

Effects of Inventory Control on Profitability of Industrial and Allied Firms in Kenya

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Abstract: *Inventory represents an important decision variable at all stages of product manufacturing, distribution and sales, in addition to being a major portion of current assets of many organizations. Too much and too low inventories bring down the level of profitability of an organization. Therefore, whether it is a manufacturing or merchandized organization, the goal should always be the same that is, to ensure the inventory is ready and at the same time inventory is at a low level. The study wanted to determine the effects of inventory control on profitability of industrial and allied firms in Kenya. It was explained by economic order quantity model (EOQ) which is based on minimization of costs between stock holding and stock ordering.. Correlational research design was adopted. Two types of data were collected. Primary data was collected through the use of a questionnaire and secondary data through the use of a record survey sheet. A sample of 71 industrial and allied companies was determined using stratified random sampling technique from a target population of 399 industrial and allied firms in Nairobi City and her environs. Data collected was analyzed at two levels; descriptive and inferential data analysis. The inferential data analysis, Pearson's correlation, regression and ANOVA analysis were applied. The results of the analysis indicated that the correlation coefficient between inventory control practices and profitability was 0.601 at 0.01 significant level. This implies there is a positive and significant relationship between inventory control practices and profitability of industrial and firms. R² value was 0.361 which means that 36.1% of the corresponding variation in profitability can be explained by change in inventory control practices. The rest 63.9% can be explained by other factors that are not in the model. The ANOVA results on inventory control practices and profitability had an F-value of 48.909 which was significant with a P-value = 0.000 meaning that the overall model was significant in the prediction of profitability in industrial and allied firms in Kenya. It is recommended that firms should install and maintain good inventory control systems such as Economic Order Quantity (EOQ) and Just in Time (JIT). This should ensure that firms are maintaining ideal levels of inventory that have an effect of increasing profitability of the firms. The management should ensure that the staff is qualified to perform duties assigned and ideal inventories levels are maintained. It should also ensure that the staffs are maintaining accurate inventory records.*

Key Words: *(EOQ, Industrial Firms, Inventory, Profitability)*

I. Introduction

Inventories are vital to the successful functioning of manufacturing and retailing organizations (Anichebe&Agu, 2013). They may consist of raw materials, work in progress, spare parts / consumables and finished goods. An efficient management of inventory is required because a substantial share of a firm's funds is invested in them. Every company must ensure that inventory is maintained at desired levels. Too much and too low inventories bring down the level of profitability of an organization. Whether it is a manufacturing organization or a merchandized organization, the goal should always be the same, that is, to ensure the inventory is ready and at the same time the inventory level should be low. Inventory represents an important decision variable at all stages of product manufacturing, distribution and sales, in addition to being a major portion of current assets of many organizations. A substantial share of an organization's investment is in the inventories. Inventories, often represent as much as 40% of total capital of industrial organizations (Moore, Lee & Taylor, 2003). It may represent 33% of an organization's total assets and as much as 90% of working capital (Sawaya& Giauque, 2003).

Inventory management refers to all activities involved in developing and managing the inventory levels, whether the inventory is raw materials, semi-finished materials or finished goods, so that adequate supplies must always be available and the firm must make sure that the cost of over or under stocks are always low (Anichebe&Agu, 2013). According to Mohamad, Suraidi, Rahman and Suhaimi (2016) an effective inventory management is able to generate more sales for the company which directly affects the performance of the company. For an inventory management to be effective, there must be a system which is managed by a group of employees who are experts in this area. The sales department may argue for a large amount of stock but the finance department may on the other hand argue for a minimal amount of stock so that the spare finance can be

utilized elsewhere (Anichebe&Agu, 2013). Whichever, the case the inventory level must be able to generate the highest profit possible.

II. Literature Review

Inventory is the stock purchased with the purpose of resale in order to gain a profit. It represents the largest cost to a manufacturing firm. For a manufacturing firm, inventory consists of between 20% and 30% of the total investment (Garcia – Teruel& Martinez, 2007). Inventory should therefore be managed well in order to facilitate the firm's operations. There are three main types of inventories namely; raw materials, work in progress and finished goods. However, Hopp and Spearman (2000) classify inventory into raw materials, work in progress, finished goods and spare parts. Raw materials are the stocks that have been purchased and will be used in the process of manufacture while work in progress represents partially finished goods. Finished goods on the other hand, represent those items of stock that are ready to be monetized (Nwankwo&Osho, 2010). Since the level of inventory is large, the financial manager has to put into consideration the ordering cost, carrying cost and stock out cost of the inventory in determining the inventory level. For the purpose of this study Inventory level and inventory control systems were considered.

Inventory Level

In the management of inventory the firm is always faced with the problem of meeting two conflicting needs: - maintaining a large size of inventory for efficient and smooth production and sales operations and maintaining a minimum level of inventory so as to maximize profitability (Pandey, 2008). Both excessive and inadequate inventories are not desirable. The dangers of excessive inventories are that stockholding costs are too high and as a result the firm's profitability is reduced. According to Mohammad (2011) managers can create value for shareholders by means of decreasing inventory levels. However, maintaining inadequate level of inventory is also dangerous because ordering costs are too high. It may also lead to stock out costs. Saleemi (1993) asserts that there are advantages of maintaining an ideal level of inventory. This includes economies of scale to be gained through quantity and trade discounts, less risks of deterioration and obsolescence, and reduced cost of insurance among others. A study carried out by Mathuva (2010) on the influence of working capital management components on corporate profitability found that there exists a highly significant positive relationship between the period taken to convert inventories into sales and profitability. This meant that firms maintained sufficiently high inventory levels which reduced costs of possible interruptions in the production process and loss of business due to scarcity of products.

Nyabwanga, Ojera, Lumumba, Odondo and Otieno(2012) found that small scale enterprises often prepare inventory budgets and reviewed their inventory levels. These results were in agreement with the findings of Kwame (2007) which established that majority of businesses review their inventory levels and prepare inventory budgets. These findings had already been stressed by Lazaridis and Tryponidis (2006) that enhancing the management of inventory enables businesses to avoid tying up excess capital in idle stock at the expense of profitable ventures. Nyabwanga et al. (2012) assert that good performance is positively related to efficiency inventory management.

Inventory Control System

A firm needs a control system to effectively manage its inventory (Pandey, 2008). There are several control systems in practice that range from simple to very complicated systems. A firm must ensure that the system it adopts must be the most efficient and effective. Pandey (2008) argues that small firms may opt to adopt simple two bin systems and the very large firms may choose to adopt very complicated systems such as ABC inventory control systems or Just in Time (JIT) systems. A study carried out by Grablowsky (2005) found that only large firms had established sound inventory control systems for determining inventory re-order and stock levels. The firms used quantitative techniques such as EOQ and Linear Programming to provide additional information for decision making. Small firms on the other hand used management judgement without quantitative back up.

Under this study, the objective was to examine how inventory control practices influence profitability of manufacturing and allied firms in Kenya and the null hypothesis was stated as follows;**H₀₁**:Inventory Control Practices do not influence Profitability of Industrial Firms in Kenya

Economic Order Quantity Model of Inventory Management

This model is an inventory control model and is based on minimization of costs, between stock holding and stock ordering. It requires the determination of economic order quantity (EOQ) which is the ordering quantity at which stock holding costs are equal to stock ordering costs (Saleemi, 1993). It suggests that the optimal inventory size is the point at which stock ordering costs are equal to the stock holding costs. The optimal inventory size is also known as economic order quantity (EOQ). This model helps an organization to put in place an effective stock management system to ensure reliable sales forecasts to be used in ordering

purposes (Atrill, 2006). In order to ensure applicability of the EOQ model several assumptions must be taken into consideration. First, the usage of stored product is assumed to be steady. Second, ordering costs are assumed to be constant, i.e. the same amount has to be paid for any order size. Finally, the carrying costs of inventory which are composed of cost of storage, handling and insurance are assumed to be constant per unit of inventory, per unit of time. The EOQ model therefore merely takes variable costs into consideration, although it can easily be extended so as to include fixed costs (Ross et al., 2008). This model has been used in the past by Nyabwanga et al. (2012) in Kenya.

The basic EOQ model is based on the assumptions that only one product is produced, annual demand requirements are known, demand is spread evenly throughout the year so that demand rate is reasonably constant, lead time does not vary, each order is received in a single delivery and there is no quantity discounts. The model is expressed as follows:

$$EOQ = \frac{2DS}{H}$$

Where D = Demand in units per year

S = Ordering cost per unit

H = Cost of Holding Inventories per unit per year

EOQ = Economic Order Quantity

Maintaining optimal inventory levels reduces the cost of possible interruptions or loss of business due to the scarcity of products, reduces supply costs and protects against price fluctuations (Nyabwanga et al., 2012).

III. Methodology

This study adopted a correlational research design. Two types of data were collected. Primary data was collected through the use of a questionnaire and secondary data through the use of a record survey sheet. A likert scale type of a questionnaire was used to collect the primary data but for a secondary datapanel data was collected over the period 2009 to 2014 on all the 71 industrial and allied companies. The sample size was determine through stratified random sampling technique from a target population of industrial firms in Nairobi City and her environs of 399 industrial and allied firms. Data collected was analyzed using SPSS software and two levels of analysis were used; descriptive and inferential data analysis.

Descriptive data analysis was the first step and showed the frequency of responses mean on the effect of inventory control on profitability. Inferential data analysis level followed and this involved; correlation, linear regression and ANOVA analysis. Pearson's correlation was used to measure the degree and direction of association between different variables under consideration. Linear regression was used to estimate the causal relationship between inventory control and profitability of industrial and allied firms and finally, the ANOVA analysis was used to test the hypothesis of the study.

IV. Results and Discussion

The objective of the study was to examine how inventory control influences profitability of manufacturing firms in Kenya. The objective was tested through five (5) composite measures on a scaled questionnaire. The findings were presented in table 1 which shows the frequencies of responses and mean on the effect of inventory control on profitability.

Defined levels of inventories ensure that firms are able to plan when to procure for additional inventories. The respondents were requested to indicate whether their firms had defined levels of inventories for their raw materials. A majority (66%) indicated that their firms had defined levels of inventories for their raw materials, (12.7%) did not commit themselves while few (11.2%) indicated that their firms did not have defined levels of inventories for their raw materials. The responses had a mean of 3.85. Majority of responses had 4 indicating that the firms have defined levels of inventories for raw materials. With well-defined levels of raw materials, firms are able to maintain ideal levels of stock and this further means minimum cost of ordering and stock holding. Therefore, the firms are able to maximize their profits. This contradicts the study carried out by Nyabwanga et al. (2012) that showed that majority of small firms do not stock optimal quantities of inventories and do not determine re-order points.

An ideal level of inventories is a good indicator that the inventories are well managed and this leads to increased profitability. The respondents were requested to indicate whether their firms had determined optimal batch sizes. A significant majority (77.4%) indicated that their firms had determined optimal batch sizes, (16.5%) did not commit themselves while few (5.6%) indicated that their firms had not determined optimal batch sizes. The responses had a mean of 3.90. Review of inventory levels helps firms determine ideal levels of inventory and reduces redundant inventory. Atrill (2006) asserts that there are certain costs that relate to holding

too much inventories and also costs relating to holding too little inventories. Thus, the management should put in place an effective management system to ensure reliable sales forecast to be used in stock ordering purposes.

Respondents were requested to indicate whether their firms reviewed inventory levels periodically. A significant majority (91.5%) indicated that their firms reviewed inventory levels periodically, (5.6%) did not commit themselves while few (2.8%) indicated that their firms do not review their inventories levels. The responses had a mean of 4.32. This is an indication that most of the responses were 4 implying that firms review inventory levels periodically. Ross et al. (2008) observed that the economic order quantity model is one of the approaches of determining the optimum inventory level and takes into account the inventory carrying costs, inventory shortages costs and total costs that help in determination of the appropriate inventory level to hold. The holding costs increase in time e.g. insurance, rent e.t.c. Therefore, the management needs to keep on reviewing the level of inventories periodically.

Keeping accurate records helps firms reduce pilferages and theft as well as maintaining ideal levels of inventories. This has an effect of reducing total cost of operation. The respondents were requested to indicate whether their firms maintained accurate records. A significant majority (94.4%) indicated that their firms keep accurate inventory records, (5.6%) did not commit themselves while few (2.8%) indicated that their firms did not keep accurate records. The responses had a mean of 4.34 and therefore, many of the responses were 4 indicating that firms maintain accurate records. The requirements of inventories keep on changing periodically. Therefore, records well-kept help managers determine optimal inventories levels. Lazaridis and Tryfonidis (2006) found that firms that do not maintain optimal levels of inventories lead to tying up excess capital at the expense of profitable operations. They argued that managers of firms should keep their inventories to an optimum level since mismanagement of inventory will lead to tying up of excess capital at the expense of profitable operations.

A firm that has a sound inventory control system is capable of maximizing profits. The respondents were asked to indicate whether their firms had inventory control systems. A significant majority (91.5%) indicated that their firms had inventory control systems, (4.2%) did not commit themselves while few (4.2%) indicated that they did not have inventory control systems. The responses had a mean of 4.22 indicating that firms have established inventory control systems. This contradicts the study carried out by Grablowsky (2005) that found that only large firms had established sound inventory control systems for determining inventory order and stock levels. The firms use quantitative techniques such as EOQ and Linear Programming to provide additional information for decision making. Small firms on the other hand use management judgement without quantitative back up.

The mean score of all the responses was 4.11 on a scale of one to five. This shows that there were more respondents who agreed with the statements in support of inventory control having an influence on profitability. This shows that the finance managers of the firms take precautions to ensure that their firms maintain ideal levels of inventories both for finished goods and for raw materials to ensure increased profitability. Saleemi (1993) asserts that firms can derive advantages by maintaining ideal levels of inventories and these include economies of scale to be gained through quantity and trade discounts, less deterioration and obsolescence, and reduced cost of insurance. Maintaining ideal levels of inventories bring about increased profitability and therefore the firms are maximizing profits. A study carried by Nyabwanga et al. (2012) showed that good performance is positively related to efficiency of inventory management. They also found that the firms were more efficient in the management of inventory than in the management of either cash or receivables.

Table 1: Inventory Control Practices Descriptive Results

Key: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

	Statement	1 %	2 %	3 %	4 %	5 %	LikertMean
1	The firm has defined levels of inventories for raw materials	5.6	5.6	12.7	50.7	25.4	3.85
2	The firm has determined optimal batch sizes	1.4	4.2	16.9	57.7	19.7	3.90
3	The firm reviews inventory levels periodically	1.4	1.4	5.6	52.1	39.4	4.32
4	The firm keeps accurate inventory records	0	1.4	4.2	59.2	35.2	4.34
5	The firm has installed an inventory control system	1.4	2.8	4.2	54.9	36.6	4.22
	Average	1.96	3.08	8.72	54.92	31.32	4.11

Reliability Measurement for Inventory Control Practices

The reliability analysis was done on all the items to determine whether they met the threshold of more than 0.7. The results of the analysis show cronbach's alpha of 0.777. This implies that the instrument was sufficiently reliable for measuring inventory control. The results of the analysis are as shown in table 2 shown below:

Table 2: Reliability Measurement Results of Inventory Control Practices

Variable	Number of Items	Cronbach's Alpha
Inventory Control	5	0.777

Two tests were carried out to determine whether factor analysis was appropriate and the results are displayed in table 3. The KMO results indicate a value of 0.790 which is higher than the recommended value of 0.5 (Tabachnick&Fidell, 2007; William, Brown & Osman, 2010). Bartlett's test of Sphericity on the other hand showed a p-value of 0.000 which was lower than 0.05 (Tabachnick&Fidell, 2007; William, Brown & Osman, 2010). The two tests indicate that it was desirable to perform principal component analysis.

Table 3: KMO and Bartlett's Test Results for Inventory Control Practices

Kaiser- Meyer-Olkin Measure of Sampling Adequacy		0.790
Bartlett's Test of Sphericity	Approx. Chi square	121.832
	df	10
	Sig.	.000

When the 5 composite variables on inventory control practices were subjected to principal component analysis the results indicated that all of the composite variables had measures loaded between 0.478 and 0.719 which were higher than 0.4 as recommended by David, Patrick, Philip and Kent (2010). All the factors were retained as critical drivers of profitability and the results are presented in table 4. The rest of the study used all the 5 measures as the composite measures of inventory control practices.

Table 4: Component Matrix of Inventory Control Practices

Factor	Factor Loading
The firm has installed an inventory control system	0.719
The firms keeps accurate inventory records	0.705
The firm reviews inventory levels periodically	0.680
The firm has determined optimal batch sizes	0.479
The firm has defined levels of inventories for raw materials	0.478

Correlation between Inventory Control Practices and Profitability

A correlation coefficient statistic that describes the degree of linear association between inventory control practices and profitability was determined. Table 5 indicates that there is a positive significant linear relationship between inventory control practices and profitability of manufacturing firms in Kenya. This relationship has been illustrated by a correlation coefficient of 0.601 at 0.01 significant level. This implies that there is a positive and significant relationship between inventory control practices and profitability of industrial and allied firms in Kenya. The results conform to the previous studies done by (Nyabwanga et al., 2012) who found that good business performance is positively related to efficiency of inventory management. This positive relationship between inventory control practices and profitability indicates that the manufacturing firms have installed sound inventory control systems that ensure that total cost between stock holding and ordering are at minimum level.

Table 5: Correlation between Inventory Control Practices and Profitability

		Profitability	Inventory Control Practices
Profitability	Pearson Correlation	1	.601**
	Sig. (2-tailed)		.000
	N	71	71
Inventory Control Practices	Pearson Correlation	.601**	1
	Sig. (2-tailed)	.000	
	N	71	71

** . Correlation is significant at the 0.01 level (2-tailed)

Regression Line between Inventory Control Practices and Profitability

A regression line was superimposed on the scatter plot of profitability versus inventory control practices as shown on figure 1. The regression line indicates a positive gradient. The findings of a positive relationship between inventory control practices and profitability concurs with those of Makori and Jagongo (2013) that found a significant relationship between inventory control and profitability and where profitability was measured by return on assets (ROA). A positive relationship indicates that maintaining high inventory levels reduces the cost of possible interruptions in production process and loss of business due to scarcity of products. Maintaining of high level of inventories helps to reduce the cost of supplying the products and protects the firm against price fluctuations as a result of adverse macro economic factors.

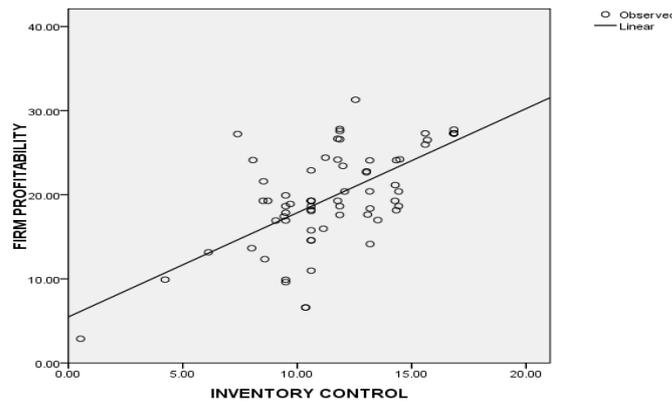


Figure 1: Curve Fit of Inventory Control Practices and Profitability

Regression analysis was conducted to determine the amount of variation in profitability explained by inventory control practices. The calculated R – value was 0.601. R² value = 0.361 which means that 36.1% of the corresponding variation in profitability can be explained by change in inventory control practices. The rest 63.9% can be explained by other factors that are not in the model. The results of the analysis are shown in table 6.

Table 6: Model Summary of Inventory Control Practices

R	R Square	Adjusted R Square	Std. Error of the Estimate
.601	.361	.354	4.23445

A one way analysis of variance (ANOVA) whose results formed a basis for tests of significance was used. The ANOVA for the linear model presented in table 7 of inventory control practices and profitability has an F value = 48.909 which is significant with p-value p = 0.000 < 0.05 meaning that the overall model is significant in the prediction of profitability in industrial and allied firms in Kenya. We therefore reject the null hypothesis that inventory control practices do not have any influence on profitability of manufacturing firms in Kenya and confirm indeed that there is a positive and significant influence of inventory control practices on profitability of manufacturing firms in Kenya.

Table 7: ANOVA for Inventory Control Practices and Profitability

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1011.331	1	1011.331	48.909	.000
Residual	1426.780	69	20.678		
Total	2438.111	70			

Analysis of the regression model coefficients is shown in table 8. From table 4.39 there is a positive beta co-efficient of 1.239 as indicated by the co-efficient matrix with a p-value = 0.000 < 0.05 and a constant of 5.476 with a p-value = 0.012 < 0.05. Therefore, both the constant and inventory control practices contribute significantly to the model. Therefore, the model can provide the information needed to predict profitability from inventory control practices. The regression equation is presented as follows: $Y = 5.476 + 1.239X + \epsilon$; Where Y = Profitability, X is the inventory control practices and ϵ is the error term

Table 8: Regression Coefficients of Inventory Control Practices and Profitability

	Coefficients		t	Sig.
	B	Std. Error		
(Constant)	5.476	2.130	2.571	.012
Inventory Control Practices	1.239	.177	6.993	.000

Conclusion on Inventory Control Practices

The results of the study have shown that when firms maintain good inventory control systems, the firms’ profits are high. The firms should install modern inventory control systems such as economic order quantity (EOQ) and just in time (JIT). These inventory control systems help firms maintain optimal inventory levels. Maintaining optimal inventory levels reduces cost of possible interruptions or loss of business due to scarcity of products at the same time it reduces high cost of maintaining stock. Cost of high stock includes stock theft, expiry, insurance and storage. In light of EOQ model, costs have to be maintained at minimal level between stock holding and ordering. The firms should also be able to put in place an effective stock

management system that ensures reliable sales forecast to be used in order purposes. Trained accountants should be employed to help in maintaining accurate inventory records.

V. Conclusions and Recommendations

The findings of inventory control on profitability of manufacturing firms in Kenya showed that finance managers of manufacturing firms take precautions to ensure that their firms maintain ideal levels of inventories of both raw materials and finished goods. This may have led to increased profitability of manufacturing firms in Kenya and therefore it can be concluded that there exists a positive and significant relationship between inventory control and profitability. Firms should install and maintain good inventory control systems such as Economic Order Quantity (EOQ) and Just in Time (JIT). This ensures that firms are maintaining ideal levels of inventory that have an effect of increasing profitability of the firms. The management should ensure that the staff is qualified to perform duties assigned. Ideal inventories levels should be maintained. The staff should also maintain accurate inventory records. All these have an impact on the profitability level of the firms.

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