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SUPPLY CHAIN AUTOMATION AND PERFORMANCE OF GARMENT MANUFACTURING COMPANIES IN NAIROBI CITY COUNTY KENYA

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ABSTRACT

The main objective of the study is to establish the influence of supply chain automation on competitiveness of garment manufacturing companies in Kenya. Specifically, the study sought to assess the influence of inventory management systems on competitiveness of garment manufacturing companies in Kenya and to establish the influence of electronic vendor evaluation on competitiveness of garment manufacturing companies in Kenya. The study adopted a cross sectional descriptive research design. The research focused on medium and large-scale garment manufacturers in Kenya. There are 67 garment manufacturers listed currently in Nairobi County which are registered members of the Kenya Association of Manufacturers (KAM) as of 20th January 2020 (KAM, 2020). The study's sample size was reached at using Krejcie and Morgan sample size determination formula. The 235 respondents were chosen with the help of stratified random sampling technique. Primary data was used in this study. The study used structured questionnaires to collect primary data. Twenty-three respondents were used for piloting to refine the data collection instrument and to ascertain validity and reliability of the study data collection. Content analysis was used to analyze qualitative data from open-ended questions while descriptive statistics and multiple regression were applied to analyze quantitative data from closed ended questions. The study findings were presented through use of tables and figures. The study concludes that inventory management system has a positive and significant influence on performance of garment manufacturing companies in Nairobi City County Kenya. In addition, the study concludes that electronic vendor evaluation has a positive and significant influence on performance of garment manufacturing companies in Nairobi City County Kenya. Further, the study concludes that electronic payment has a positive and significant influence on performance of garment manufacturing companies in Nairobi City County Kenya. The study concludes that electronic sourcing has a positive and significant influence on performance of garment manufacturing companies in Nairobi City County Kenya. From the findings, this study recommends that garment manufacturing companies in Nairobi City County should continue embracing inventory management system to enhance effectiveness of inventory operations. In addition, garment manufacturing companies in Nairobi City County should continue embracing electronic vendor evaluation to be in a position to filter the available vendor to work with the best.

Key Words: Supply chain automation, Inventory management systems, Electronic vendor evaluation, Competitiveness, Garment manufacturing companies

INTRODUCTION

Supply chain automation has provided organizations with vast opportunities to operate beyond their traditional physical boundaries. More specifically ICT practices have provided manufacturing and service firms with more efficient solutions to drive significant value into their business (Premkumar, 2009). Indeed in 2001 one of the major advocates of internet-based business strategies, Michael Porter, professed that if firms were intent on remaining competitive, they would have to adapt their business models to accommodate more effective and efficient internet-based business approaches.

Such adaptation has however, produced both positive and negative effects for firms in relation to commercial relationships and ICT practices deployment (Porter & Millar, 2009). The purchasing of goods and services in the public sector is central because it supports all functions of government; each governmental unit needs supplies and equipment to accomplish its mission (Oliveira & Martins, 2011). Lysons (2013) opined that one of the most important challenges in government procurement is how to best utilize information technology in an age of communications revolution. The issue has been discussed both from a technological perspective and a managerial perspective (Lavelle & Bardon, 2009).

A study by Teo, Lin, and Lai (2019) on the adoption of ICT procurement practices was conducted in Hong Kong. The main objective of the study was to identify the perceived critical success factors and perceived barriers regarding the implementation of enterprise resource planning. A conceptual framework had been developed for the adoption of enterprise resource planning, and this subsequently had been tested with data collected from companies in Hong Kong. The results indicated that educating companies in both long- and short-term benefits would encourage the application of enterprise resource planning (Thai, 2007). The ICT manufacturing sector may provide examples of best practice and the knowledge gleaned may help inform future research (Samuelson, 2018). Building on the traditional implementations, procurement ICT research has included a variety of constructs and measures in understanding and predicting implementation success.

Kenya's trade liberalization has accelerated since the early 1990s, thus stimulating imports and improving access to alternative and superior technologies. With the advent of globalization and global financial crisis, adopting information and communication technology in Kenyan parastatals have become increasingly important. For example, national gender and equality commission has adopted systems such as RTGS in its procurement processes (Amayi, 2011).

Statement of the Problem

The Kenyan Vision 2030, the country long-term socio-economic development blueprint, identified manufacturing sector to be one of its key pillars (RoK, 2017). Similarly, the sector is one of the Big 4 agenda, President Uhuru Kenyatta’s development print outlining his focus during his last presidential term to improve the living standards of Kenyans, grow the economy, and leave a lasting legacy (RoK, 2017). The two socio-economic development blueprints expect the manufacturing sector substantial contribution to their realization. For example, the Vision 2030 expects at least 20 percent contribution to the country Gross Domestic Product (GDP) by 2030 for it to be realized (RoK, 2017) and the Big 4 agenda expects it to have a 15 percent impact on the GDP from the current 9.2 percent for the agenda to be realized (RoK, 2017). The sector is predominantly agro-processing (KAM, 2017). Thus, agro-processing sub-sector is expected to move from the current 16 percent contribution to GDP to 50 percent contribution by 2022, create 1000 SME’s, which will in turn generate part of the 200,000 new jobs to realize the goal in the Big4 agenda (KAM, 2017, RoK, 2017).

However, the sector's share of GDP has remained stagnant with only limited increases in the last three decades, contributing an average of 10% from 1964-73 and rising marginally to 13.6% from 1990-2007 and averaging below 10% in recent years (KAM, 2017, RoK, 2018). In a similar pattern, garment manufacturing sub-sector registered a paltry contribution of 3.5 percent in the year 2017 with no sign that the sub-sector is about to change cause in the near future (KAM, 2017, RoK, 2018) due to issues related to operational costs (KAM, 2017; Nyaga and Achuora, 2020). Therefore, there is a need for a management approach that is capable of addressing operational and performance-related issues in order to increase the capacity of the sector to meet both Vision 2030 and Big4 agendas.

According to Transparency International (2011) 80% of garment manufacturing companies in Kenya rely on old records in selecting their suppliers, while only 25% search through internet catalogue in selecting suppliers (Rajkumar, 2010), the reason for poor procurement practices.

However, in Hong Kong, previous research by Chan and Lee (2019) on the survey of the use of supply chain automation, shows that use of the ICT in their processes improved procurement performance by 72%, while in Kenya, no empirical research has been undertaken to quantify the influence of supply chain automation on procurement performance. It is against that backdrop that this study was done to determine the influence of supply chain automation on competitiveness of garment manufacturing companies in Kenya.

Objectives of the Study

i. To assess inventory management systems on performance of garment manufacturing companies in Nairobi City County Kenya.
ii. To establish electronic vendor evaluation on performance of garment manufacturing companies in Nairobi City County Kenya.

LITERATURE REVIEW

Theoretical Review

The Technology Acceptance Model (TAM)

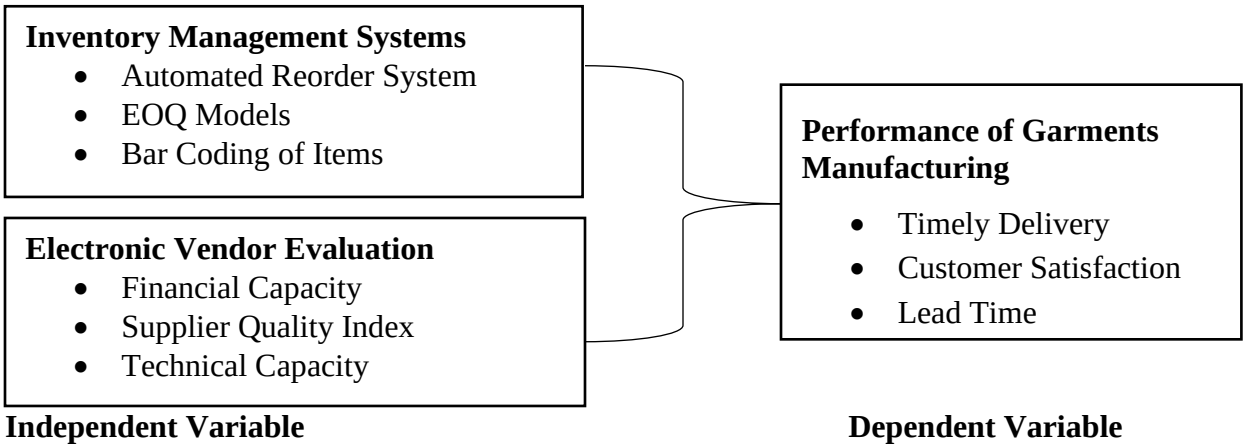
This model was developed and validated by Davis (1993), he used technology acceptance model (TAM) to explain the mechanisms that influence and shape users' acceptance of new information technology such as electronic tendering (Minahan & Degan, 2011). Inventory management system as an information technology application consists of useful tools for users to save money and increase organizations' effectiveness and efficiency (Davila, Gupta & Palmer, 2013). Technology acceptance model is relevant in that it explains garment manufacturing companies in Kenya are increasingly accepting and using new technologies in inventory management which consequently is improving procurement performance.

Partnership Theory

Partnerships theory was developed by Sir Francis Hill (1966) in which he opined that in supply chain, the common model through which theorists study the relationship between supplier and buyer is known as the partnership theory. In its basic nature, the partnership model depicts the buyer and supplier as partners with a common interest which is customer satisfaction (Petroni & Braglia, 2010).

Partnership is a business relationship based on mutual trust, openness, shared risks and rewards that enables an organization gain competitive advantage leading in the company achieving a performance that's far much greater than the firm would have achieved when operating as single entities. This model requires efficient electronic vendor evaluation systems between the buyer and supplier which is a critical element of any partnership (Ribeiro & Henriques, 2011).

Conceptual Framework



Inventory Management Systems

Inventory management systems in this study was considered as an ICT practice variable that influences performance of procurement in the parastatals. The attributes of electronic inventory management which will be taken into consideration in this study are: automated reorder systems, EOQ models and bar coding of items. Lean management is getting more and more attention in today's highly competitive environment. The proponents of electronic inventory system argue that excess inventory will adversely affect the net cash flows of a firm (Moon, 2015).

On the cost side, most obvious are the costs of holding inventory, which include the capital costs (interest or opportunity) and the physical cost (storage, insurance and spoilage). In recent years, a number of electronic inventory systems have been developed in the field of operations management to deal with excess inventory problem. Management oriented systems include the automated reorder systems, EOQ models and bar coding of items. These organization wide practices encompass the entire supply chain (Wong & Sloan, 2014).

The elements of automated reorder systems include shared product design with suppliers and customers, movement towards single sourcing proximate suppliers, reduced machine set- up times and total preventive maintenance (Lysons, 2013). It is an electronic inventory strategy that is implemented to improve the return on investment of a business by reducing inventory and its associated carrying costs. In order to achieve JIT, the process must have signals of what is going on everywhere within the process which can lead to dramatic improvements in a public organization's return on investments, quality and efficiency. It emphasizes that production should create items that arrive when needed, neither earlier nor later (Davila *et al.*, 2013)

Electronic Vendor Evaluation

Electronic vendor evaluation in this study was considered as an ICT practice variable that influences performance of procurement in the parastatals. The attributes of electronic vendor evaluation which will be taken into consideration in this study are: financial capacity, supplier quality index and technical capacity. Vendor evaluation is the evaluation and monitoring of supplier capability to ensure successful delivery of commercial outcomes.

It is an essential part of strategic sourcing, vendor management and securing competitive advantage (Rotich, 2011). It is best considered in two phases, pre-contract and post-contract often referred to as contract management. The pre contract involves assessment of potential vendors' capability of controlling quality, delivery, quantity, price and all other factors embodied in a

contract while the post-contract involves assessing ongoing vendor performance, deciding what to monitor and the success factors involved (Bradley, 2015).

Premkumar (2009) stated that the strategic importance of a given supply item (and in aggregate a contract or vendor) is related to its profit impact and its supply risk. Profit impact can be volume or value purchased, impact on supply chain value-add, business growth potential or dependency. Supply risk can be product availability, number of suppliers, ease or cost of switching vendor or the availability of substitute products or services (Aboelmaged, 2009).

Empirical Review

Inventory Management Systems and Organizational performance

Kalakota *et al.,* (2015) analyzed the warehouse and inventory management system in Shell Petroleum Development Company and demonstrated the utility of ICT through vendor managed inventory as a veritable value-added tool in electronic inventory management. Croom (2010) also tried to justify the use of modified EOQ models logistic-based approach to managing inventory of perishable products. Davila *et al.,* (2018) used statistical process monitoring tools with inventory levels and stock-outs as key metrics in achieving proactive inventory policy intervention in the context of cooperative supply chains. Their results showed the possibility of detecting out-of-control supplier signals beforehand and significantly reducing stock-outs through dynamic adjustments of inventory levels (Chan *et al.,* 2019).

As earlier noted, there has also been renewed interest by researchers to improve on the awareness of the economic benefits of robust electronic inventory management (Lysons, 2013). These studies suggest the need for modern organizations to do away with qualitative approaches, in favor of quantitative methods, given today's increasingly complex and unpredictable environment. In this regard, Githumbi (2018), applied quantitative demand forecasting methods along with two classic inventory models, namely electronic order quantity, to demonstrate significant (up to 44 per cent) inventory cost reduction and improved customer service levels at a company in Nairobi.

Also, in the context of electronic order quantity inventory analytical tool, Kar (2009), made an attempt to use modified linear optimization method that improved the discriminating power among inventory items beyond what is obtainable by conventional approaches. Similarly, Callender *et al.,* (2015) used financial statement data to establish the nexus between inventory management and firm profitability among US manufacturing firms. The researchers found that a lower ratio of inventory to sales for a firm is associated with higher profit margin for the firm, but the specific IMTs that helped the enterprises to achieve profitability were not the focus of the study.

In similar vein, Issa *et al.,* (2018), used the inventory management system to highlight the effectiveness (or ineffectiveness) of internal control of an entire organization. Relatedly, in the Nigerian context, Kannan *et al.,* (2018) used a combined case study / survey methods to provide some useful insights into how Nigerian manufacturers optimized inventory management in terms of lead-time delivery and reduced stock-outs of products, goods and materials. Cagliano *et al.,* (2018) used similar approach to evaluate the role of inventory management in fostering entrepreneurship. In both studies, the results suggest that robust inventory management leads to economy, efficiency, and cost-reduction, among other benefits.

Electronic Vendor Evaluation and Organizational performance

According to a study done by Farzin *et al* (2017) he argues that electronic vendor appraisal process is an essential aspect of both strategic sourcing and procurement performance in order for an organization to achieve competitive advantage. Boer *et al.,* (2016) observed that developing a robust, easy-to-deploy method of evaluating vendor electronically is a critical business competency. Boer noted that the methodology should be sound and the approach practical. Vendor

evaluation may take various approaches which all influence the quality of data obtained from the vendors which reflect the true picture of the suppliers (Petroni, 2018).

Davila *et al.,* (2015) noted that there are many sources which the procuring entity should use to check or verify the dependability and reliability of each supplier. Davila further observed that electronic vendor appraisal is one of the widely used to collect information about the vendor and electronic vendor appraisal uses published or unpublished information already in existence and is particularly applicable to product and financial appraisals. Saford (2010) added that electronic vendor research should always precede field research since it will indicate what matters need to be investigated.

According to the study by Egbu *et al.,* (2017), third party appraisals may also be undertaken mostly through a variety of agencies especially when assessing the compliance to quality systems. Similarly, in the study by Rajkumar (2016), he observed that electronic vendor evaluation enables information to be provided on a template to be verified and answers given by the vendor's staff in the course of the evaluation. Rajkumar also observed that frequent electronic vendor evaluations with suppliers facilitate the prevention of inefficient practices at an early stage and encourage continuous improvement of vendors.

These assessments, however, are mutually beneficial only if both parties are willing to cooperate and provide the necessary inputs (Teo *et al.,* 2019). When seeking to approve vendors, procurement functions must be satisfied that as a minimum they are technically sound, managerially competent, adequately resourced, financially stable and reliable which consequently leads to timely delivery and supply of quality products (Li, 2018).

RESEARCH METHODOLOGY

The study adopted a cross sectional descriptive research design. Descriptive research design allows the researcher to study the elements in their natural form without making any alterations to them (Kothari, 2018).The study targeted 67 garment manufacturers listed currently in Nairobi County. The research focused on medium and large-scale garment manufacturers in Kenya. The study used primary data that was gathered by use of structured questionnaires and captured through a 5-point Likert scale type and interview schedule. The Likert scale with closed and open question guide was distributed to the respondents after approval to collect data. The purpose of the study was explained and consent to participate in the study was sought. Dates and venues for administering the questionnaires in consultation with the potential subjects were set. Drop-and-pick-later method of questionnaire administering was implored with explanations of how to fill them. Data was then coded and classified in terms of similarities then tabulated. Descriptive statistics such as percentages, means and standard deviations were used to analyze quantitative data. SPSS version 28 program was also used to analyze quantitative data and results presented in form of charts, graphs and frequency tables for easier interpretation.

RESEARCH FINDINGS AND DISCUSSIONS

Response rate

The sample size of this study was 235 and it comprised of employees of garment manufacturing firms in Nairobi County, Kenya. The researcher distributed 235 questionnaires to the respondents during data collection process and 221 were fully filled and returned to the researcher thus making a response rate of 94%. Kothari (2012) argues that a response rate which is more than 50% is considered adequate while excellent response rate is usually above 70%. This implies that the response rate in this research is good for making conclusions as well as recommendations.

Descriptive Analysis of the Variables of the Study

Inventory Management Systems and Firm Performance

Table 1 indicate the results on the statements regarding the effect of inventory management systems on performance of garment manufacturing companies in Nairobi City County Kenya. Findings show that majority of the respondents agreed that their organization has implemented inventory management systems to effectively track and control their inventory levels. This is shown by a mean of 3.915 (std. dv = 0.776). As shown by a mean of 3.908 (std. dv = 0.836), the respondents agreed that the inventory management systems used by garment manufacturing companies have improved their overall operational efficiency. Further, with a mean of 3.870 (std. dv = 0.972), the respondents agreed that the implementation of inventory management systems has reduced stockouts and overstocking issues in garment manufacturing companies.

The participants agreed that the inventory management systems have enabled garment manufacturing companies to optimize their production planning and scheduling. This is shown by a mean of 3.812 (std. dv = 1.005). As shown in the results, the respondents agreed that the accuracy of inventory records has significantly improved after the implementation of inventory management systems in garment manufacturing companies. This is shown by a mean of 3.802 (std. dv = 0.608). As shown by a mean of 3.786 (std. dv = 0.897), the respondents agreed that the use of inventory management systems has resulted in a reduction in inventory holding costs for garment manufacturing companies.

Table 1: Inventory Management Systems and Firm Performance

	Mean	Std. Dev.
Our organization has implemented inventory management systems to effectively track and control their inventory levels.	3.915	0.776
The inventory management systems used by garment manufacturing companies have improved their overall operational efficiency.	3.908	0.836
The implementation of inventory management systems has reduced stockouts and overstocking issues in garment manufacturing companies	3.870	0.972
The inventory management systems have enabled garment manufacturing companies to optimize their production planning and scheduling.	3.812	1.005
The accuracy of inventory records has significantly improved after the implementation of inventory management systems in garment manufacturing companies	3.802	0.608
The use of inventory management systems has resulted in a reduction in inventory holding costs for garment manufacturing companies	3.786	0.897
Aggregate	**3.814**	**0.819**

Electronic Vendor Evaluation and Firm Performance

The statements concerning effect of electronic vendor evaluation on performance of garment manufacturing companies in Nairobi City County Kenya. are presented in Table 2. Findings show that majority of the the respondents agreed that their company uses electronic vendor evaluation systems to assess the performance of their vendors. This is shown by a mean of 3.955 (std. dv = 0.172). As shown by a mean of 3.855 (std. dv = 0.839), the respondents agreed that the electronic vendor evaluation systems have improved the efficiency and effectiveness of vendor selection and management in garment manufacturing companies. Further, with a mean of 3.842 (std. dv = 0.898), the respondents agreed that the electronic vendor evaluation systems have resulted in better communication and collaboration between garment manufacturing companies and their vendors.

The participants agreed that the electronic vendor evaluation systems have helped garment manufacturing companies identify and mitigate risks associated with vendor performance. This is shown by a mean of 3.815 (std. dv = 0.112).

As shown in the results, the respondents agreed that the accuracy and reliability of vendor performance data have significantly improved after the implementation of electronic vendor evaluation systems. This is shown by a mean of 3.758 (std. dv = 0.969). As shown by a mean of 3.723 (std. dv = 0.732), the respondents agreed that the use of electronic vendor evaluation systems has led to cost savings and better negotiation outcomes for garment manufacturing companies.

Table 2: Electronic Vendor Evaluation and Firm Performance

	Mean	Std. Dev
Our company uses electronic vendor evaluation systems to assess the performance of their vendors.	3.955	0.172
The electronic vendor evaluation systems have improved the efficiency and effectiveness of vendor selection and management in garment manufacturing companies	3.855	0.839
The electronic vendor evaluation systems have resulted in better communication and collaboration between garment manufacturing companies and their vendors	3.842	0.898
The electronic vendor evaluation systems have helped garment manufacturing companies identify and mitigate risks associated with vendor performance.	3.815	0.112
The accuracy and reliability of vendor performance data have significantly improved after the implementation of electronic vendor evaluation systems	3.758	0.969
The use of electronic vendor evaluation systems has led to cost savings and better negotiation outcomes for garment manufacturing companies	3.723	0.732
Aggregate	**3.365**	**0.598**

Inferential Analysis

Correlation Analysis

The results in Table 3 show that there is there was a very strong relationship between inventory management systems and the performance of garment manufacturing companies in Nairobi City County Kenya (r = 0.828, p value =0.001). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings are in line with the findings of Muhoya (2016) who indicated that there is a very strong relationship between inventory management systems and firm performance.

Moreover, there was a very strong relationship between electronic vendor evaluation and the performance of garment manufacturing companies in Nairobi City County Kenya (r = 0.838, p value =0.001). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings are in line with the findings of Koech, Boit and Maru (2015) who indicated that there is a very strong relationship between electronic vendor evaluation and firm performance.

Table 3: Summary of Pearson's Correlations

		Firm Performance	Inventory Management Systems	Electronic Vendor Evaluation
Firm Performance	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	221		
Inventory Management Systems	Pearson Correlation	.828**	1	
	Sig. (2-tailed)	.001		
	N	221	221	
Electronic Vendor Evaluation	Pearson Correlation	.838**	.297	1
	Sig. (2-tailed)	.001	.060	
	N	221	221	221

Regression Analysis

Table 4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.923[a]	.851	.853	.10482

Table 5 Analysis of Variance

	Sum of Squares	d.f	Mean Square	F	Sig.
Regression	12.028	4	3.007	160.80	.002[b]
Residual	3.668	196	.0187		
Total	115.695	200			

Table 6 Regression of Beta Coefficient and Significance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.342	0.089		3.843	0.002
Inventory Management Systems	0.397	0.097	0.398	4.093	0.003
Electronic Vendor Evaluation	0.387	0.097	0.389	3.990	0.002

The r-squared for the relationship between the independent variables and the dependent variable was 0.851. This implied that 85.1% of the variation in the dependent variable (performance of garment manufacturing companies in Nairobi City County Kenya) could be explained by independent variables.

F calculated was 160.80 while the F critical was 2.418. The p value was 0.002. Since the F-calculated was greater than the F-critical and the p value 0.002 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of inventory management systems and electronic vendor evaluation on performance of garment manufacturing companies in Nairobi City County Kenya.

Inventory management systems has a significant effect on performance of garment manufacturing companies in Nairobi City County Kenya β_1=0.397, p value= 0.003). The relationship was considered significant since the p value 0.003 was less than the significant level of 0.05. The findings are in line with the findings of Muhoya (2016) who indicated that there is a very strong relationship between inventory management systems and firm performance

The results also revealed that electronic vendor evaluation has a significant effect on performance of garment manufacturing companies in Nairobi City County Kenya β1=0.387, p value= 0.002). The relationship was considered significant since the p value 0.002 was less than the significant level of 0.05. The findings are in line with the findings of Koech, Boit and Maru (2015) who indicated that there is a very strong relationship between electronic vendor evaluation and firm performance.

Conclusion

The study concludes that inventory management system has a positive and significant influence on performance of garment manufacturing companies in Nairobi City County Kenya. Findings revealed that automated Reorder System, EOQ Models, Bar Coding of Items influence the performance of garment manufacturing companies

In addition, the study concludes that electronic vendor evaluation has a positive and significant influence on performance of garment manufacturing companies in Nairobi City County Kenya. Findings revealed that financial Capacity, supplier Quality Index and technical Capacity influence the performance of garment manufacturing companies

Recommendations of the Study

The study findings revealed that inventory management system has a positive and significant influence on performance of garment manufacturing companies in Nairobi City County Kenya. This study therefore recommends that garment manufacturing companies in Nairobi City County should continue embracing inventory management system to enhance effectiveness of inventory operations

In addition, the study findings revealed that electronic vendor evaluation has a positive and significant influence on performance of garment manufacturing companies in Nairobi City County Kenya. This study therefore recommends that garment manufacturing companies in Nairobi City County should continue embracing electronic vendor evaluation to be in a position to filter the available vendor to work with the best.

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