventory Management in Construction Projects." *Conf. of Technology Management, Business and Entrepreneurship* 2012: 447–52.
12. Kecerdasan, Inventori, and Pelbagai Ikep. 2008. "Research Review on Activity-Based Costing System (ABC): ABC's Development, Applications, Challenges, and Benefits," 6.
13. Material, Study. 2015. "Cost and Management Accounting (Module 1, Paper 2)." *THE INSTITUTE OF Company Secretaries of India*, 603.

14. Mpwanya, Musenga Francis. 2005. “Inventory Management as a Determinant For Improvement of Customer Service,” no. 7: 147. Ogbo, Ann I., Onekanma Ifeyinwa Victoria, and Wilfred I. Ukpere. 2014. “The Impact of Effective Inventory Control Management on Organisational Performance: A Study of 7up Bottling Company Nile Mile Enugu, Nigeria.” *Mediterranean Journal of Social Sciences* 5 (10 SPEC. ISSUE): 109–18. https://doi.org/10.5901/mjss.2014.v5n10p109.
15. Ravinder, Handanhal V., and Ram B. Misra. 2016. “ABC Analysis For Inventory Management: Bridging The Gap Between Research And Classroom.” *American Journal of Business Education (AJBE)* 9 (1): 39–48. https://doi.org/10.19030/ajbe.v9i1.9578.
16. Senay Atabay, and Niyazi Galipogullari. 2013. “Application of Value Engineering in Construction Projects.” *Journal of Traffic and Transportation Engineering* 1 (12). https://doi.org/10.17265/2328-2142/2013.12.005.
17. Sharif, K. 2012. “An Optimal Inventory Control Planning for an Indian Industry : An Analysis.” *Iieom.Org*, 129–38. http://iieom.org/ieom2012/pdfs/41.pdf.