RELEVANCE OF MATERIALS MANAGEMENT IN VALUE CHAIN

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ABSTRACT

This paper aims to examine the framework of materials management (MM) in material planning, handling, cost control, and quality assurance (QA). Moreover, the factors of QA were identified which affect the organization. The study also focuses on the impact of productivity, cost, and efficiency on MM and QA of the value chain.A total sample of 96 respondents were interviewed with a structured questionnaire. The responses captured were analyzed by using regression to frame the understanding and predict the impact. The results highlighted that MM is a function of QA, Cost Reduction(CR), Better Material Handling(BMH), and Efficient Materials Planning(EMP) which means organizations should focus on these parameters to have an effective MM framework in place. The results also signify that QA is a function of Process Approach(PA), Inspection(INPS), and Inventory Management(INVM) which means the quality of the resources maintained at the organization level would improve. The study has uncovered the various issues and the benefits that the companies are facing thereby providing insight to the managers, policymakers, and other related members of the manufacturing units.

Keywords: Materials Management, Efficient Materials Planning, Cost Reduction, Better Material Handling, Quality Assurance, Inventory Management.

INTRODUCTION

The objective of material management (MM)is to guarantee that the resources of the organization should be available on time, and it does not obstruct the flow of the process. If the process getsimpeded than the overall production will be affected, and it also affects the efficiency and productivity of the organization. At the same time cost overrun may also occur. Therefore, the major role of the ideal MM system is to certify that the resources used for the process should of appropriate quality and quantity. Also ensures the purchasing, transportation, and management of the resources judiciously and cost-effectively (Edike, 2021).MM is the coordinating function wherein the material flow planning and control (MFP&C) is done. The MFP&C ensures that the production process should not be interrupted and the availability of the resources as and when required should be properly managed ina well-coordinated manner (Stock & Lambert, 2001). Purchasing, distribution, handling, and waste minimization are thus important aspects of MM to assure quality, quantity, and timeliness. Materials must be purchased in the appropriate quantity, time, quality, and at an acceptable price for efficient materials flow (Arnold and Chapman, 2004). The overall concept for aMM system that merged and integrated the activities of material requisition, vendor appraisal, buying process, warehousing, and distribution. The method increased worker efficiency, decreased material surplus, enhanced MM, and lowered manpower costs. The computerized materials management and control strategy proved have a number of advantages. To name a few, it resulted in providing information

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regarding stockpiles, saves time in MM and access to current and updated information (Navon and Berkovich. 2006). One of the important elements of MM is managing and controlling. Tompkins and White (1984) described effective material handling as "using the right method in providing the right amount of the right material, at the right place, time, sequence, position, condition, and cost". Productivity of the organization gets affected, if proper the MM is not in right place (Kaming, et al. 1997). At the same time the cost increases and affects the efficiency and performance of the organization. The achievement of the organization largely depends on the effective MM with respect to cost, quality, and time management (Alabi et al., 2018). On the above pretext, the study is designed to understand the relevance of MM in the value chain with respect to cost, productivity, and efficiency.

LITERATURE REVIEW

Each firm in the supply chain has an influence on the performance of the others in the chain, both directly and indirectly (Mentzer et al., 2001). A complete categorization based on the four aspects "provider, process, place and customer" are the parts of the total value chain (Cook et al, 1999). Beekman-Love and Nieger(1978) described the MM as "the process of effectively using facilities, workers, resources, and capital by planning, procuring, storing, transferring, and regulating materials". In this perspective, MM is the absolute antithesis of Physical Distribution Management. It includes controlling the flow of materials from the supplier market into the company. (Farmer, 1977).The goal of MM is to properly control the flow of materials. It also investigates the process of getting the appropriate materials to the right location at the right moment to keep a desired quantity finished product at minimum cost. The process of MFP&C generally starts with requisition of material received from the production department and then followed by vendor selection and finalization to procure the order and ensures that it reaches the required department to be used. The whole purpose of MM is to ensure smooth flow of material.The MM framework should be arranged in such a way that it allows for comprehensive MFP&C to maximize resource utilization and save costs (Beekman-Love and Nieger, 1978). MM systems should be developed to prepare, order, inspect supplies, store, control the usage of goods, and pay for supplies (Dey, 2001). The material handling (MH) is a significant dimension in MM, where the design of the flow of the materials is critical factor (Asef-Vaziri & Laporte , 2005).The MH of the organization includes the flow of the resources internally as well as externally of the manufacturing unit. A better MH system ensures smooth flow of resources and can act as unique point of the organization to maintain its competitive edge. It helps to overcome the delay in the process and the logistic obstacles in the value added and non-value-added activities in the MM (Naim, 1994).Another significant dimension in MM is the inventory management wherein the customers' specialized needs to be delivered in time by the manufacturing plant to reduce inventory levels and space requirements (Fugate et al., 2009).In the proper implementation of the inventory management, the organization encounters the challenges such as maintaining the flow of resources at a proper pace in the manufacturing process which is going to meet the expected satisfaction level at a low cost. The MM framework includes material planning and scheduling, inventory management, quality to name a few (Abdul Rahman et. al, 1994).Cost reduction is another important aspect of MM (Schroeder al, et., 1986; Alabi et al., 2018). To setup the MM process, it involves certain investment and cost (Aiyetan, 2013). Kasim (2008) investigated some of theparameters of MM, which includes, material planning, handling, cost, and inventory management. The Just in time (JIT) method of inventory

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management ensure that their systems are adaptable and receptive enough to deal with the uncertainty as when encounter by the organization (Wilding, 1998). The MM in the manufacturing industries the capital-intensiveis responsible for maximization of performance (Mitchelson, 1992).

The review of the literature provides insight into understanding the MM framework for manufacturing companies. The objectives of the study were defined as follows:

- To evaluate the framework of MM concerningmaterial planning, handling, cost control, and quality assurance.
- To determine the quality assurance (QA) factors affecting the organization.
- To understand the impact of productivity, cost, and efficiency on MM and QA of the value chain.

METHODOLOGY

To measure the impact of productivity, cost and efficiency relationship with MM and QA in value chain, the variables of MM and QA are obtained from the support of the above literature review.

The research was designed with a structuredquestionnaire in three parts, where 16 manufacturing firms participated. A total sample of 96 employees working in these companies in the MM department were interviewed with a structured questionnaire.We received useable questionnaires of 94 out of which 82 percent was male respondents and 18 percent were female. The respondents between 36 and45 years were about 51 percentand those aged 46 years and abovewere 20.2%. The respondents aged between 26 and 35 years were 25.8 percent,and the remaining were aged 18–25years. To test the reliability, the Cronbach's alpha reliability test is applied.The alpha score of 0.7 is adequate to proceed to the next level of analysis (Cronbach, 1951). The conceptual model to prove the relevance of MM in improving the productivity, cost, and efficiency of the value is presented in figure 1.

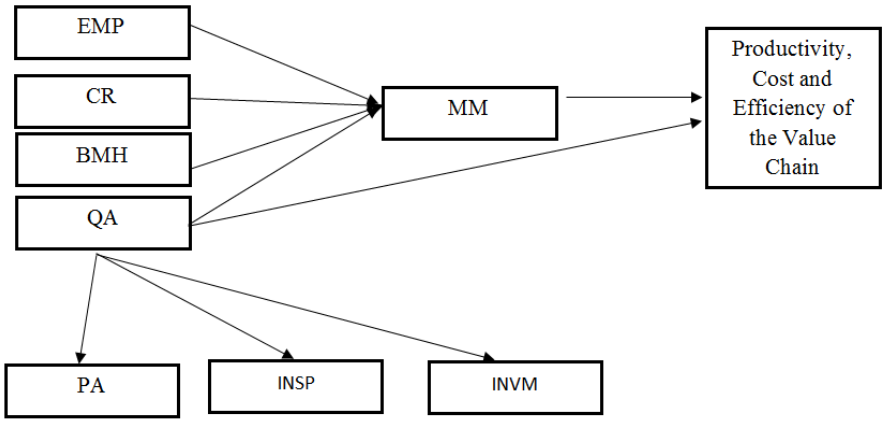

FIGURE 1
CONCEPTUAL MODEL

The variables used in the study are listed in table 1 with the source.

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Table 1 LIST OF VARIABLES		
Variable	**Acronym**	**Source**
Materials Management	MM	Beekman-Love and Nieger(1978); Farmer (1977)
Efficient Materials Planning	EMP	Rahman et. al, (1994); Kasim (2008)
Cost Reduction	CR	Aiyetan(2013); Schroeder al, et. (1986); Alabi et al. (2018)
Better Material Handling	BMH	Kasim (2008); Asef-Vaziri & Laporte (2005)
Quality Assurance	QA	Dey (2001)
Process Approach	PA	Naim (1994)
Inspection	INSP	Dey (2001)
Inventory Management	INVM	Rahman et. al, (1994); Kasim (2008); Fugate et al. (2009)

RESULTS AND DISCUSSION

The table 2 indicates the result of the reliability test, where the alpha coefficient value is 0.839, which is adequate to proceed to the next level of analysis (Hair, 2007).

Table 2 TEST OF RELIABILITY	
Cronbach's Alpha	Number of Items
0.839	39

Source: Author.

The first level analysis was carried out to evaluate the MM frameworkfor four parameters, efficient material planning (EMP), cost reduction (CR), better material handling (BMH) and quality assurance (QA). The hypothesis formulated for the same is as follows:

$H1_0$: *There is no relationship between MM and EMP of theorganization.*

$H2_0$: *There is no relationship between MM and CR of theorganization.*

$H3_0$: *There is no relationship between MM and BMH of theorganization.*

$H4_0$: *There is no relationship between MM and QA of theorganization.*

Table 3demonstrates the result of the multiple regression analysis, where it is found that there exists an association between the MM and the EMP as the null hypotheses was not accepted. It was also noted that the CR has an impact on the MM as the p-value was less than 5 percent. Same was found incase of BMH and QA where the null hypotheses was not accepted and it was thus concluded that MM is a function of all the four parameters i.e., EMP, CR, BMH and QA.

MM =f(EMP, RC, BMH, QA)

MM= -0.35X1-0.72X2+.169X3+.144X4+1.185+ μ(error)

Where, MM= Material management in value chain, X1= Efficient Material planning (EMP), X2=Reduction in overall cost of material (CR), X3= Better Material handling(BMH) and X4=Quality assurance(QA).

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Table 3
REGRESSION RESULTS FOR MM

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.185	.597		1.986	.050*
	EMP	-.035	.023	-.132	-1.523	.031*
	CR	-.072	.024	-.253	-3.061	.003*
	BMH	.169	.040	.391	4.218	.000*
	QA	.144	.039	.364	3.682	.000*
	R Square	0.493				.000*

Dependent Variable: MM
*Significant at 5 percent level.

Source: Author.

The next analysis was conducted for the quality assurance parameters in the MM framework and its relevance.QA is dependent on process approach (PA), inspection (INPS) and inventory management (INVM). The hypothesis formulated for the same was as follow:

$H5_{0:}$ QA in MM is not a function of process approach, inspection, and inventory management

Table 4 indicates the result for the regression analysis of QA as a function of PA, INPS and INVM. The r square is 0.349 significant at 5 percent level. The null hypothesis is not accepted as the p- value for PA, INPS and INVM were less than 5 percent. So, it is concluded that QA is a function of PA, INPS and INVM.

Table 4
REGRESSION RESULTS FOR QA

Model		Unstandardized Coefficients[a]		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
2	(Constant)	2.953	.844		3.499	.001*
	PA	.148	.088	.163	1.669	.004*
	INSP	.284	.104	.250	2.721	.008*
	INVM	.487	.100	.447	4.870	.000*
	R Square			0.349		.000*

Dependent Variable: QA
*Significant at 5 percent level.

Source: Author.

QA=f(PA, INSP, INVM)

QUALITY=.148X1+.284 X2+.487 X3 +2.953+ μ(error)

Where, X1= Process Approach (PA), X2= Inspection (INPS) and X2=Inventory Management (INVM)

Final analysis was done for determining the productivity, cost and efficiency in value chain is dependent on MM and QA. The hypothesis for the following relationship is as follows:

$H6_{0:}$ PCEVC is not dependent on MM and QA.

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Table 5 demonstrate the results of regression analysis of PCEVC, , where it is found that the independent variables MM and QA are significant 5 percent level. Thus, it is inferred that PCEVC is a function of MM and QA.

PCEVC=f (MM, QA)

PCEVC=.269X1+.295X2+5.164+ μ(error)

Where, PCEVC= Productivity, Cost and Efficiency in Value Chain, X1=MM and X2=QA

Table 5
REGRESSION RESULTS FOR PCEVC

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
3	(Constant)	5.164	1.103		4.682	.000*
	MM	.269	.128	.217	2.097	.039*
	QA	.295	.134	.229	2.208	.030*
	R Square	0.490				.005*

Dependent Variable: PCEVC
*Significant at 5 percent level

Source: Author.

DISCUSSIONS

As from the results we can find the MM is a function of QA, CR, BMH and EMP which means organizations should focus on these parameters to have an effective MM framework in place. The findings are supported by Farmer, (1977); Schroeder al, et., (1986); Aiyetan, (2013) and Kasim (2008).The MM framework of the organization should include all the dimensions such as the EMP, CR, BMH and QA to improve the productivity and efficiency of the value chain of the organization. Also, the organizations should focus on QA activities as from the results we could find that QA is a function of PA, INPS, and INVM which means the quality of the resources maintained at the organizations level would improve if the process, which will eventually reduce the inventory management obstacles and facilitates the inspection and quality check, which in line with Fugate et al., (2009) and Rahman et. al, (1994) findings.Inventory can be used to mitigate risk however this may raise prices for companies who operate on a Just in time (JIT) basis. As a result, organisations employing JIT must ensure that their systems are flexible and responsive enough to deal with the increased uncertainty that may arise. If JIT inventory methods are to be used, all business and manufacturing systems must be examined to ensure that they are flexible and responsive enough to deal with increasing uncertainty (Wilding, 1998). The overall productivity, cost and efficiency of the value is dependent on the MM framework and the parameters of QA, which are integrated in each other(Mitchelson,1992).

CONCLUSION

To uncover the framework responsible for the proper MM and the related activities in value chain, the present study has filled the sparse issue regarding these linkages. The study was designed with a structured questionnaire mentioning various attributes that are found to be responsible but different manufacturing organizations. Thus, to fill the gap with existing literature the study provides insight related to the factors responsible for proper MM and their relationship with different areas like QA productivity, and cost efficiency in the value chain.

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The study has uncovered the various issues and the benefits that the companies are facing thereby providing insight to the managers, policymakers, and other related members of the manufacturing units. This will lead the further enhancement and improvement at the present level of MM and its importance in the value chain. However, considering all these relationships the study concluded that MM practices will be better only when there is better material planning and handling practiced by the organization. It also emphasizes cost reduction and quality assurance in the organization. At the same time, quality assurance is dependent on the process, inspection, and inventory management of the firms. The overall value chain impact in terms of productivity, cost, and efficiency improvement can be visualized when the MM and QA of the organization are well-planned and implemented.

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