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E-INVENTORY MANAGEMENT SYSTEMS AND THE PERFORMANCE OF SUPERMARKETS IN NAIROBI COUNTY, KENYA

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ABSTRACT- This study establishes the influence of e-inventory management systems on the performance of supermarkets in Nairobi County, Kenya. Specifically, the study sought to examine the effect of electronic data interchange, electronic point of sale, bar coding and radio frequency identification on performance of supermarkets in Nairobi County. The study was grounded on the resource based view theory. A descriptive cross-sectional survey research design was employed and stratify random sampling approach was used to ensure representativeness of the population of the study. The target population was 158 supermarkets in Nairobi County and the study sample size was 113 supermarkets. A structured questionnaire was used to collect primary data and was administered to the heads of supply chain management in the respective firms through the drop-and-pick later method. Descriptive statistics and multiple regression equation were applied to analyse quantitative data with the help of Statistical package for social science (version 21.0). The study established a positive significant relationship between e-inventory management systems and performance of supermarkets. The study therefore concludes that e-inventory systems significantly improve performance of supermarkets. Consequently, the study recommends that supermarkets in Kenya should implement e-inventory management systems in order to improve their performance through reduction of operation costs and improved inventory control. Further, the government should give tax rebate on IT infrastructure related to e-inventory management systems to encourage up take of the systems by firm as a way of boosting their performance and growth. Finally, the study recommends that future research should focus on undertaking a comparable study incorporating a larger population as well as research on elements affecting the effectiveness of e-inventory management systems once they are implemented by supermarkets in order to obtain a comprehensive understanding of the subject matter and contribute towards literature in the area of study

1.1 Background of the Study

Today inventory management is not only considered a cost-cutting method but according to Katz (2006), it is a competitive weapon which when strategically employed may lower inventory carrying costs, improve market share and customer service levels and essentially improve performance of firms in the retail industry. Harshitha (2017), defines inventory management as a daily method for ordering, processing, receiving and maintaining stock. Thus e-inventory management systems (EIMS) can be defined as, the process of planning, ordering and controlling of stock items electronically in a manner that contributes to performance of firms (Shardeo, 2015). Blanchard (2010) postulated the e-inventory systems to include practices such as electronic data interchange, electronic point of sale, bar coding and radio frequency identification. This study therefore sought to establish the influence of e-inventory management systems on the performance of supermarkets in Nairobi County, Kenya.

Kenya's supermarkets comprise of a mixture of large retail outlets that supply consumer goods from major international firms and small traders that sell more basic goods (McCullough, 2012). As at 2014 the four large home grown chains dominating the retail market included; Nakumatt with 57 branches, Tuskys 45 branches, Naivas 36 branches and Uchumi 27 branches; all of which stock a variety of products including food, home and personal care, electronics and clothing (PWC, 2016). However, Mbuthia and Rotich (2014), report that an alarming two thirds of retail firms in Kenya drop out of the growth curve of the product lifecycle with cases of supermarkets shutting down (such as Jack and Jill, payless) and/or withdrawing from regional markets (such as Uchumi, Nakumatt), within the first few years of expansion. This has resulted in criticism of practices being used by the management of supermarkets (Mburu, 2013; Dedeke & Watson, 2008). Sire and Muturi (2017) assert that, the performance of supermarkets depends a great deal on the service levels provided by stock management and as reported by Mwiriki (2015), a number of supermarkets in Kenya have started automating their inventory management in an attempt to improve their performance. Muturi (2017) nevertheless noted that the impact of the investment on the automation of inventory operations on performance is yet to be empirically conclusively confirmed thus this study.

1.2 Statement of the Problem and Research Gap

Kenyan Vision 2030 considers retailing as one of the most important sector(s) in its achievement. The sector accounts for approximately 10 percent of the GDP and 10 percent of formal employment (ROK, 2007). KIPPRA (2013) adds that, the sector serves as an important tax collection point as value added tax (VAT) is gathered at the retail level in this country; and similarly contributes to the social welfare of consumers by offering goods at reasonable prices (ROK, 2007; KIPPRA, 2013).The vision emphasizes the need to improve performance and raise productivity in retail trade as the economy heads towards a 10 percent growth rate (ROK, 2007). Nevertheless, the retail sector has been mired with several challenges with a number of them enduring worrisome financial woes, accompanied by empty shelves, closure of branches both locally and regionally and complaints by unpaid suppliers (Mburu, 2013). As a result, the contribution of the retail sector to the GDP has

been progressively declining; standing at 8.0 percent in 2014 and further declining to 7.5 percent as at 2015 (IDC, 2016) putting doubt on the sector's ability to effectively contribute to the realization of the country Vision 2030. This then calls for a new approach with potential of improving performance of the supermarkets in order to realize Vision 2030 milestones (GoK, 2007). E-inventory management systems have been hypothesized to have significant effect on performance of retail firms (Mburu, 2013; Dedeke & Watson, 2008) through reduction of operation costs, effective control of inventories, untying working capital and improvement of customer services (Harshitha, 2017). Therefore, a number of supermarkets in Kenya have started automating their inventory management in an attempt to improve their performance Muturi (2017). Muturi (2017) nevertheless noted that the impact of the investment on the automation of inventory operations on performance is yet to be empirically conclusively confirmed thus this study. Further, the existing literature focuses on other continents other than Africa such as: America, Europe, and some parts of Asia (Kassim, 2014); hence the study on the influence of e-inventory management systems on the performance of supermarkets in Nairobi County, Kenya.

1.3 Objectives

1.3.1 General Objective

The global objective of the study was to establish the influence of e-inventory management system on the performance of supermarkets in Nairobi County, Kenya.

1.3.2 Specific Objectives

The following specific objectives guided the study:

1. To determine the influence of electronic data interchange on the performance of supermarkets in Nairobi County.

2. To establish the influence of electronic point of sale on the performance of supermarkets in Nairobi County.

3. To ascertain the effect of bar coding on the performance of supermarkets in Nairobi County.

4. To establish the influence of radio frequency identification on the performance of supermarkets in Nairobi County.

1.4 Research Questions

1. To what extend does electronic data interchange influence the performance of supermarkets in Nairobi County?

2. What is the influence of electronic point of sale on the performance of supermarkets in Nairobi County?

3. What is the effect of bar coding on the performance of supermarkets in Nairobi County?

4. To what extend does radio frequency identification influence the performance of supermarkets in Nairobi County?

1.5 Need and scope of the study

This study was necessitated by the need to address performance challenges facing the retail sector in Kenya especially the supermarkets. The study was needed to provide an effective inventory management tool with the potential of reducing operation costs, improve customer services and ensure effective stock control. The study defined EIMS in terms of: electronic data interchange, electronic point of sale, bar coding and radio frequency identification. Nairobi County was selected as the representative county of study due to its unique status of being home to the largest number of supermarkets in Kenya and hosts all of forms of supermarkets giving it a representative status. The study adopted profitability and customer service as a measures of firm performance as advocated by Hernant (2009), Mburu (2013) and Lwiki et al (2013). Head of supply chain management were the respondents in each firm studied. The study covers January to March, 2019 period.

2. Literature review

2.1 Theoretical Review

A theoretical review introduced and described a theory which explains why the research problem under study exists. The study therefore is grounded on **resource based view theory** as advanced by Grant (1991). The theory states that the resources and capabilities of a firm are central when it comes to strategy formulation. Grant (2013) reveals that firms have within their possession, resources that can enable them to achieve competitive advantage by taking an inverted view of why companies succeed or fail. Wade and Hulland (2010) add that, resources are valuable and rare, the benefits of which can be utilised by the firm, to provide the firm with a temporary competitive advantage as well a long term competitive advantage depending on the extent to which the firm is able to protect against resource imitation, transfer, or substitution (Fahy, 2002; Peteraf, 2015).Therefore, within this theory, Peteraf, (2015) suggested e-inventory management systems: electronic data interchange, electronic point of sale, bar coding and radio frequency identification as rare valuable internal resources which when harnessed well are capable of giving a firm competitive advantage through reduction of cost of operation, improved customer service and effective stock control (Peteraf, 2015).

2.2 Hypothetical Model

The theoretical review provided ground for development of the hypothetical relationship model of the study. According to Peteraf, (2015) under the resource based view theory, e-inventory management systems are unique internal resources with potential to significantly improve performance of a firm. Thus the study tested hypothetical model is presented in fig. 2.1:
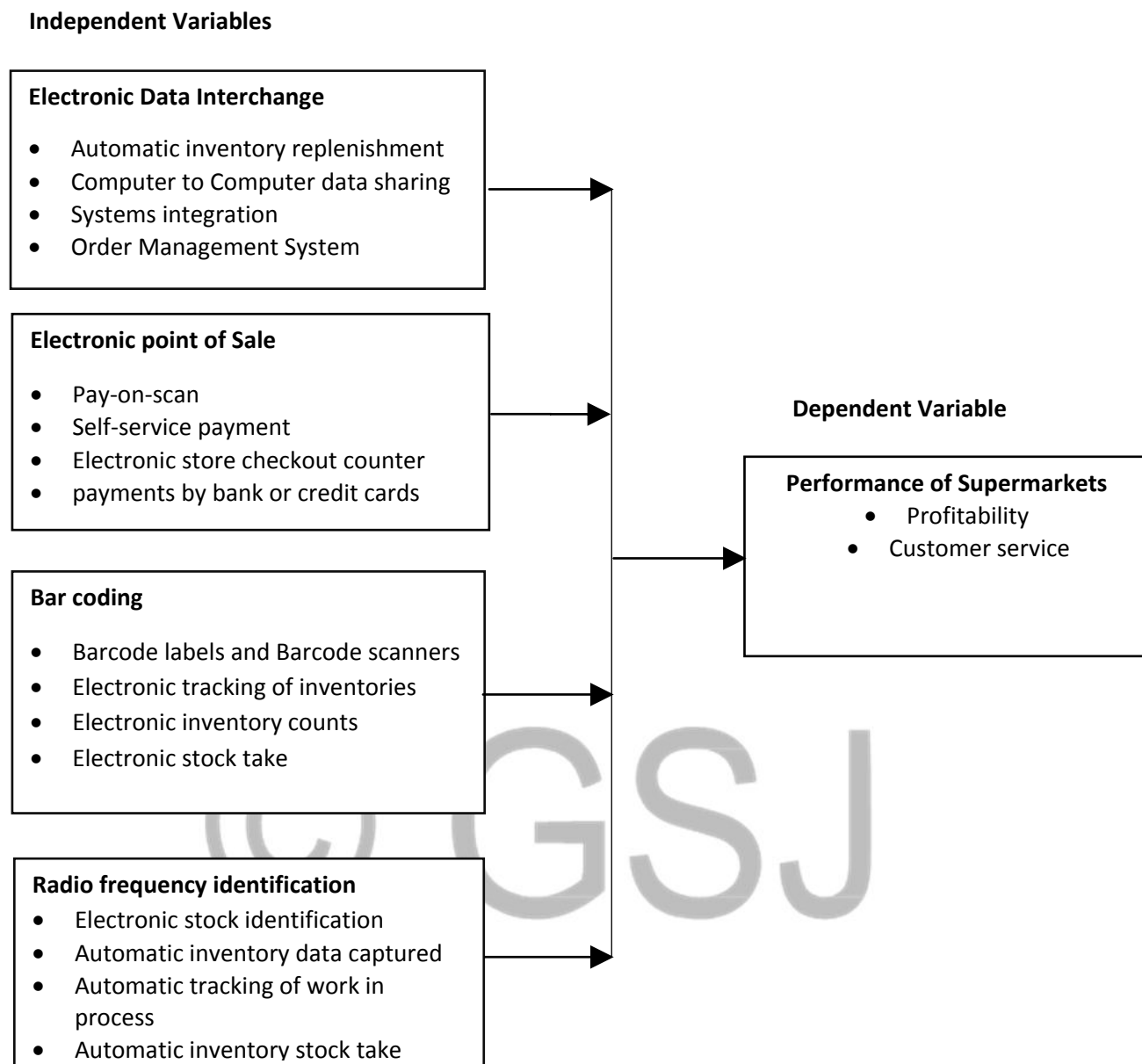
Independent Variables

Electronic Data Interchange

- Automatic inventory replenishment
- Computer to Computer data sharing
- Systems integration
- Order Management System

Electronic point of Sale

- Pay-on-scan
- Self-service payment
- Electronic store checkout counter
- payments by bank or credit cards

Bar coding

- Barcode labels and Barcode scanners
- Electronic tracking of inventories
- Electronic inventory counts
- Electronic stock take

Radio frequency identification
- Electronic stock identification
- Automatic inventory data captured
- Automatic tracking of work in process
- Automatic inventory stock take

Dependent Variable

Performance of Supermarkets
- Profitability
- Customer service

Fig. 2.1: Tested hypothetical model

2.3 Operationalization and Measurement of the variables

The hypothetical needed to be operationalised for testing. Operationalisation involved identification of the constructs, constructs measures and measurement scales. These are presented on Table 2.1:

Constructs	Type	Operationalization/ Indicators	Measurement Scale	Sources
Electronic Data Interchange	Independent	• Automatic inventory replenishment • Computer to Computer data sharing • Systems integration • Order Management System	Aggregate index of 1-5	Fahy, 2002; Peteraf, 2015
Electronic point of Sale	Independent	• Pay-on-scan • Self-service payment • Electronic store checkout counter • payments by bank or credit cards	Aggregate index of 1-5	Fahy, 2002; Peteraf, 2015
Bar coding	Independent	• Barcode labels and Barcode scanners • Electronic tracking of inventories • Electronic inventory counts • Electronic stock take	Aggregate index of 1-5	Fahy, 2002; Peteraf, 2015
RFID	Independent	• Electronic stock identification • Automatic inventory data captured • Automatic tracking of work in process • Automatic inventory stock take	Aggregate index of 1-5	Fahy, 2002; Peteraf, 2015
Supermarkets Performance	Dependent	• Profitability • Customer service	Aggregate index of 1-5	Fahy, 2002; Peteraf, 2015

3. Research Methodology
3.1 Research Design

A descriptive cross sectional survey research design was used in this study. Descriptive cross sectional survey research design is a study in which the variables or a set of information is collected for a defined population at specific point in time (Bland, 2015). The design has the ability to provide a good picture of exposure and outcome, compares many variables at the same time at minimum cost (Bland, 2015).

3.2 Study Population

The target population for the study was all the 158 supermarkets in Nairobi County (KNBS, 2017). The Nairobi County was chosen for the study largely because it is home to all kinds of supermarkets and about 50% of the total supermarket population in Kenya are based in Nairobi County.

3.3 Sampling Frame

A sampling frame is a list of all the elements in the populace of interest (Bland, 2015). The sampling frame operationally defines the target population from which the sample is drawn and to which the sample data will be generalized (Levy & Lemeshow 2008). The sampling frame in this study was the entire list of 158 supermarkets as published by the Kenya bureau of statistics (KNBS, 2017).

3.4 Sample and Sampling Technique

A Sample is a subset of the population that is selected for a study (Gronhaug & Ghauri, 2005); while sampling is the process of choosing a representative portion of the entire population for a study in such a way that the individual selected represents the large group from which they are selected (Scheaffer, Mendenhall, Ott & Gerow, 2012).

From the target population of 158 supermarkets, the sample size was computed based on Yamane (1967) sample size formula as shown in Equation 3.1.

Where:

$$n = \frac{N}{1 + Ne^2}$$

n = Sample size

N = Population size

e = the error of Sampling (0.05)

Equation 3.1: Sample size Formula (Yamane 1967)

The formulae was applied in computing the sample size as follows:-

$$= \frac{158}{1 + 158\,(0.05)^2} = 113.261 \simeq 113$$

The study made use of stratified random sampling procedure to select respondents. A Simple random sampling was then used to select a sample from each strata (size) as recommended by Levy and Lemeshow (2008) and purposive sampling was used to the unit of observation (heads of supply chain management) based on the knowledge of inventory handling and management, e-inventory solutions employed by the organization, pricing and payment decisions as well as procurement practices (Babikir, Ali, & elWahab, 2009).

3.5 Data collection Instruments

A questionnaires was used to collect primary data. The questionnaire had structured closed questions to guide the respondents. The questionnaire was divided into: section A, which gathered general information about the respondents and their institutions; Section B gathered data on e-inventory management systems; and section C gathered data on supermarket performance. The primary data was captured using a five point Likert type scale. In applied management studies, the Likert type scale is one of the acceptable

techniques for measurement of attitudes in a "scientific" way, which allows the use of statistical tools to analyze data (Gall, Gall, & Borg, 2007).

3.6 Data collection procedures

The questionnaires were self-administered through email. Email method was chosen in this study due to its efficacy, specific to time and cost (Gall, Gall, & Borg, 2007). All the email addresses were obtained from the Nairobi Business Directory and personalised email sent to all the respondents requesting them to respond within seven working days. Thereafter reminders were sent to all those who failed to respond within the stipulated time. This was repeated until an acceptable rate of responses were received.

3.7 Reliability and Validity tests of constructs

3.7.1 Reliability Test

Data collection instrument was piloted to test for its reliability and validity. The Cronbach's Alpha Test of Reliability was used to test the reliability of the constructs in the study and the results were as follows: electronic data interchange had an alpha score of 0.7353, electronic point of sale, bar coding and radio frequency identification had alpha scores of 0.7812, 0.7200 and 0.7373 respectively. Alpha values measure the level of internal consistency of the constructs. A closer alpha values to one indicates a higher consistency. According to Nunnally and Bernstein (1994) a-score exceeding 0.7 indicates high internal consistency and thus high internal reliability of the scaled items. The attained alpha scores indicate an acceptable level of reliability of the measures. The table 3.1 shows the reliability test results based on the piloted data:

Table 3.1: Reliability Test Results

Constructs	Cronbach Alpha (α-score)	No. of Items	Interpretation (Nunnally & Bernstein, 2004)
Electronic data interchange	0.7353	4	Acceptable
Electronic point of sale,	0.7812	4	Acceptable
Ear coding	0.7200	4	Acceptable
Radio frequency identification	0.7373	4	Acceptable

3.7.2 Validity Test

Validity is the accuracy and meaningfulness of inferences, which is based on research results (Kothari, 2004). The validity of the instrument was ensured through derivation of the measures from the related study theories and incorporating expert's opinions on the study measures (Ruxton & Colegrave, 2006). Face validity, constuct validity and content validity were all addressed through derivation of the measures from the related study theory and incorporating expert's opinions in the study measures.

3.8 Data Processing, Analysis and Presentation

The study data was quantitatively collected. The collected data was keyed in and processed by SPSS version 18. SPSS version 18 was preferred due to its Automated Data Preparation feature (ADPF) which can provide multiple comparisons of data and allows tables' customization. Multiple regression analysis was used to establish the influence of e-inventory management systems on the performance of supermarkets. Regression analysis was preferred due to its ability to model and analyse several variables. The multiple regression equation applied in this study was modelled as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \mathcal{E}$$

Where: Y = Dependent variable (profitability)

X_1 = Vendor-managed inventory

X_2 = Lean inventory systems

X_3 = Information communication technology

X_4 = Activity-based costing systems

ε = Constant

A simple linear regression equation in the form $y = B_1 X_1 + \mathcal{E}$ was applied for each variable in relation to performance so as to obtain values of the regression co-efficient – 'r' which measured the strength and direction of the linear relationship between the variables, and R-squared (R^2) value to show what percentage of performance was impacted by the independent variables. A t-test was also done at a p-value of significance level $p \leq 0.05$. The results of the analysis are presented using pie-charts, bar graphs, and frequency tables with a view to absolutely reveal data patterns together with explanations in continuous prose.

4.0 Research Findings and Discussions
4.1 Research Findings
4.1.1 Response Rate

A total of 113 respondents were issued with questionnaires, out of which, 80 questionnaires were filled and returned. This gave a response rate of 71%. This was considered sufficient for this study in line with Edwards, Clarke, & Roberts, (2009) recommendation that a response rate of 80% and above is excellent while that of between 60% and 80% is just sufficient for a study. Table 4.1 shows the response rate.

Table 4.1: Response Rate

	Response	Frequency	Percent
1	Returned	80	71%
2	Unreturned	33	29%
	TOTAL	**120**	**100%**

4.1.2 Regression Analysis (SIMPs and Performance)

The study sought to establish the influence of e- inventory management systems on the performance of supermarkets in Nairobi County, Kenya. A regression equation in the form of: **Y = β0 + a1X1 + a2X2+ a3X3+ a4X4+ ε** was used to establish the association between Performance (dependent factor) and EIMPs (independent factors). EIMSs were regressed against the dependent factor (performance) and the results were as presented on Table 4.2. The model Coefficient of determination value, R^2 was found to be 0.3855 indicating that 38.55% of supermarket performance was explained by e-inventory management systems (EIMSs). The results from table 4.2 shows that the predictor equation for supermarket performance (Y) versus independent factors (Xi) takes the form:

Performance = 2.981+ 0.215 (Electronic data interchange) + 0.293 (Electronic point of sale) + 0.279 (Bar coding) + 0.175 (Radio frequency identification) +1.270.

This implied that performance increases by 0.215 when electronic data interchange goes up by 1 index unit, increases by 0.293 when electronic point of sale increases by 1 index unit, increases by 0.279 when bar coding increases by 1 index unit, and increase by 0.175 when radio frequency identification increases by 1 index unit. The study findings further indicate that electronic point of sale has the greatest influence on performance at 29.3 percent followed by activity Bar coding at 27.9 percent, electronic data interchange at 21.5 percent and the least is Radio frequency identification at 17.5 percent.

Table 4.2: Regression Results for EIMSs Practices and Performance

Supermarkets Performance	Coefficient (B)	Standard Error	t	Sig (p)
Electronic data interchange	0.215	0.051	3.974	0.020
Electronic point of sale	0.293	0.034	0.772	0.002
Bar coding	0.279	0.126	2.498	0.008
Radio frequency identification	0.175	0.141	2.490	0.020
Constants	2.981	1.270	2.376	0.025

F (4, 80) =71, P-value <0.025, R-squared=0.3855, Adj R-squared=0.3775

4.2 Research Discussion

The study sought to establish the influence of e-inventory management systems on the performance of supermarkets in Nairobi County, Kenya. A number of studies (Fahy, 2002; Peteraf, 2015; Wade & Hulland, 2010; Mongare & Nasidai, 2014) have argued that EIMSs lead to improvement of the performance of firms. This study postulation was grounded on such studies within the resource based view theory. The study findings indicate that firms which have embraced EIMSs within their operations experience improvement in their performance. The multiple regression analysis results indicate that EIMSs have a positive statistically significant effect on performance of supermarkets; p < 0.05 (P=0.025) with an explanatory power of 38.55 percent. Therefore, the study question "Does e- inventory management systems affect performance of supermarkets in Nairobi County?" was answered in the affirmative which then addresses the study general objective "to establish the influence of EIMSs on the performance of supermarkets in Nairobi County. The findings

of this study strongly agree with resource based view theorists (Peteraf, 2015; Wade & Hulland, 2010; Fahy, 2002) which theorised a positive and significant relationships between EIMSs and performance and advance EIMSs as unique resources capable of giving a firm competitive advantage.

5.0 Summary, Conclusions and Recommendations
5.1 Summary

The study established a positive significant relationship between EIMSs and supermarkets performance based on the following constructs: electronic data interchange, electronic point of sale, bar coding and radio frequency identification. However, electronic point of sale was found to be the one offering greatest influence on performance followed by bar cording, electronic data interchange and radio frequency identifier respectively.

5.2 Conclusion

With respect to performance of supermarkets, the study concludes that it is most affected by electronic point of sale followed by bar cording, electronic data interchange and radio frequency identifier respectively. The study finally concludes that all the four factors of EIMSs combined positively and significantly affect the performance of supermarkets.

5.3 Recommendations

The study established that EIMSs positively and significantly influence the performance of supermarkets. Consequently, the study recommends that supermarkets in Kenya should implement e-inventory management systems in order to improve their performance through reduction of operation costs, improved inventory control and customers' service. Further, the government should give tax rebate on IT infrastructure related to e-inventory management systems to encourage up take of the systems by firm as a way of boosting their performance and growth.

6.0 Suggestions for Further Studies

The study suggests that future research should focus on undertaking a comparable study incorporating a larger population as well as research on elements affecting the effectiveness of e-inventory management systems once they are implemented by supermarkets in order to obtain a comprehensive understanding of the subject matter and contribute towards literature in the area of study.

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