Journal of Strategic Management

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ISSN: 2616-8472

Stratford Peer Reviewed Journals and Book Publishing
Journal of Strategic Management
Volume 6||Issue 2||Page 86-102 ||May||2022|
Email: info@stratfordjournals.org ISSN: 2616-8472

Inventory Management Practices and Operational Performance of Manufacturing Companies in Rwanda: A Case of Bralirwa Plc

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***How to cite this article*: Sylvere M. & Nkechi E., I. (2022). Inventory Management Practices and Operational Performance of Manufacturing Companies in Rwanda: A Case of Bralirwa Plc. *Journal of Strategic Management. Vol* 6(2) pp. 86-102.** https://doi.org/10.53819/81018102t2065

Abstract

Operational performance of manufacturing companies in Rwanda has been an issue of concern to various stakeholders. This study's main objective was to determine the effect of inventory management practices on operational performance of manufacturing companies in Rwanda. Based on my research and analysis the manufacturing companies, the study was guided by the following specific objectives: to establish the effect of vendor managed inventory on operational performance of manufacturing companies in Rwanda; to determine the effect of demand forecasting on operational performance of manufacturing companies in Rwanda; to establish the effect of Just-in-Time on operational performance of manufacturing companies in Rwanda. This study was based on Goldrat's Theory of Constraints and Network Perspective Theory. Piloting was done on respondents over a period of two weeks to gain an understanding of the ways in which inventory management practices would affect manufacturing companies' service delivery and operational efficiency. This study adopted cross sectional survey research design. The target population of the study consisted of 42 employees of Bralirwa Plc from the supply chain, finance, marketing, sales and human resources departments. The study sampled all 42 using census technique because targeted population was small. The study found that vendor managed inventory, demand forecasting and Just-in-Time affect operational performance of manufacturing companies in Rwanda. The study further found that vendor Managed Inventory had significant effect with operational Performance of Bralirwa Plc, Kigali (β=.719; $p<0.001$). There is no significant statistical effect of Demand Forecasting on Operational Performance of Bralirwa Plc, Kigali. There was a statistically significant effect of Demand Forecasting on operational Performance of Bralirwa Plc, Kigali (β=.768; $p<0.001$)." The null hypothesis was rejected and the alternate accepted. The study concluded that there was a significant statistical effect of Demand Forecasting on operational Performance of Bralirwa Plc, Kigali. There is no significant effect of Just-in-Time on Operational Performance of Bralirwa. The study concluded that vendor managed inventory, demand forecasting and Just-in-Time affects operational performance of manufacturing companies in Rwanda. The study recommends that Bralirwa Plc, Kigali should employ more vendor managed inventory practices to enhance

Stratford Peer Reviewed Journals and Book Publishing
Journal of Strategic Management
Volume 6||Issue 2||Page 86-102 ||May||2022|
Email: info@stratfordjournals.org ISSN: 2616-8472

the operational performance in manufacturing companies on vendor flexibility, strategic plans should factor in both short term and long-term demand forecasting in order to improve on the operational performance.

Keywords: *Inventory Management Practices, Operational Performance, Rwanda*

1. Introduction

The Manufacturing companies are meant to spur economic growth by providing 24-hour services thus the need to maintain sufficient inventory to be able to discharge their duties effectively. It is a generally agreed that where inventory management by manufacturing companies is poor, delivery of service is normally affected. Manufacturing companies are facing the problem of determining appropriate inventory levels that should be kept to ensure customer needs are met. Striking balance between overstocking and under-stocking is one of their major challenges manufacturing companies are facing in Rwanda. Rwanda's biggest brewer, Bralirwa Plc, experienced a 37.6 decline in after-tax profit in 2015, from Rwf11.394 billion ($14.7 million) posted in 2014 to Rwf7.106 billion ($9 million). However, sales revenue grew by 9.5 per cent while total sales volumes increased by 7.6 per cent, a trend attributed to growth in soft drinks sales, which grew by 5.3 percent and beer sales up by 5.3 per cent. The depreciation of the franc for the most part of 2018 also affected the brewer, as it imports a large chunk of raw materials used in the manufacturing of its products, and it also suffered currency translation costs while importing packaging materials. The company also made investments in manufacturing plants, such as a brewery in Gisenyi and a soft drinks plant in Kigali, using debt and internally generated funds. The depreciation of the franc increased the net financing costs, which they have been incurring between 2016 and 2021. To compensate for this level of increased cost at a time when currency depreciation has impacted on raw materials and other costs is a challenge, particularly as passing on costs to the consumer may not deliver value said Jonathan Hall, the vice chairman of the board of directors Bralirwa Plc. Despite strong sales and revenue, growth margins have remained under pressure in 2021 resulting in lower levels of profitability. This study therefore seeks to establish the effect of inventory management practices on operational performance of manufacturing companies in Rwanda.

1.1 Objectives of the study

1.1.1 General objective

The main objective of the study was to examine the effect of inventory management practices on operational performance of manufacturing companies in Rwanda.

1.1.2 Specific Objectives

(i) To establish the effect of vendor managed inventory on operational performance of Bralirwa Plc, Kigali.
(ii) To determine the effect of demand forecasting on operational performance of Bralirwa Plc, Kigali.
(iii) To assess the effect of Just-in-Time on operational performance of Bralirwa Plc, Kigali.

https://doi.org/10.53819/81018102t2065

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1.1.3 Research Hypotheses

H01: There is no significant statistical effect of vendor-managed inventory on operational performance of Bralirwa Plc, Kigali.

H02: There is no significant statistical effect of demand forecasting on operational performance of Bralirwa Plc, Kigali.

H03: There is no significant statistical effect of Just-in-Time on operational performance of Bralirwa Plc, Kigali.

2.1 Empirical Literature Review

2.1.1 Vendor Managed Inventory and Operational Performance in Rwanda

Wisner (2016) conducted a study on the relationship between Vendor Managed Inventory and Operational Performance in manufacturing firms. Operational performance was measured in terms of the bullwhip effect that is usually associated with wrong demand forecast, set-up time, production planning, administrative cost, service level, truckload rate as well as stock level. Using questionnaires and interview schedules to collect data. Regression analysis was used. The finding was that set-up time of manufacturing plants were improved, planning of production was improved, administrative costs were decreased, service level increased, truckload rate was improved while stock out risk was decreased.

Ika (2016) conducted a research to establish the effect of vendor managed inventory on operational performance in terms of supplier-buyer partnership. The study looked at a two-level supply chain consisting of one supplier and one buyer. The model being analytical was geared towards supply chain inventory with specific attention on probabilistic demand in a normal distribution framework. The finding indicated that the vendor managed inventory reduces the supply chain cost, increases the inventory replenishment and improves the service level.

Venkatesha (2017) conducted a study on the effect of vendor managed inventory on operational performance of Walmart retail outlets. Questionnaires and interview schedules were used to collect data. Least Square method and regression analysis was used to analyze the data. The study found that vendor managed inventory potentially provide benefits to both the vendor and the customer when properly applied. This study therefore seeks to establish the effect of using vendor managed inventory and operational performance model in manufacturing firms.

2.1.2 Demand Forecasting and Operational Performance

According to Kalchschmidt (2014) following a study conducted to establish the effect of demand forecasting practices on operational performance of manufacturing industries in Italy, forecasting is a critical player for effective operational performance in the manufacturing sector. The manufacturing firms in question used Material Requirement Planning (MRP) systems and Economic Order Quantity (EOQ) models in determining their demand forecast. Questionnaires and regression was used for methodology. The findings showed improved operational performance with the adoption of MRP and EOQ. This study however fails to clearly show the contribution played by the individual indicators of demand forecasting (MRP and EOQ) on operational performance of manufacturing companies.

Hanni, *et al.*, (2013) conducted a study on demand forecasting of medical consumables in public company s in Indonesia. The study aimed at identifying the root causes of problems in managing medical consumables inventory in company s. The study employed a case study research design and data was collected through in-depth interviews and field observations. They found that efficient planning for demand and collaboration with other departments are important factors in improving customer services. The study however failed to elaborate how company s can ensure efficient demand planning in managing inventory. This study therefore seeks to establish the effect of using Materials Requirement Planning and Economic Order Quantity models in forecasting the demand of manufacturing firms as a way of ensuring efficient use of inventory.

According to Oballa et al., (2015), ensuring accurate future demand have a positive influence on Operational Performance. The study used descriptive case study research design. The study however did not go ahead to state the strategies that can be used in establishing accurate future demands. This study therefore seeks to employ MRP and EOQ as demand forecasting techniques while determining their effect on operational performance of manufacturing companies.

Awanga (2018) carried a study to determine the effect of demand planning on supply chain performance of fast moving consumer goods in Kenya. Data was collected using interview schedules and questionnaires. The finding of the study was that demand planning critically reduces the overall supply chain cost through enhancement of clearer visibility of future demand. This study however fails to clearly show the contribution played by the individual indicators of demand forecasting (MRP and EOQ) on operational performance of manufacturing companies.

2.1.3 Just-in-Time Inventory Management Practice and Operational Performance

In search of the relationship between just-in-time and operational excellence of manufacturing companies in Jordan, Asia, a study was conducted by Yazan (2017). Using questionnaires and regression analysis the findings were that just-in-time systems have a significant effect on operational excellence of manufacturing companies in Asia. With a consideration of the critical role JIT plays as the backbone and a pillar for achieving competitive advantage in an operational context, the study recommended a test-run of similar research in other sectors like as food& beverage industry, textile or other fast moving consumer goods manufacturers so as to concretely generalize the results. This study however fails to clearly show the contribution played by the individual indicators of JIT (vendor flexibility and lead-time) on operational performance of manufacturing companies.

Similarly, looking at the manufacturing firms in Nairobi Kenya, Derick (2014) assessed the effect of Just in Time inventory management on operational performance of consumer goods. Using descriptive research design and a census, JIT was established to have statistically significant effect on operational performance of consumer goods. The study also fails to clearly show the contribution played by the individual indicators of JIT (vendor flexibility and lead-time) on operational performance of consumer goods manufacturing companies. This study sets in to find out the effect of JIT (vendor flexibility and lead-time) on operational performance of consumer goods manufacturing companies.

Munyao *et al*, (2005) earlier had investigated the role of Just in Time on operational performance of manufacturing firm's production departments in Mombasa. The study had

used a descriptive research design besides stratified simple random sampling. Questionnaires were used to collect data. The finding was that among the manufacturing firms which practiced Just-in-time for inventory management, higher operational performance was witnessed. The study also failed to clearly show the contribution played by the individual indicators of JIT (vendor flexibility and lead-time) on operational performance of consumer goods manufacturing companies. This study sets in to compliment the findings of Munyao et al, (2005) by getting the individual effect of JIT factors (vendor flexibility and lead-time) on operational performance of manufacturing companies.

Odhiambo and Kihara (2018) carried a research on the relationship between JIT inventory management practices and performance of public health facilities in Kisumu. Questionnaires were used to collect primary data while secondary data was collected through desktop review. Census was used in focusing on the sample size of 84. The study however focused more on supply chain performance as opposed to operational performance. This study thus comes in to focus on the relationship between JIT inventory management practices and operational performance.The operational performance of Bralirwa Plc was the dependent variables. This conceptual framework helps in understanding how inventory management practices would affect operational performance of Bralirwa Plc. Vendor Managed Inventory was measured by the extent to which continuous selling as well as direct selling was used to manage vendor inventory. The indicators of effective demand forecasting was material requirement planning (MRP) Systems as well as Economic Order Quantity (EOQ) Models to make forecasts and subsequently order for inventory. The indicators of Just-in-Time inventory management practice were vendor flexibility and delivery lead time. Lastly, Operational Performance was measured by level of service delivery in addition to operational efficiency

2.2 Research Gap

Ika (2016) mainly looked at a two-level supply chain consisting of one supplier and one buyer. The model being analytical was geared towards supply chain inventory with specific attention on probabilistic demand in a normal distribution framework. Awanga (2018) did not clearly show the contribution played by the individual indicators of demand forecasting (MRP and EOQ) on operational performance of manufacturing companies. Hanni et al., (2013) did not to elaborate how companies can ensure efficient demand planning in managing inventory. While Yazan (2017) considered the critical role JIT plays as the backbone and a pillar for achieving competitive advantage in an operational context, the study recommended a test-run of similar research in other sectors like as food & beverage industry, textile or other fast moving consumer goods manufacturers so as to concretely generalize the results, Yazan (2017) however fails to clearly show the contribution played by the individual indicators of JIT (vendor flexibility and lead-time) on operational performance of manufacturing companies. Derick (2014) failed to clearly show the contribution played by the individual indicators of JIT (vendor flexibility and lead-time) on operational performance of consumer goods manufacturing companies. Munyao *et al*, (2005) failed to clearly show the contribution played by the individual indicators of JIT (vendor flexibility and lead-time) on operational performance of consumer goods manufacturing companies. Odhiambo and Kihara (2018) focused more on supply chain performance as opposed to operational performance.

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2.3 Conceptual Framework

The conceptual framework consist of the dependent variable in this study is Operational Performance measured in terms of Service Delivery and Operational Efficiency while independent variables are Inventory Management Practice included Vendor Managed Inventory measured in terms of Continuous Selling and Direct Selling Demand Forecasting is indicated by MRP Systems and EOQ model and finally Just-in-Time measured in terms of Vendor flexibility and Lead Time. Fig 1 below shows a figurative representation of the variables to be examined in this survey.

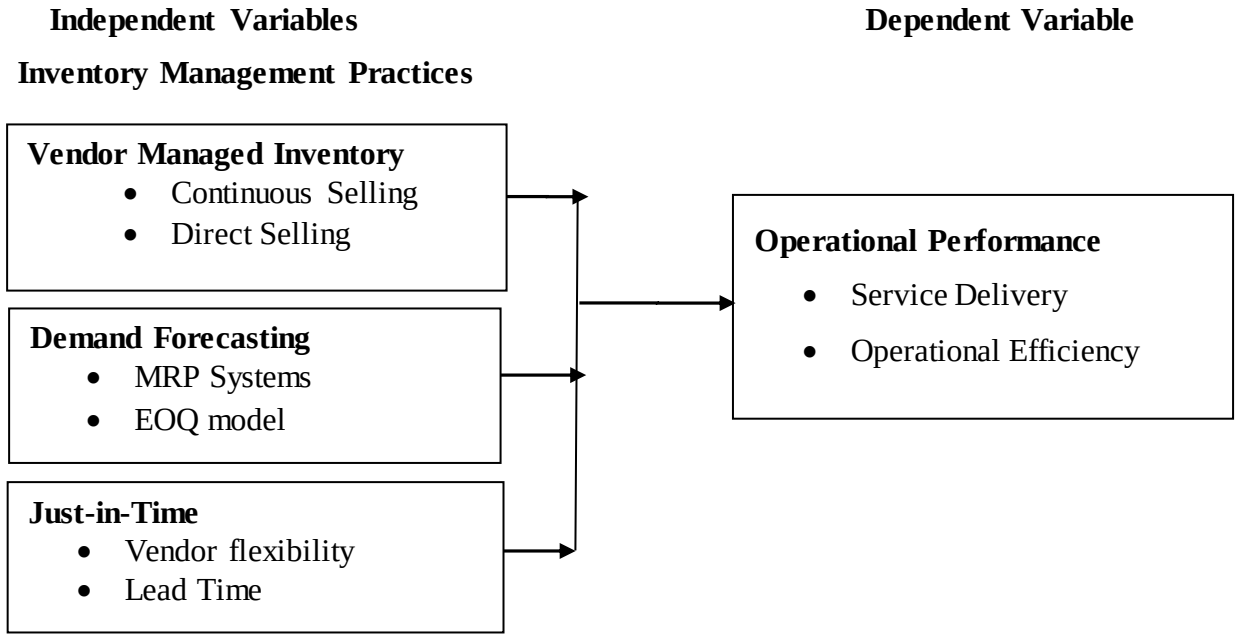

Figure 1: Conceptual Framework

3. Materials and Methods

The researcher used a mixed methods approach by incorporating both quantitative and qualitative methods. The use of mixed methods design is preferred because it offers statistical analysis along with qualitative findings and this expands the research, thus making it more comprehensive. The quantitative approach applied in collecting numerical data while the qualitative approach was applied on non-numeric/narrative or textual data. The population was first stratified as supply chain department (7), finance department (8), marketing department (9), sales department (12) and human resources department (6). Subsequently, the researcher adopted census technique because targeted population was small. This is in line with Mugenda and Mugenda (2003) who recommends on the use of census technique where the target population is small. The sampling technique used in this study was the non-probability technique which does not involve a random selection. This data was collected first hand from respondents by use of the questionnaire survey and interviewing method. The questionnaire (Appendix I) composed of close-ended response items that were constructed on a 5-point Likert Scale where SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree and SD=Strongly Disagree. In addition to the Likert Scale options, there was an option a general comment on each item selected by the survey respondent. The close-ended items were preferred because they enable responds to easily select responses and score an item of their choice.

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Quantitative and qualitative approaches were used in data presentation and analysis. Quantitative data was analyzed using descriptive statistics represented by frequency and percentage presentation. Correlation test was also conducted based on Pearson's Correlation Coefficients to determine the statistical relationship between SM and operational sustainability in EPRN. The Statistical Package for Social Sciences version 20 and Microsoft Excel Data Analysis Tool Pack were used in data processing and presentation. This enabled the researcher to visualize and summarize data in form of tables without carrying out modeling. Qualitative data from desk research and key informant interviews was analyzed by content and narrative analyses respectively. Content analysis involved reading, recording and categorization of textual, verbal or behavioral data for the purpose of classification summarization and tabulation. In narrative analysis, the data was explained by paraphrasing and where necessary by quoting the responses of respondents. Secondary and interview data was used to complement the questionnaire survey data by making comparisons which helped in drawing the conclusions and recommendations.

This study was collected data, organized, tabulated, collated and described the data among the employees of Bralirwa Plc in Rwanda across all the departments. The analysis was aided by the use of STATA. The regression model in equation 1 was used to guide the study and establish the relationship between the study variables: $\boldsymbol{Y= \beta_0+ \beta_1 X_1+ \beta_2 X_2+ \beta_3 X_3+e \ldots Eq.3.1}$ Where: Y = Operational Performance, X_1 = Vendor Managed Inventory, X_2 = Demand Forecasting, X_3 = Just-in-Time, e = Error Term, β_0 =Model Constant and $\beta_{1,2,3,}$ = Model Coefficients. The assumptions of the model are that there are identical, independent and normally distributed random variables with a zero mean and a constant variance at 5% significance level.

4. Research Findings and discussion

4.1 Vendor Managed Inventory and Operational Performance

The first objective was to establish the effect of vendor managed inventory on operational performance in Bralirwa Plc, Kigali. This was done by respondents stating their level of agreement or otherwise with the statements using scale of measurement of 1 to 5 where 1, 2,3,4,5 represented strongly disagree, disagree, neutral, agree and strongly agree respectively. The respondents' opinions are presented in Table 1.

Table 1: Descriptive Statistics of Vendor Managed Inventory and Operational Performance

Statements on vendor managed inventory	2	3	4	5	Mean	SD
Bralirwa Plc has a number of customers with whom they manage their inventory using VMI	4.3%	24.4%	41%	30.3%	4.016	.983
Bralirwa's VMI customers have constantly maintained required inventory levels	0	72%	20%	8%	3. 871	1.047
Constant usage of proper VMI Analysis in our inventory management has led to improved operational efficiency	3.2%	21.7%	25.7%	49.3%	4. 016	1.101
Constant usage of proper VMI Analysis in our inventory management have led to improved service delivery	2.9%	5.6%	44.8%	46.6%	4. 016	1.014
The use of Direct Selling in our inventory management has led to well stocked inventory required by customers hence improved operational efficiency	13.4%	0	86.6%	0	3. 016	1.14
The use of Continuous Selling in our inventory management has led to well stocked inventory required by customers hence improved service delivery	0	0	72%	28%	2.016	1.014
Aggregate mean				3.48	0.861	

Source: Survey Data (2022)

Table 1 demonstrates that out of the175employees of in Bralirwa Plc Kigali, that 41%of respondents agree 30.3% Strongly agree, 24.4% neither agreed nor disagreed while 4.3% disagreed that concurred that Bralirwa Plc, Kigali has a number of customers with whom they manage their inventory using VMI, while 15% disagreed (mean response=4.016 and an S.D =.983). It was also seen that, 8% Strongly agree, 20% agreed, 72%neither agreed nor disagreed while none disagreed that Bralirwa's VMI customers have constantly maintained required inventory level (mean response =3.871 and an S.D =1.047).

Besides, 25.7% of respondents agree 49.3 % Strongly agree, 21.7% neither agreed nor disagreed 72% of Bralirwa Plc, Kigali staff agreed that their constant usage of proper VMI Analysis in inventory management has led to improved operational efficiency (mean response =4.032 and an S.D =1.101). 2.9% of respondents 44.8% agree neither agreed nor disagreed, 46.6% strongly agree while 5.6% disagreed that constant usage of proper VMI Analysis in inventory management has led to improved service delivery (mean response =4.016 and an S.D =1.014). Similarly, 86.6% strongly agree while 13.4% disagreed that the use of direct selling in their inventory management has led to well stocked inventory required by customers hence improved operational efficiency (mean response =3.016 and an S.D =1.014). 72% of the Bralirwa Plc, Kigali staff also disagreed that the use of continuous selling in inventory management has led to well stocked inventory required by customers hence improved service delivery, though 28% strongly disagreed (mean response of 2.016 and an S.D =1.014).

These finding compare well with the findings observed by Wisner (2016), Ika (2016) and Venkatesha (2017). They pointed that vendor managed inventory potentially provide benefits to both the vendor and the customer when properly applied. The models in all the cases were analytical and were geared towards supply chain inventory with specific attention on probabilistic demand in a normal distribution framework. The incorporation of vendor managed inventory management practice in the organization's daily inventory operations would thus for example improve the set-up time of manufacturing plants, improve the planning of production, decrease administrative costs, increase service levels, improve truckload rates while at the same time it would decrease stock out risks.

4.2 Demand Forecasting and Operational Performance

The second objective was to establish the effect of Demand Forecasting on Operational Performance in Bralirwa Plc, Kigali. The researcher sought opinion of respondents on whether they strongly agree, agree, neutral, disagree or strongly disagree that the Demand Forecasting on Operational Performance in Bralirwa Plc, Kigali. The respondents' opinions are presented in Table 2.

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Table 2: Demand Forecasting and Operational Performance

Statements on Demand Forecasting	2	3	5	5	Mean	SD
Bralirwa Plc usually makes correct demand forecasts for required inventory to be supplied to them in time	16.7%	0%	83.3%	0%	4. 022	0.17
Bralirwa Plc usually makes correct market demand forecasts for their products that would match customer demands	18%	0%	82%	0%	4. 078	1.051
Our constant usage of proper MRP System in our inventory management have led to improved service delivery	0.8%	6.4%	0.3%	92.5%	4.033	1.132
Our constant usage of proper EOQ Model in our inventory management have led to improved service delivery	40%	42%	10%	8%	3.9	1.734
The use of MRP System in our inventory management has led to well stocked inventory required by internal and external customers hence improved service delivery	0.0%	0.5%	2.7%	96.8%	4. 911	1.814
Bralirwa Plc usually makes correct demand forecasts for required inventory to be supplied to them in time	0.0%	11%	89%	0.0%	4.033	1.132
Aggregate mean					**4.16**	**0.4**

Source: Survey Data, (2022)

Table 2 shows that 83.3% agreed that Bralirwa Plc usually makes correct demand forecasts for required inventory to be supplied to them in time while 16.7% disagreed (mean response = 4.022 and S.D =.017). The results further showed that 82% of the respondents did agree that Bralirwa Plc usually makes correct market demand forecasts for their products that would match customer demands while18% had a contrary opinion (mean response =4.078 and S.D =1.051). 3.8%of respondents neither agreed nor disagreed, 1.6%agree while 94.6%strongly agreed that constant usage of proper MRP System in our inventory management have led to improved service delivery (mean response 4.033 and S.D =1.132). 40% of respondents disagreed 42% neither agreed nor disagreed, 10 % agree while 8% strongly agreed that constant usage of proper EOQ Model in our inventory management have led to improved service delivery (mean response =4.911 and S.D =1.814). 8%of respondents disagreed 6.4% neither agreed nor disagreed, 0.3 %agree while 92.5%strongly agreed that the use of MRP System in our inventory management has led to well stocked inventory required by internal and external customers hence improved service delivery (mean response= 3.9 and S.D =1.734). Finally, 89% of respondents agreed that Bralirwa Plc usually makes correct demand forecasts for required inventory to be supplied to them in time, while 11% disagreed (mean response=4.033 and S.D =1.132). These finding support the findings obtained by Kalchschmidt (2014), Hanni et al., (2013), and Awanga (2018). A well planned demand system with clear forecasts would then be seen to critically reduce the overall supply chain costs through enhancement of clearer visibility of future demand. Efficient planning for demand and collaboration with other departments are therefore important factors in improving customer services. As such the use of demand forecasting techniques like Material Requirement Planning (MRP) systems and Economic Order Quantity (EOQ) models in determining accurate future demand forecast would likely have a positive influence on operational performance.

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4.3 Just-in-Time and Operational Performance

The third objective was to establish the effect of Just-in-Time on Operational Performance in Bralirwa Plc, Kigali. The researcher sought opinion of respondents on whether they strongly agree, agree, neutral, disagree or strongly disagree that the just-in-Time on Operational Performance in Bralirwa Plc, Kigali. This was done by respondents stating their level of agreement or otherwise with the statements using scale of measurement of 1 to 5 where 1, 2,3,4,5 represented strongly disagree, disagree, neutral, agree and strongly agree respectively

Table 3: Just-in-Time and Operational Performance

Statements on Just-in-Time	4	3	2	1	Mean	SD
Bralirwa's inventory from suppliers are always received just-in-time when needed in short lead times	4.3%	24.4%	41%	30.3%	4. 253	0.813
Bralirwa's inventory to customers are always delivered just-in-time when the customers need them and in short lead times	0	92%	0	8%	3.2	0.47
The flexibility of our vendors in inventory order management have led to improved operational efficiency	3.2%	21.7%	25.7%	49.3%	4.2	0.9
The lead time offered by our vendors in inventory order management have led to improved operational efficiency	0%	82%	18%	0%	3.16	1.014
Aggregate mean					**3.70**	**0.799**

Source: Survey Data, (2022)

Table 3 illustrates that 43% disagreed ,24.4% neither agree nor disagreed 41% agreed 30.3% strongly disagreed that the Bralirwa's inventory from suppliers are always received just-in-time when needed in short lead times while 22% disagreed (mean response =4.253 and S.D =.813). 92% of the respondents did agree nor disagreed that Bralirwa's inventory to customers are always delivered just-in-time when the customers need them and in short lead times while 8% agreed (mean response =3.2 and an S.D =.47). 3.2% disagreed ,21.7% neither agree nor disagreed 25.7% agreed 43.7% that the flexibility of our vendors in inventory order management have led to improved operational efficiency while 20% disagreed (mean response =4.2 and S.D =0.9). 82% of respondents agreed that the lead time offered by their vendors in inventory order management have led to improved operational efficiency, though 18% disagreed (mean response =3.116 and S.D =1.014).These finding closely assumes the trend that was observed by Yazan (2017), Derick (2014), Munyao et al., (2005), as well as Odhiambo and Kihara (2018) in attempts to establish the effect of Just-in-Time on Operational Performance.

4.4. Inferential Statistics

The analysis of the findings in this research constituted descriptive and inferential statistics.

4.4.1 Correlation Analysis

Correlation analysis is one of the inferential statistics that the study conducted

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Table 4: Correlation Analysis

Variables		operational performance	demand forecasting	Just-in-Time	Vendor Managed Inventory
operational performance	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	175			
Vendor Managed Inventory	Pearson Correlation	0.810**	1		
	Sig. (2-tailed)	0.000			
	N	175	175		
demand forecasting	Pearson Correlation	0.706	-0.751	1	
	Sig. (2-tailed)	0.004	.005		
	N	175	175	175	
Just-in-Time	Pearson Correlation	0.431**	0.689**	0.859**	1
	Sig. (2-tailed)	0.000	.000	.000	
	N	175	175	175	175

Source: Survey data (2022)

The study investigated the relationship between inventory management practices and operational performance of manufacturing companies in Rwanda. The results shows that Vendor Managed Inventory and demand forecasting had a significance high degree of positive correlation (r=0.810 p=0.000, r=0.706 p=0.000) with operational performance of manufacturing companies in Rwanda respectively while Just-in-Time had a significance low degree of positive correlation (r=0.431 p=0.000) with operational performance of manufacturing companies in Rwanda

4.5.1 Vendor Managed Inventory and Operational Performance

The first objective was to establish the effect of vendor managed inventory and operational performance in Bralirwa Plc, Kigali. Table 5 shows the summary of results.

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Table 5: Regression Results of Vendor Managed Inventory and Operational Performance

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
				R Square Change	F Change	df1	df2	Sig. F Change
0.742[a]	0.551	0.522	0.019	0.551	124.452	3	172	0.000

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	119.848	3	39.949	124.452	0.000[b]
Residual	55.153	172	0.321		
Total	175.001	175			

a. Dependent Variable: Operational Performance
b. Predictors: (Constant): VMI

Regression Coefficients
Regression coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.192	0.753		3.719	0.000
	Vendor Managed Inventory	0.719	0.168	0.551	5.280	0.000

Source: Survey Data, (2022)

Table 5 shows a correlation coefficient (R) of 0.742 shows that vendor managed inventory has a strong positive association to operational performance of Bralirwa Plc , Kigali. With R-square change of 0.551 obtained, 55.1% of the observed change in operational performance of Bralirwa Plc, Kigali was due to vendor managed inventory practices.

Considering Hypothesis One ($H_0$1) that, "there is no statistically significant effect of vendor managed inventory on operational performance of Bralirwa Plc, Kigali," the results show that, on the contrary, "there was a statistically significant effect of vendor managed inventory on operational performance of Bralirwa Plc, Kigali" (β=.719; p<0.001). The null hypothesis that, "there was a statistically significant effect of vendor managed inventory on operational performance of Bralirwa Plc, Kigali," was rejected and the alternate accepted. Using the unstandardized Beta coefficients and the constant, the following model relationship was obtained: $\boldsymbol{Y= 1.192+ 0.719X_1}$ Where Y is the Operational Performance of Bralirwa Plc, Kigali, andX_1 is the Vendor Managed Inventory. From the model, on the event vendor managed inventory is adjusted by one unit, there would be a corresponding change in operational performance of Bralirwa Plc, Kigali by 0.719 units from 1.192.These finding compare well with the findings observed by Wisner (2016), Ika (2016) and Venkatesha (2017). They pointed that that vendor managed inventory potentially provide benefits to both the vendor and the customer when properly applied. The models in all the cases were analytical and were geared towards supply chain inventory with specific attention on probabilistic demand in a normal distribution framework. The incorporation of vendor managed inventory management practice in the organization's daily inventory operations would thus for example improve the set-up time of manufacturing plants, improve the

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planning of production, decrease administrative costs, increase service levels, improve truckload rates while at the same time it would decrease stock out risks.

4.5.2 Demand Forecasting and Operational Performance

The second objective was to determine the effect of demand forecasting on operational performance in Bralirwa Plc, Kigali,Table 6 show the summary of results.

Table 6: Regression Results of Demand Forecasting and Operational Performance

Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.237	0.32		3.774	0.000
	Demand Forecasting	0.768	0.101	0.531	4.827	0.001

Hypothesis Two ($H_0$2) stated that, "there is no significant statistical effect of demand forecasting on operational performance of Bralirwa Plc, Kigali." The results, on the contrary, show that "there was a statistically significant effect of demand forecasting on operational performance of Bralirwa Plc, Kigali (β=.768; p<0.001)." The null hypothesis that, "there was a statistically significant effect of demand forecasting on operational performance of Bralirwa Plc, Kigali," was rejected and the alternate accepted. In consideration of the unstandardized Beta coefficients and the constant, the following model was obtained: $\mathbf{Y= 1.237 + 0.768X_2}$

Where Y is the Operational Performance of Bralirwa Plc, Kigali, and X_2 is the Demand Forecasting. From the model, if Demand Forecasting is manipulated by one unit, there would be a corresponding change in Operational Performance of Bralirwa Plc, Kigali by 0.768 units. These finding support the findings obtained by Kalchschmidt (2014), Hanni et al (2013), and Awanga (2018). A well planned demand system with clear forecasts would then be seen to critically reduce the overall supply chain costs through enhancement of clearer visibility of future demand. Efficient planning for demand and collaboration with other departments are therefore important factors in improving customer services. As such, the use of demand forecasting techniques like Material Requirement Planning (MRP) systems and Economic Order Quantity (EOQ) models in determining accurate future demand forecast would likely have a positive influence on operational performance.

4.5.3 Just-in-Time and Operational Performance

The third objective was to establish the effect of Just-in-Time on operational performance in Bralirwa Plc, Kigali. Table 7 show the summary of results.

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Table 7: Regression Results of Just-in-Time and Operational Performance

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
				R Square Change	F Change	df1	df2	Sig. F Change
0.729[a]	0.531	0.712	0.041	0.753	198.515	3	172	0.000

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	120.301	3	40.100	198.515	0.000[b]
Residual	140.142	172	0.202		
Total	174.994	175			

a. Dependent Variable: Operational Performance
b. Predictors: (Constant): Just-in-Time

Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.234	0.32		3.774	0.000
	Just-in-Time	0.531	0.101	0.531	4.827	0.040

Source: Survey Data, (2022)

Table 7 shows a correlation coefficient (R) of 0.729. This shows that Just-in-Time had a strong positive association to operational performance of Bralirwa Plc, Kigali. The R-square change obtained was 0.531, an indication that 53.1% of the observed change in operational performance of Bralirwa Plc, Kigali was attributed to Just-in-Time practices.

Hypothesis Three ($H_0 3$) stated that, "there is no significant effect of Just-in-Time on operational Performance of Bralirwa Plc, Kigali." The results however show that, "there was a statistically significant effect of Just-in-Time on operational performance of Bralirwa Plc, Kigali (β=.531; p<0.001)." The null hypothesis that, "there was a statistically significant effect of Just-in-Time on operational Performance of Bralirwa Plc, Kigali," was rejected and the alternate accepted. Considering un standardized Beta coefficients and the constant, the following model was obtained: $\boldsymbol{Y= 1.234 + 0.531X_3}$

Where Y is the operational Performance of Bralirwa Plc, Kigali, X_3 is the Just-in-Time. From the model, if Just-in-Time is changed by one unit, there would be a corresponding change in operational performance of Bralirwa Plc L, Kigali by 0.531 units from 1.234. These finding closely assume the trend that was observed by Yazan (2017), Derick (2014), Munyao et al, (2005), as well as Odhiambo and Kihara (2018) in attempts to establish the effect of Just-in-Time on Operational Performance.

https://doi.org/10.53819/81018102t2065

Stratford Peer Reviewed Journals and Book Publishing
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4.5.4 Inventory Management Practices and Operational Performance

The general objective was to establish the effect of inventory management practices on operational performance in Bralirwa Plc, Kigali. Table 8 show the summary of results.

Table 8: Model Summary

Model Summary

				Change Statistics			
R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
0.832[a]	0.692	0.635	0.035	0.692	120.661	3	172	0.000

Table 8 shows that inventory management practices market had a strong positive association (R= 0.832) to operational performance of Bralirwa Plc, Kigali. With R^2= 0.692,there was an implication that69.2% of the change observed in operational performance of Bralirwa Plc, Kigali was due to inventory management practices.

Table 9 ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	122.713	3	40.904	120.661	0.000[b]
Residual	58.315	172	0.339		
Total	180.028	175			

a. Dependent Variable: Operational Performance

b. Predictors: (Constant): Vendor Managed Inventory, Demand Forecasting & Just-in-Time

The study tested the overall model on effect of inventory management practices on operational performance of Bralirwa Plc, Kigali." The results however show that there was a statistically significant statistical effect of inventory management practices on operational performance of Bralirwa Plc, Kigali (F=120.661; p<0.001).

Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t-statistics	Sig.
		B	Std. Error	Beta		
	(Constant)	1.244	0.201		6.189	0.000
1	Vendor Managed Inventory	0.732	0.103	0.629	7.107	0.000
2	Demand Forecasting	0.785	0.116	0.669	6.767	0.000
3	Just-in-Time	0.601	0.104	0.497	5.779	0.000

Source: Survey Data, (2022)

The null hypothesis that, "there was a statistically significant effect of inventory management practices on operational performance of Bralirwa Plc, Kigali," was rejected and the alternate accepted. This led to the following model: $\boldsymbol{Y = 1.244 + 0.735X_1 + 0.785X_2 + 0.601X_3}$

Where Y is the Operational Performance of Bralirwa Plc, Kigali, X_1 is the Vendor Managed Inventory, X_2 is the Demand Forecasting, and X_3 is the Just-in-Time Practices. In view of the model, should vendor managed inventory practices be adjusted by one unit, there would be a

corresponding change in operational performance of Bralirwa Plc, Kigali by 0.735 units keeping demand forecasting as well as Just-in-Time practices constant. Should demand forecasting process be adjusted by one unit, there would be a corresponding change in operational performance of Bralirwa Plc, Kigali by 0.785 units keeping vendor managed inventory as well as Just-in-Time practices constant. Should Just-in-Time practices be manipulated by one unit, there would be a corresponding change in operational performance of Bralirwa Plc, Kigali by 0.601units keeping vendor managed inventory and demand forecasting practices constant.

These finding closely assumes the trend that was observed by Jelena, et al., (2012) in Croatia, Nnabuife & Ojukwu (2015) in Nigeria, Bagorogoza et al., (2011) in Uganda and Ha, Lo and Wang (2016) in their search for the effect of inventory management practices on operational performance. vendor managed inventory potentially provide benefits to both the vendor and the customer when properly applied. The models in all the cases were analytical and were geared towards supply chain inventory with specific attention on probabilistic demand in a normal distribution framework. The incorporation of vendor managed inventory management practice in the organization's daily inventory operations would thus for example improve the set-up time of manufacturing plants, improve the planning of production, decrease administrative costs, increase service levels, improve truckload rates while at the same time it would decrease stock out risks. A well planned demand system with clear forecasts would then be seen to critically reduce the overall supply chain costs through enhancement of clearer visibility of future demand. Efficient planning for demand and collaboration with other departments are therefore important factors in improving customer services. As such the use of demand forecasting techniques like Material Requirement Planning (MRP) systems and Economic Order Quantity (EOQ) models in determining accurate future demand forecast would likely have a positive influence on operational performance.

5.1 Conclusion

The study concluded that there was a significant statistical effect of vendor managed inventory on operational performance of Bralirwa Plc, Kigali, therefore; this should serve as a pointer to better operational performance and vendor managed inventory potentially provide benefits to both the vendor and the customer when properly applied

The study furthered concluded that efficient planning for demand and collaboration with other departments are important factors in improving customer services. The study however failed to elaborate how company s can ensure efficient demand planning in managing inventory.

Manufacturing firms, which practiced Just-in-time for inventory management, higher operational performance was witnessed. The study also failed to clearly show the contribution played by the individual indicators of JIT (vendor flexibility and lead-time) on operational performance of consumer goods manufacturing companies.

5.2 Recommendations

First, the study concluded that there was a significant statistical effect of vendor managed inventory on operational performance of Bralirwa Plc, Kigali, therefore; this should serve as a pointer to better operational performance. The study thus recommends that policy makers in Bralirwa Plc, Kigali should employ more vendor managed inventory practices to enhance the operational performance in manufacturing companies on vendor flexibility. Findings show that sixty-two (62) percent appreciate Operational performance of manufacturing companies

in Rwanda. The process identifies strategic actions required to effectively manage operational performance in manufacturing firms in Rwanda

Secondly, the study concluded that there was a significant statistical effect of demand forecasting on operational performance of Bralirwa Plc, Kigali. The study recommends that the strategic plans should factor in both short term and long term demand forecasting in order to improve on the operational performance. Eighty one (81) percent also revealed that records management facilitated operational performance of manufacturing companies in success because they improve transparency, accountability and organizational learning as well as fulfill performance requirements and facilitate traceability.

Lastly, the study concluded that there was a significant statistical effect of Just-in-Time on Operational Performance of Bralirwa Plc, Kigali. The study therefore recommends that adoption of Just-in-Time inventory management policy, which should clearly be specified in the standard operating procedure manual.

5.3 Acknowledgement

First of all, I thank the Almighty God for giving me good health and guiding me through the entire course. My gratitude also goes to the management of Bralirwa Plc, Kigali for allowing me to carry out research in this manufacturing firm. Sincere thanks to the Bralirwa Plc management and staff in general for participating in primary data collection. I take this opportunity to express my gratitude to the entire staff and management of MKU University for mutual and academic support during the study. I also thank everyone whose names are not mentioned, but has contributed in one way or another to the completion of this research.

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