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Performance Analysis of Inventory Management System in Construction Industries in India

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Abstract: Inventory management system involves procurement, storage, identification, retrieval, transport and construction methods. Each is indelibly linked to safety, productivity and schedule performance. The main objective of the study is to analyse the inventory management control adopted and the effective utilization of inventory at the construction site. The first part based on conducting questionnaire survey in various construction companies. In second part, analysing those results by using Statistical Package for Social Sciences SPSS. ABC analysis is one of the conventionally used approaches to classify the inventories and the case study of a company is collected. The model can deal with both uncertain demand and availability of supply. These findings may mainly reflect the main factors that will affect the inventory management system which able to achieve the improved efficiency of project management and to reduce the waste of materials in the respective region of construction industries.

Keywords: Inventory, SPSS, Uncertain Demand, Availability of Supply.

I. INTRODUCTION

The term inventory refers to the goods or materials used by a firm for the purpose of production and sale. It also includes the items, which are used as supportive materials to facilitate production. Nearly 60% of money is allotted for the inventory in a project. Inventory constitutes one of the important items of current assets, which permits smooth operation of production and sale process of a firm. Inventory management is that aspect of current assets management, which is concerned with maintaining optimum investment in inventory and applying effective control system so as to minimize the total inventory cost.

Materials Management is related to planning, procuring, storing and providing the appropriate material of right quality, right quantity at right place in right time so as to co-ordinate and schedule the production activity in an integrative way for an industrial undertaking. Inventory Management is simply the process by which an organization is supplied with the goods and services that it needs to achieve its objectives of buying, storage and movement of materials. Inventory is seen as incurring costs, or waste, instead of adding and storing value, contrary to traditional accounting. Just in time (JIT) is a production strategy that strives to improve a business' return on investment by reducing in-process inventory and associated carrying costs.

II. LITERATURE REVIEW

Q. Feng, G. Gallego,et.al [2] had done a Periodic-Review Inventory Model with three consecutive delivery modes and forecast updates. This paper is concerned with a periodic-review inventory system with three consecutive delivery modes (fast, medium, and slow) and demand forecast updates. At the beginning of each period, the inventory level and demand information are updated and decisions on how much to order using each of the three delivery modes are made. It is shown that, there is a base-stock policy for fast and medium modes which is optimal. Furthermore, the optimal policy for the slow mode may not be a base-stock policy in general. **Ali Roozbeh Nia, et.al** had done a investigated report on Vendor Managed Inventory Application in Supply Chain:The EOQ Model with Shortage.This study considers the retailer–supplier partnership through a vendor managed inventory (VMI) system and develops an

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analytical model to explore the effect of important supply chain parameters on the cost savings realized from collaborative initiatives. A model was developed for a two-level supply chain consisting of a single supplier and a single retailer and examines the inventory management practices before and after implementation of VMI. Three numerical examples are also given to support this claim. **Gulsen Aydin Keskin and Coskun Ozkan** [4] had found a multiple criteria ABC analysis with FCM clustering. The number of stock keeping units (SKUs) possessed by organizations can easily reach quite a few. An inventory management policy for each individual SKU is not economical to design. ABC analysis is one of the conventionally used approaches to classify SKUs. In the classical method, the SKUs are ranked with respect to the descending order of the annual dollar usage, which is the product of unit price and annual demand. the few of the SKUs that have the highest annual dollar usage are in group A and should be taken into account mostly; the SKUs with the least annual dollar usage are in group C and should be taken into account least; the remaining SKUs are in group B. In this study, we proposed fuzzy c-means (FCM) clustering to a multicriteria ABC analysis problem to help managers to make better decision under fuzzy circumstances. The obtained results show that the FCM is a quite simple and an easily adaptable method to inventory management. **Narimah Kasim** [10] has focussed on ICT Implementation for Materials Management in Construction Projects: Case Studies.The findings from the case studies reveal that the implementation of ICT in the materials management processes for construction projects in Malaysia is at early stage. Microsoft Excel Spreadsheet and handheld devices are found to be the common ICT tools adopted in the materials management processes. The main barrier is found to be the cost involvement at the initial stage or overall implementation of ICT in the materials management processes.

III. SCOPE OF IMS

This concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting and also by replenishment or can be defined as the left out stock of any item used in an organization.

IV. DETERMINATION OF REORDER LEVEL

Reorder level is that level of inventory at which the firm should place an order to replenish the inventory. The term lead time refers to the time normally taken in receiving the delivery of inventory after the order has been placed. The re-order level can be determined by the following formula:

Re-order level=average usage* lead time

The formula for determining the re-order level when safety stock is maintained will be as follows:

Re-order level = lead time * average usage + safety stock

V. OBSOLETE INVENTORY AND SCARP ITEMS

An inventory becomes obsolete because of changes in product design or because of technological change. Obsolescence cannot be controlled without a proper identification of inventories which might become obsolete form time to time. No manufacturing system can be percent efficient; there is bound to be some scrap. The quality of scrap can be minimized by adopting corrective measures and by proper maintenance of machines.

VI. RESEARCH METHODOLOGY

Research methodology can be defined as systematic and purposive investigation of facts with an objective determining the effective relationship among such facts and research between two or more phenomena. The questionnaire survey method was administered to collect data.

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The respondent have been ask to express their opinion on the variable at 5-point scale, ranging from strongly agree to strongly disagree. Furthermore the questionnaire item drawn from different sources and condent validity of the questionnaire has been checked by consulting with experts and a modification has been made in the questionnaire to suit the requirement of the study. This study was conducted during the period of January 2014 to march 2014. The researcher adopted random sampling data method to collect data. The total samples collected by the researcher were 138.Based on the response received from the construction industries, the desired objective can be obtained by sequencing the flow of work into a typical methodology and the data were analysed using SPSS 16.

VII. FACTORS IDENTIFICATION

There are some factors which influence inventory management system. These factors were identified based on literature study .

Literature study was conducted to

- To consider factors from recent researches
- To know how other researchers conducted their study over inventory

To identify reason for considering factors.

These factors are considered as the variables

- To identify the need for stock/inventory
- To analyse the importance of keeping inventory
- To identify the cost allocation for inventory

VIII. ANALYSIS OF DATA

The literature survey gives an idea about the different techniques that are used for the inventory management system in construction companies. From the extensive literature study it is much clearer to formulate the objective of the present study and contribute directly for successful completion of the project. In particular, researches were conducted to small extent to explore about inventory management in construction projects. This causes impact on performance of the inventory management. To yield a desired performance, it is necessary to ensure the project work effectively. Questionnaire survey was conducted among construction professionals to identify their opinion towards inventory management system in their organization. The obtained data is analysed to find out the frequency of response for various factors.

The risk factor were generated based on extensive literature review especially the work of Narimah Kasim [10] Gulsen Aydin Keskin and Coskun Ozkan [4] Q. Feng, G. Gallego,et.al [2]

TABLE 1
VARIOUS VIEWS FOR THE STUDY ON IMS IN CONSTRUCTION INDUSTRIES

1	Accepting goods before scheduled date	19	Managing stock in growth of company
2	Active suppliers in master supplier file	20	Method of categorising the items
3	Categories of professionals for managing	21	Need for stock management
4	Change order affects material quantity and quality	22	percentage of amount invested in stock management
5	Control in stock overflow in construction site	23	Physical inventory checks
6	Criteria maintained for stock materials	24	Price difference in the receipt & procedure to reconcile
7	Data related to inventory	25	Provisions made for obsolete and inactive item
8	Distance from project site to storage yard	26	Purchase order
9	Effects of material quantity variation in site	27	Receiving materials than ordered
10	Emphasis on software than skilled manpower	28	Reorder point
11	Future of inventory management system	29	Safety stock in planning calculation
12	Growth of company by managing stock	30	Selection of vendor
13	Importance to stock comparing other works	31	Storing of stock
14	Inspection in goods arrival	32	Training for stock management practices
15	Involvement of contractor in material management	33	Type of cross check

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16	Kind of material stock maintained in greater quantity	34	Type of material access available for stock data
17	Maintaining safety in storing	35	Type of stock management system adopted
18	Major benefits of inventory management	36	Long lead items

The data are entered in SPSS 16. Reliability analysis and the cronbach alpha value allows to study the properties of measurement scales and the items that compose the scales. Reliability is concerned with the extent to which any measuring procedure yields the same results on repeated trials. Chronbach's alpha is designed as a measure of internal consistency. A rule of thumb that applies to most situation is alpha greater than 0.7. The chronbach's alpha for this research is 0.832, where number of Cases = 138 and number of Items = 36. So, the research is an acceptable one.

TABLE 2
RELIABILITY STATISTICS

Cronbach's Alpha	N of Items
.832	36

KMO & Bartlett's Test of Sphericity is a measure of sampling adequacy that is recommended to check the case to variable ratio for the analysis being conducted. In most academic and business studies, KMO & Bartlett's test play an important role for accepting the sample adequacy. While the KMO ranges from 0 to 1, The Kaiser-Meyer-Olkin measure of sampling adequacy is an index for comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients

The generated score of KMO is 0.859, reasonably supporting the appropriateness of using factor analysis. As per Kaiser Level, 0.859 is middling, almost meritorious. Significance value of Bartlett's test of sphericity <0.05 indicates that these data are approximately multivariate normal and acceptable for factor analysis.

TABLE 3
KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.859
Bartlett's Test of Sphericity	Approx. Chi-Square	2.141E3
	df	595
	Sig.	.000

IX. RESULT AND DISCUSSION

The factor analysis is carried out through principal components method with varimax rotation and the mean values are calculated. From this all factors are ranked.

TABLE 4
FACTORS MEAN VALUE AND THEIR RANKING

Factors	Mean Value	Ranking/Priority
Involvement of contractor in material management	3.98	1
Need for stock management	3.92	2
Managing stock in growth of company	3.82	3
Importance to stock comparing other works	3.80	4

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Maintaining safety in storing	3.76	5
Safety stock in planning calculation	3.72	6
Change order affects material quantity and quality	3.63	7
Emphasis on software than skilled manpower	3.62	8
Accepting goods before scheduled date	3.61	9
Data related to inventory	3.19	10
Selection of vendor	2.97	11
Purchase order	2.76	12
Receiving materials than ordered	2.54	13
percentage of amount invested in stock management	2.36	14
Control in stock overflow in construction site	2.33	15
Provisions made for obsolete and inactive item in inventories	2.28	16
Growth of company by managing stock	2.25	17
Criteria maintained for stock materials	2.23	18
Price difference in the receipt and procedure to reconcile	2.22	19
Major benefits of inventory management system in an organization	2.19	20
Reorder point	2.13	21
Categories of professionals are managing your company stock	1.94	22
Future of inventory management system in your company	1.87	23
Inspection in goods arrival	1.84	24
Active suppliers in master supplier file	1.74	25
Physical inventory checks	1.70	26
Method of categorising the items	1.68	27
Storing of stock	1.62	28
Effects of material quantity variation in site	1.62	29
Type of material access available for stock data	1.60	30
Kind of material stock maintained in greater quantity	1.59	31
Distance from project site to storage yard	1.54	32
Type of cross check	1.30	33
Type of stock management system adopted	1.28	34
Training for stock management practices	1.23	35
Long lead items	1.18	36

Table 4 shows that tangibility related variables rated highest for actual service perceived in construction sites

X. CONCLUSION

Based on the analysis, the result shows that below points were focused mainly in Construction Industries

- ✓ Involvement of contractor in material management
- ✓ Need for stock management
- ✓ Managing stock in growth of company
- ✓ Importance to stock comparing other works
- ✓ Maintaining safety in storing

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Finally, Inventory management system is considered to perform a key role in an organization, which is responsible to complete the company's project in a specific budget within a certain period of time. It is very clear that inventory management of any construction will undergo intense stress in their work environment.

Few main inventory management risk were being identified in construction industries in India and are summarised below

- Lack of storage space
- Problems with de-centralised processing
- Inadequate training practices
- Improper Financial support in ordering of materials
- Difficulty in delivery of long lead materials

Thus, Proper preventive measures like JIT, Supply chain management system concept along with lean production system will be suggested to overcome impacts in inventory management system to improve the productivity in construction projects.

XI. SCOPE OF FUTURE WORK

The purpose of this future study is to make sure the application of Just In Time (JIT) concept at construction industry. This would discuss about the results of the analysis according to the objective and problem statement before and after the application of JIT. The discussion would focus in certain case at inventory stock and relationship between vendors and contractors.The implementation of (JIT) concept helps the construction industries to improve their productivity and also in reduction of material waste.

REFERENCES

[1] A. K. Datta, "*Materials Management: Procedures, text and cases, Rev. Ed.*", New Delhi: Prentice-Hall, 1992.
[2] Q. Feng, G. Gallego,et al., "Periodic-Review Inventory Model with three consecutive delivery modes and forecast updates": Journal of Optimization Theory and Applications in – Journal of Optimization Theory Application , vol. 124, no. 1, pp. 137-155, 32 .2005.
[3] C. T. Formoso, L. S. M. ASCE, C. De Cesare, and E. L. Isatto, "Materials waste in building industry: Main causes and prevention", *Journal of Construction Engineering and Management*, vol. 128(4), pp. 316-325, 2002.
[4] Gulsen Aydin Keskin and Coskun Ozkan ," Multiple criteria ABC analysis with FCM clustering". Journal of Industrial Engineering, Volume, Article ID 827274, pp. 1- 7, 2013.
[5] Horman, M. and Thomas, H, "Role of Inventory Buffers in Construction Labor Performance". Journal of construction engineering management. Vol 131(7), pp.834–843. 2005.
[6] N. B. Kasim, C. J. Anumba, and A. R. J. Dainty, "Improving materials management practices on fast-track construction projects", *21st Annual ARCOM Conference, 7-9 September 2005*, SOAS, University of London, vol. 2, pp. 793-802, 2005.
[7] Kalpakam.S "a lost sales inventory system with supply uncertainity"computers mat Application vol.33, no.3, pp.81-93. 1997.
[8] Min-Chun Yu, "Multi-criteria ABC analysis using artificial-intelligence-based classification techniques". Department of Business Administration, Elsevier journal eswa Vol.177(1): pp 344- 353. 2011.
[9] Musara Mazanai "Impact of just-in-time (JIT) inventory system on efficiency, quality and flexibility among manufacturing sector, small and medium enterprise (SMEs) in South Africa" African Journal of Business Management Vol. 6(17), pp. 5786-5791.2012.
[10] Narimah Kasim "ICT Implementation for Materials Management in Construction Projects: Case Studies" KICEM Journal of Construction Engineering and Project Management Online ISSN .Vol 6.pp 22-33. 2011.
[11] R. Navon and O. Berkovich, "An automated model for materials management and control", *Journal of Construction Management and Economics*, vol. 24(6), pp. 635-646, 2005.
[12] V. Prabu and M. Baker, "*Materials Management*" UK: McGraw-Hill, 1986.
[13] Safak KIRI,S, "multi-criteria inventory classification by using a fuzzy analytic network process (ANP) approach". INFORMATICA, Vol. 24, No. 2, pp.199–217, 2013.
[14] M. M. M. Teo and M. Loosemore, "A theory of waste behaviour in the construction industry", *Journal of Construction Management and Economics*, vol. 19(7), pp. 741-751, 2001.
[15] Tanthatemee T., Phruksaphanrat B , "Fuzzy Inventory Control System for Uncertain Demand & Supply". IAENG proceedings of the international multi conference of engineers and computer scientists , Vol II , pp. 7-9,2012.
[16] Zhang jing-wen,CI Tie-jun , "the research improving ABC classification of inventory management based on AHP",IEEE journal ,Vol 9,pp-1-4 ,2009.
[17] M. Zakeri, P. Olomolaiye, G. D. Holt, and F. C. Harris, "A Survey of constraints on Iranian construction operatives' productivity" *Journal of Construction Management and Economics*, vol. 14, pp. 417-426, 1996.