Effect of Supplier Relationship Management on the Relationship between Electronic Data Interchange Integration and Supply Chain Performance in Sugar Manufacturing Firms in Kenya

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Abstract: Globally and in Kenya to be specific, there has been a challenge on cost of manufacturing. Manufacturing cost has been rising for; a status report from the Sugar Directorate indicates that wholesale price of sugar in February 2017 was at average Sh 5, 352 per 50 kg, compared with Sh 4, 432 in the same period last year. In Kenya, sugar cane production decreased from 6.7 million tons in 2013 to 6.5 million tons in 2014 as reported in Economic Survey of 2014. Moreover, despite reporting increased cane delivery in 2015, supply chain in sugar firms remained dismal indicating inefficient firm processes and overall poor performance due to high cost of production. Its argued that supply chain(SC)s may use Electronic data interchange integration(EDII) to mitigate on cost and improve firm performance.SRM is management of all interactions with suppliers, while SCP performance means responsiveness, timeliness and reliability However; studies have not addressed this adequately. The purpose of this study was to determine the effect of supplier relationship management on the relationship between electronic data interchange integration and supply chain performance among sugar firms in western Kenya, the study established effect of electronic data interchange integration on supply chain performance; effect of supplier relationship management on supply chain performance; and effect of supplier relationship management on the relationship between electronic data interchange integration and supply chain performance. This study was anchored on resource based, transaction cost analysis, and social exchange theories. Correlation research design was used. Target population was 300 supply chain employees from 10 sugar manufacturing firms in western Kenya. A sample of 169 was drawn using cluster, purposive and simple random sampling. 10% of the sample was used to pre-test the questionnaire. Questionnaire and interview guides were used to collect primary data. Secondary data was obtained from Company's' records. The study concluded that EDI, SRM have significant effects on SCP and that SRM has moderating effect on the relationship between EDI and SCP. The study recommends that adopted EDII in SCP should be implemented consistently for improved performance and because SRM has a significant relationship between EDII and SCP it should been enhanced for increased performance. Findings may provide useful information for policy formulation for faster decision making in enhancing increased customer service level in the sugar firms and availability of research literature for further research

I. Introduction

This chapter highlights the background of the study, statement of the problem, objectives of the study, hypothesis, the scope of the study, justification of the study and the presentation of the conceptual framework.

1.1 Background of the study

Electronic data interchange integration (EDII) is the movement of data electronically across firms. It's the computer-to-computer exchange of business documents between companies. Volmer (2011) advances that it is the standardized electronic format for communication between business partners, through computer-to-computer & cloud based exchange. According to De Vries (2017), Electronic Data Interchange (EDI) is defined as the movement of business data electronically between or within firms including their agents or intermediaries. EDI documents use specific computer record formats that are based on widely accepted standards. However, each company will use the flexibility allowed by the standards in a unique way that fits their business needs. The exchange such as, E-sourcing E-invoicing, E-ordering, E-payment, and supports various business transactions taking place within and without firms.

The extent of adoption, advantages and problems ensuing from a no adoption decision need to be assessed. For nearly two decades, electronic data interchange (EDI) has been widely viewed as a technology pivotal to supply chain management that has also provided benefits to terms on multiple levels. According to De Vries (2017) EDI continues to prove its major business value by lowering costs, improving speed, accuracy and business efficiency. The greatest EDI benefits often come at the *strategic* business level. According to a recent research study from Volmer (2011), EDI continues to prove its worth as an electronic message data format. This research states that "the annual volume of global EDI transactions exceeds 20 billion per year and is still growing. For

buyers that handle numerous transactions, using EDI can result in millions of dollars of annual savings due to early payment discounts. From a financial perspective alone, there are impressive benefits from implementing EDI. Exchanging documents electronically improves transaction speed and visibility while decreasing the amount of money you spend on manual processes. But cost savings is far from the only benefit of using EDI. Supply chain technologies (SCT) such as EDII refer to tools or techniques that may be implemented in order to effectuate integrated supply chain performance within or across organizational boundaries. The focus of many studies has been on the adoption of EDII while little attention has been paid to EDII utilization, Simply adopting EDII will not translate to benefits and enhanced organizational performances unless such SCT/EDII are actually utilized within existing business processes to create capabilities. Simply adopting SCT/EDII will not translate to benefits for firms unless such SCT/EDII this study seeks to find the moderating effect of supplier relationship ,management between the relationship on EDII and SCP assuming the sugar firms have adopted SCT/EDII in its internal and external business operations As a subset of traditional information technology (IT), SCT facilitates the boundary spanning activities of sugar manufacturing firms and enables information-sharing and communication across organizational boundaries. SCP is measured as Supply efficiency Supply quality Supply effectiveness Supply productivity in this study

Such an understanding can help managers facilitate SCT utilization within supply chain networks and thus increase operational efficiency. Moreover, given that firms typically spend a large amount of money and effort in implementing SCT within their supply chains the understanding of the performance implications of SCT utilization would be invaluable for executives, especially for supply chain managers this will shade more lights in endeavouring to understand the drivers and performance implications of SCT/EDII/IT adoption and consistence implementations. Different authors have different definitions of supply chain process: consumer (Lyssons k and Farrington, 2006) defines Supply chain processes as a network that encompasses every effort involved introducing and delivering the final product from the supplier' supplier to the customer's customer. Supply chain council defines supply chain process as a network of organization that involves upstream and downstream linkages, processes and activities that produce value inform of products and services in the hands of the final consumer. However Handfield, Santos and Bourne (2012) state that supply chain process involves activities associated with the flow and transformation of information's, goods and services from the raw materials stage (extraction), through to the end user. Mentzer et al. (2001) define a supply chain as three or more of the flows of products, services, finances, and or information from a source to a customer it can also be measured by the following variables Strategic Process, Operational process, Customer relationship management process, Supplier relationship management process. Supplier relationship management (SRM) is the discipline of managing all interactions with suppliers, strategically planning for, and managing, all interactions with third party organizations that supply goods and/or services to an organization in order to maximize the value of those interactions (Hughes, 2012).SRM delivers a competitive advantage by harnessing talent and ideas from key supply partners and translates this into product and service offerings for end customers (Mettler and Rohner, 2009).

An important assumption of Customer Relationship Management SRM is that customers differ in their value contribution to the firm (Gupta et al.2004; Venkatesan and Kumar 2004). This value contribution partially depends on their positions in a customer relationship life cycle, which means that customers have different requirements throughout their relationships regarding goods and services (Bruhn 2003). Applying this customer relationship life cycle and common definitions of CRM (e.g., Dwyer et al. 1987; Reinartz et al. 2004) to the supplier side, it's measured as long term relationship, formal contracts, management controls and customer feedbacks

Supply chain performance is defined as the   responsiveness timeliness and reliability of the entire chain's ability to meet end customer needs through product availability and customers responsive, on time delivery (Ndambuki, 2013). The integration of activities and processes among the members of the supply chain is frequently referred to as Supply Chain Management (Handfield and Nichols, 2003). Supply chain performance is measured through supply Efficiency, Supply Quality, Supply Productivity, and Supply Effectiveness. Two well-known indicators are cost containment and performance reliability constructs. Lee, Kwon &Severance, (2007) and Chalmeta &Grangel,(2003) agree in their studies that performance indicators can be measured by considering cost containment and performance reliability constructs putting considerations on order fulfillment rate, inventory turnover, safety stocks and inventory obsolescence. A number of studies have been conducted around EDI and supply chain performance. Odiko (2004) for example examined e-business as a mode of international business engagement. She concluded that although there is much gain in EDI development in Kenya across several sectors, a number of challenges still need to be addressed. Ramamurthy, Premkumar & Crum (2009) studied organizational and interorganizational determinants of EDI diffusion and organizational performance using a causal model. The results from a structural equation model (SEM), developed using LISREL, provided quite a strong support for the hypothesized relations. Organizational variables and inter-organizational variables such as customer support and competitive pressure were found to influence EDI diffusion. The results also indicated that external integration dimension of diffusion enables adopter firms to achieve improved operational and market-oriented performance, whereas internal integration contributes only to operational performance.

Ndungu (2000) on his survey "challenges facing Internet growth in Kenya. He found that the challenges included poor telecommunication infrastructure, lack of information and communication policy, lack of standardized cost structure for internet services, lack of cooperation among Internet Service Providers (ISPs) and high rate of client movement from one client to the other. Although the Internet platforms has facilitated the growth of EDI and organizations performance, the challenges of Internet growth may not be necessarily the challenges of EDI implementation and application.

Past literature have reported that EDI could yield enormous benefits provided that it is highly integrated, these benefits can be simplified as operational and strategic benefits (Elbaz, 1998; Mukopadhyay and Kekre, 2002; Parsa and Popa, 2003; Ngai and Gunasekaran, 2004). Operationally; EDI provides direct benefits such as reduction in costs associated with clerical labours and forms as well as in length of data transmission and processing. Further, an integrated EDI with existing systems is believed to facilitate the reengineering of some critical business processes including improvement in customer service and trading partner relationship and also as entry barriers for new comers and exit barriers for trading partners.

Wanjiku (2013) studied effect of supply chain integration on supply chain performance and concluded that, most banks embraced EDI in business integration over ten years ago and this has assisted them to enhance the performance of their supply chain. These findings are of significant value addition, with regards to evaluation of the same in State Corporations in Kenya. Similarly, Ndambuki (2013) concluded that EDI integration of supply chain in Humanitarian Non-Governmental Organizations (NGOs) has proven to be critical success factors for the organizations supply chains and performance. His study highlighted that information sharing, faster decision making, supplier relationship management and efficiency in a supply chain has influence in the humanitarian organizations performance.

The study by Han, Wang and aim (2017) theorized a research model by integrating disparate streams of IT flexibility research with three types of IT flexibility, namely, operational, transactional, and strategic, and tested both the direct and indirect effects of the three IT flexibility types on firm performance. The theoretical model used an extended resource based view to highlight the role of IT flexibility in managing interdependent firm relationships in supply chains. They found that transactional IT flexibility affects operational IT flexibility, and operational IT flexibility affects strategic IT flexibility.

Studies in the area of EDI integration remain unclear. They do not address specific EDI specific integration areas such as sourcing, invoicing, ordering and payment. Therefore clear knowledge of relationship between EDI integration and supply chain performance is lacking. Further, EDI integration is often accompanied by supplier relationship management (SRM). Therefore EDI and SRM are expected to together, have an interaction with supply chain performance. Empirical evidence does not reveal this. Knowledge is lacking on the effect of supplier relationship management on the relationship between EDI integration and supply chain performance. It is also not clear what direct effect supplier relationship management has on supply chain performance. The two however are important in driving firm performance as argued theoretically by De Vries (2017) and Hughes (2012). Clear knowledge on this relationship can help solve challenges faced by firms in manufacturing and service. Manufacturing firms such as sugar firms which are facing challenges can greatly benefit from application of this knowledge. The manufacturing sector in Kenya for example grew at 3.5% in 2015 and 3.2% in 2014, contributing 10.3% to gross domestic product (GDP) (KNBS, 2016). On average, however, manufacturing industry has been growing at a slower rate than the economy, which expanded by 5.6% in 2015. This implies that the share of manufacturing industry in GDP has been reducing over time. As a result, it can be argued that Kenya is going through premature industrialization in a context where manufacturing industry are still relatively under-developed (AfDB, 2014).

In the case of sugar production, domestic consumption currently outstrips production, Currently, Kenya imports an average of 200,000 MT of sugar to meet the deficit. Of this amount, 111,000 MT is industrial or refined sugar, which Kenya does not currently have the capacity to produce. Over the last 8 years, the average production level has been 430,000 MT per year against an average domestic demand of 625,000 MT. According to Economic Survey (2016), agriculture was the biggest driver of the country's growth in 2015 stamping its position as the economy's back-bone. The sector grew by 6.2 per cent in 2015. Similarly, deliveries of sugar cane to factories rose by 4.6 per cent from 6.5 million tons in 2014 to 6.8 million tons in 2015. However, value addition in the sector, although rising, was still dismal indicating that the sugar firms are still performing poorly. This challenge can be addressed by looking at efficiency and effectiveness of firm processes of these sugar firms. EDI integration and supplier relationship management are expected to help alleviate this poor value addition process reported in these firms.

Global Trade Atlas (GTA, Kenya's Sugar Directorate reported that: forecasts Kenya's sugar production to remain flat in the marketing year (MY) 2017/2018 due to continued poor performance of the state-owned sugar milling plants. Consumption is however forecast to increase and the resultant shortfall will be offset by an increase in imports. The import safeguard that limits duty free sugar imports from the Common Market for Eastern and Southern Africa (COMESA) countries remains in place. According to Kennedy Gitonga Kevin Sage-EL 2017, the much anticipated privatization of the sugar mills has not taken place and they continue to be burdened by obsolete milling technology and huge debts leading to poor services to the farmers. Consequently,

privately owned mills have encroached some of areas that were previously zoned-off for the state-owned mills to provide alternative cane marketing outlets. According to Kenya's Sugar Directorate, locally produced sugar remains uncompetitive with the cost of production at about $600 USD per ton and therefore higher than anywhere else in the Common Market for Eastern and Southern Africa (COMESA). Kenya has since 2004 sought extensions of safeguards to limit importation of duty free sugar from the COMESA region by invoking Article 61 of the COMESA treaty, which provides for the protection of emerging sectors until a time when they are considered mature for competition. Local sugar production is also limited

1.2 Statement of the Problem

Globally and in Kenya to be specific, the cost of manufacturing and production of sugar has been on the rise, there was a decrease in sugar cane production from 6.7 million tons in 2013 to 6.5 million tons in 2014 as reported in Economic Survey done in 2014. Although in 2015 there was an increase of cane delivery to sugar firms. Most sugar cane firms had Operationalized Supply chain interventions through adoption of electronic data interchange integration (EDII) in sugar firms, yet the supply chain performance still remained dismal indicating inefficient firm processes and overall poor performance. It's argued that once a firm adopts EDII it's not enough unless the implementation of the intervention is consistently utilized in the supply chain of the firm.

Table 1.1: Output and market share of sugar companies in western Kenya

Rank	Name of Manufacturer	Output (Metric tonnes)	Market Share (%)
1	Mumias Sugar Company	117,966[17]	19.93
2	West Kenya Sugar Limited	73,696[17]	12.45
3	Nzoia Sugar Factory	66,462[17]	11.23
4	South Nyanza Sugar Company	60,028[17]	10.14
5	Transmara Sugar Company	58,887[17]	9.95
6	Butali Sugar Mills	56,853[17]	9.60
7	Sukari Industries Limited	42,143[17]	7.12
8	Kibos Sugar and Allied Industries Limited	39,415[17]	6.66
9	Muhoroni Sugar Company	38,864[17]	6.56
10	Chemelil Sugar Factory	37,720[17]	6.37
	Total	**592,034[17]**	**100.00%**

Sugar manufacturing firms have been exposed to high cost of production through various factors such as, unreliable contracts, longer lead times, poor supplier relationships, quality, raw materials availability, unfair competition and technological advancement; these have negative effect on the supply chain performance and the overall organizational performance. It is argued that strategies such as electronic data interchange integration (EDII) and supplier relationship management (SRM) may improve firm's performance through enhanced supply chain interventions. However, studies have not addressed this adequately. Therefore knowledge that can be applied by these sugar firms about EDI integration and supplier relationship management is lacking. It is not clear what effect EDII integration has on supply chain performance of the sugar firms. It is also not clear what effect supplier relationship management has on this sugar firms' supply chain performance. The effect of supplier relationship management in the relationship between EDI integration and supply chain performance of the sugar firms also remain undefined.

1.3 Objectives of the Study

The overall objective of the study was to analyze the effect of supplier relationship management on the relationship between the electronic data interchange integration and supply chain performance among sugar manufacturing firms in Kenya.

The specific objectives of the research were:

i.   To establish the effect of electronic data interchange integration on supply chain performance of sugar manufacturing firms in Kenya

ii.   To establish the effect of supplier relationship management on the supply chain performance of sugar manufacturing firms in Kenya

iii.   To determine the moderating effect of supplier relationship management on the relationship between electronic data interchange integration and supply chain performance of sugar manufacturing firms in Kenya

1.4 Hypotheses of the Study

The above objectives were addressed by the following hypotheses:

$H0_1$: Electronic data interchange integration has no significant effect on supply chain performance of sugar manufacturing firms in Kenya

$H0_2$: Supplier relationship management has no significant effect on supply chain performance of sugar manufacturing firms in Kenya

$H0_3$: Supply relationship management has no moderating effect on the relationship between electronic data interchange integration and supply chain performance
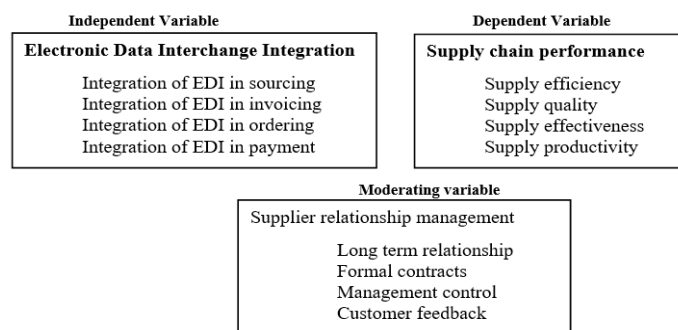
1.5 Scope of the Study

The study intended to establish the effect of electronic data interchange integration on supply chain performance of sugar manufacturing firms in Kenya, establish the effect of supplier relationship management on the supply chain performance of sugar manufacturing firms in Kenya and; determine the moderating effect of supplier relationship management in the relationship between electronic data interchange integration and supply chain performance of sugar manufacturing firms in Kenya. The study focused on the manufacturing firms in Kenya which have been in existence for at least five years. This was because any strategy such as EDI integration is expected to yield results after the expiry of the strategic period, commonly taken as five years.

1.6 Justification of the study

By assessing the extent of EDI integration into supply chain process, in regards to its effectiveness, efficiency, productivity and quality assurance in the line of firm's performances, to policymakers, this propelled faster decision making into greater heights, the study may be used as a source of information regarding technology adoptions and implementations of the integrated technology in manufacturing firms. To the government being the key player in promoting and regulating industrial activities, the study will assist develop and promote strong linkages with the parent governmental Ministries. This study will also aid the government in making viable decisions in regards to legislating laws and policies that will cushion the local markets against unfair competition from the developed countries and this will increase revenue collection to the government. Kenyan government having had initiated the integrated financial management information systems (IFMIS) technology adoption to enhance the effectiveness and increase productivity in its activities all these efforts are geared towards the performance. The study may benefit sugar regulators: Kenya Sugar Board (KSB)/KESREF and sugar companies directly. The academic fraternity may use the findings of this study as a source of wealth in literature for further research.

1.7 Conceptual framework

Figure 1.1 conceptual framework

Source: Adapted from De Vries (2017) and Lee, Kwon and Severance (2007)

The figure depicts an expected relationship between electronic data interchange integration (EDII), supplier relationship management (SRM) and supply chain performance (SCP). While EDII is indicated by E-sourcing, E-invoicing, E-ordering and E-payment, Supply Chain Performance is indicated by supply efficiency, supply quality, supply productivity and supply effectiveness.

II. Literature Review

This chapter deals with the available literature that has been reviewed for the study. The literature is mainly on the electronic data interchange integration on supply chain performance, establish the effects of supplier relationship management on the supply chain performance and the moderating interplays of the relationship between electronic data interchange integration and supply chain performance. The specific areas covered include performance appraisal, theoretical review, empirical review, critical review and the conceptual framework.

2.1 Theories of the Study

2.1.1 Resource Based Theory [RBT]

Resource-based theory aspires to explain the internal sources of a firm's sustained competitive advantage (Kraaijenbrink, Spender, & Groen, 2010). It was Penrose who established the foundations of the resource-based view as a theory. Penrose first provides a logical explanation to the growth rate of the firm by clarifying the causal relationships among firm resources, production capability and performance. Resource-based theory is used to explain performance as well as performance improvements. To perform is to produce valued results. A performer can be an individual or a group of people engaging in a collaborative effort. Developing performance is a journey, and level of performance describes location in the journey. Current level of performance depends holistically on various variables that can involve the context, the knowledge of the individual, capabilities, skills internal and external factors within an individuals and firms. Resource Based Theory, provides a platform for resourced based skills, technology of the firm's competencies and the individual skills that can facilitate the interaction between electronic data interchange integration and supply chains performance.

The adoption and implementation of EDII of Sugar firms are dependent on the resources that are available both internal and external for the firms to achieve its maximum performance. The extent of adoption and consistency and implementation of EDII within the firm may differ or be similar when exposed to the market. The RBT therefore allows for the provision of the platform under which the EDII can be adopted, implemented and supported by the firms because there is no way this implementations can be done without the financial muscle of the firms and the skills needed that are resourced based.

2.1.2 Transaction cost analysis

In the second objective that was anchored on cost reduction through sustained transactional costs related to supplier base such as accounting for the actual cost of outsourcing, production of goods and service, transaction costs, operating costs, **coordination costs, and search costs.** it is argued that modularization reduces transaction costs. Modular systems lower the transaction costs of information about the parts available (for a firms) and imply economies of scale in assembling the package (for a consumer) (Langlois and Robertson, 1992). Product architectures made up entirely of standard component would favour market governance. One incentive to devise modular product architectures is to have components with standardized interfaces to enable competition between suppliers on technology innovation.

To reduce transaction costs, firms may outsource product development and manufacturing activities of certain components to qualified suppliers. Firms naturally try to find the optimal trade-offs between switching costs and performance between partners, which will depend on the length of relationships shared between the buyer and its suppliers. The TCA theory will enhance efficiency in the sugar firm by cutting costs and comparing inputs and output. The efficiency is determined by analyzing costs such as storage, raw materials, labor, utilities, the transaction costs of negotiating with suppliers, unfulfilled contracts, long lead times, transactional errors can be reduced in order to enhance efficiency and performance in general the main idea is to cut unnecessary costs.

2.1.3 Social Exchange Theory

Social Exchange Theory is an important social psychology concept that concerns social changes as a process of interactive exchanges between different people. This theory is often used within the business world to explain and analyze commercial transactions. Early psychologists focused on the principles of reinforcement, functionalism, and utilitarianism. Interestingly enough, the theory of social exchange isn't a unified and standardized theory. Instead, there are different theories that contribute to the overall theoretical framework. However, all viewpoints agree on basic assumptions about humans. For example, people generally seek rewards, avoid punishments and are rational beings. Fundamental Concept of the Theory of social exchange views human interactions and exchanges as a kind of results-driven social behaviour, cost and rewards. This means that cost and reward comparisons drive human decisions and behaviour. Costs are the negative consequences of a decision, such as time, money and energy. Rewards are the positive results of social exchanges. Therefore, the generally accepted idea is that people will subtract the costs from the rewards in order to calculate the value. What are the Basic Principles of the Theory, states that human being will expect the most profit, rewards, positive outcomes and long-term benefits. They will also prefer the exchange that results in the

most security, social approval and independence. In contrast, they will also choose alternatives that result in the fewest costs, consequences and least social disapproval. Therefore, every social exchange decision can be a complex decision that requires the person to evaluate different costs and rewards.

Social exchange theory (SET) extends the technical economic perspective by examining the non-contractual based reasons for participating in an exchange (Blau 1964; Das and Teng 2002; Thomas and Ranganathan 2005). Social exchanges differ from economic exchanges in that the specific benefits of exchange are not contractually and explicitly fully specified; partners have a social bond out of social influence. Supply chain collaboration can be explained by SET with the examination of social influence (e.g., power). According to SET, power is regarded as the most important sociological aspect of an interorganizational relationship when one firms needs to influence another's decisions. The exercise of power is often referred to as influence strategies. These influence typically involve threats, punishment, rewards, and assistance. And since interest is vested in knowing the relationship of suppliers relations to their interface interactions between electronic data interchange integration and supply chain: then this theory was rightly placed, because it will indicate the general and professional perspective of the players in the market. This theory advocates for a non contractual engagement by the suppliers and the vendors, as such, SRM should lead should lead to reduction in costs, enhanced relationships, timely customer feedback, commitment to awarded contracts thereby improve the supply chain performance. This means that sugar firms should provide a structured and coherent approaches in enhancing the supplier buyer relationships at all the times. This theory will help in consummating the contracts and ensuring that the relationship is built around developing economic muscles amongst the players. Social exchange Theory is important to understand human interaction and decision making. The theory has excellent applications for real-world situations, such as understand business and interpersonal relationships. The Social Exchange Theory is something that everyone should understand and incorporate into how they make decisions in their business.

2.1.4 Concept of Electronic Data Interchange Integration (EDII)

Electronic data interchange is the computer to computer exchange of business data in an agreed format (Noor, 2003). Electronic data interchange is the structured transmission of data between organizations by electronic means. Electronic data interchange aids the transfer electronic documents or business data from one computer system to another i.e. from one trading partner to another trading partner without human intervention. Electronic data interchange is one of the most discussed business-to-business topics of today. It has become a tool for adapting and rendering business processes towards an integrated logistics. Electronic Data Interchange (E.D.I) has been used as a technique for communicating between different computer systems since the 1960's. However, it took another 20 years for EDI to support different types of business processes (Lee, 2009).

Electronic Data Interchange (EDI) technology is used for transfer of business documents from one computer to other computer. With EDI the business documents such as invoices, cheques are sent electronically from one organization to another. In fact EDI is a drive towards paperless document transfer or transactions. The difference between the email message and EDI message is that, Email is composed and interpreted manually, while EDI message is composed by using one software application and interpreted by other software's-mail data is not structured while EDI data or message is structured. Electronic data interchange is the computer to computer exchange of business data in an agreed format (Noor, 2003). In addition to that, Electronic data interchange is the structured transmission of data between organizations by electronic means. It is used to transfer electronic documents or business data from one computer system to another i.e. from one trading partner to another trading partner without human intervention.

It is more than mare e- mail, for instance organizations may place bills of lading and even change with the appropriate EDI messages. It also refers specifically to a family of standards. Electronic data interchange is one of the most discussed business-to-business topics of today. It has become a tool for adapting and rendering business processes towards an integrated logistics. Electronic Data Interchange (E.D.I) has been used as a technique for communicating between different computer systems since the 1960's. However, it took another 20 years for EDI to support different types of business processes (Lee, 2009). In the 1970's, several industries sponsored a shared EDI system that they usually turned over to a third party network

EDI allows efficiency hence shorter lead times according to Gunasekaran (2001), order cycle time is the order sourcing time which is the time the order is received until it is replenished. Christopher (1992) noted that supply chain responsiveness reduces due to reduction in order cycle time. Supply chain performance also result from firms' efficiency. Efficiency can be enhanced in many ways such as timely delivery, performance, order fulfillment lead time, supply chain responsiveness, production flexibility, and inventory cost, better discounts among others which result to improved quality, cost reduction and shorter lead time thus there is entire improvement in the supply chain.

Harink (2003) defined EDI as the use of various forms of communication technology at various stages of procurement and it may include receipt registration, negotiation, search, order placing, need identification, sourcing and payment. Another approach is given by Kim & Shank (2004), who says that e - procurement is procurement of goods and services using internet technology. To

affirm this, De Boer et al (2002) argued that using the web employees can make orders directly from their computers. According to Gebauer & Seger (2001), e-procurement uses internet to publish request for quotation (RFQ), request for proposal (RFP), to support procurement activities, to establish e-market places, to build catalog and negotiation. Presutti (2003) argued that EDI uses internet in all procurement stages and activities such as specification development, supplier selection, and negotiation and supplier assessment.

Electronic Data Interchange (EDI) started in the developed countries and spread out to developing countries due to use of internet. Many studies have revealed much concerning some of the early implementers of e-procurement. In Brazil studies done by Sigulem & Zucchi (2009), indicates that real saving can be achieved through E-procurement. In India, studies done in India by Salkute & manager (2012), shows that EDI adoptionis influenced by cost benefits, Transparency International (2006) noted that e-procurement facilitated information flow between the procuring entities and the supplying firms in Brazil. In other countries like Chile, Mexico, Peru and Venezuela, e-procurement is mandatory application in every step of procurement processes. In Philippine EDI concept is used for transactional and information exchange during business. The report further noted that in Malaysia, EDI enhanced use of open EDI competitive tender to curb corruption which is estimated to have reduced by 5.9% compared to earlier figures 3.7% when paper work was used.

The government of Kenya considers electronic data interchange (EDI) as a key pillar in success of vision 2030 which targets to transform this country into an industrialized nation. As a step to achieving this, The Government has moved to set up EDI centers i.e. by introducing IFMIS to all its operations, this is geared towards effectiveness in terms of payments for the service providers, it's also endeavoring to introduce and implementing the free primary laptop programs in all the primary schools in Kenya, the coverage is still significance, for this kind of initiatives to take place.

The government is taking initiative to connect all primary schools and rural homes with electricity (rural electrification programs) Studies done by Njuguna (2009) reveals that a fully EDI board has been set up by the government to spearhead the EDI revolution in the country which is a positive signal to e-procurement. Recently the ministry of Finance with the support of PPOA came up with a mandate of establishing EDI alongside IFMIS in public institutions. The government of Kenya is currently advocating for adoption of e-procurement by all public procuring entities to ensure there is transparency, effectiveness, accountability and reduction in corruption.

Electronic data interchange EDI on Supply chain is expected to combine partners, resources and perspectives into a firm's value propositions, thereby allowing all companies in the network to excel in performance. Previous studies etc. Cf. Antonelli (1988), Bensaou (1992), Faulhaber, Noam & Tasley (1986), Malone, Yates and Benjamin (1987), Scott Morton (1991), Its major pay-off is thus due not to the automation of (EDI)have highlighted the importance of information communication technology through (EDI) electronic data interchange, integration in supply chain by linking it with various outcomes like competitive advantage, reduced lead times, cost controls, improved suppliers and customers relationships are having the strongest association with performance indicators identified in the premise of (EDI). (Antonelli C. (1988), Bensaou (1992), Faulhaber, Noam & Tasley (1986), Malone, Yates & Benjamin (1987), Scott Morton (1991),

Past literature have reported that EDI could yield enormous benefits provided that it is highly integrated, these benefits can be simplified as operational and strategic benefits (Elbaz, 1998; Mukopadhyay and Kekre, 2002; Parsa and Popa, 2003; Ngai and Gunasekaran, 2004). Operationally; EDI provides direct benefits such as reduction in costs associated with clerical labours and forms as well as in length of data transmission and processing. Further, an integrated EDI with existing systems is believed to facilitate the reengineering of some critical business processes including improvement in customer service and trading partner relationship and also as entry barriers for new comers and exit barriers for trading partners.

Wanjiku (2013),in her study of the effect of supply chain integration on supply chain performance concluded that, most banks embraced EDI in business integration over ten years ago and this has assisted them to enhance the performance of their supply chain. These findings are of significant value addition, with regards to evaluation of the same in State Corporations in Kenya. However, she restricted her research on the Banking sector in Kenya. Similarly, Ndambuki (2013) concluded that EDI integration of supply chain in Humanitarian Non-Governmental Organizations (NGOs) has proven to be critical success factors for the organizations supply chains and performance. His study highlighted that information sharing, faster decision making, supplier relationship management and efficiency in a supply chain has influence in the humanitarian organizations performance.

Despite substantial potential benefits of EDI, the growth of EDI implementation has still been much slower than anticipated. For example, in America, a giant corporate nation, merely less than 5% of businesses exchange their trade documents electronically (Kalakota and Whinston, 1996 in Lu and Hwang, 2001). Significant initial investment or lack of financial resources was found to be the major inhibitor for EDI implementation (Chau, 2001; Parsa and Popa, 2003; Ngai and Gunasekaran, 2004). EDI

implementation in fact entails high cost for communication network i.e. value-added network (Lummus and Duclos, 1995; Emmelhainz, 1994).

The impact of electronic data interchange (EDI) on effective implementation of SCM is high. Findings indicated that information system factor had the highest effect on accuracy of information followed by flow of information and compatibility of technology (Kimani, 2013). According to Okello and Were, (2014), inventory management plays a primary role in food manufacturing companies because it provides the modern food manufacturing company with a platform to address their management and communication needs. Industry-specific features and flawless integration increase quality, service, product safety and operational efficiency. According to (KNBS, 2012) it's unfortunate that the performance of the food manufacturing sector in Nairobi has been affected by the use of obsolete supply chain management practices and technologies with poor state of physical infrastructure and inadequate supply chain innovation.

USAID (2009) view Supply chain performance in offering the visibility, alignment, and incentives necessary to manage complexity, while retaining a focus on customer service through reliable product availability. Odiko (2004) examined business as a mode of international business engagement. She noted that although there is muchgaininI.C.T development in Kenya across several sectors, a number of challenges still need to be addressed. Clearly, none of the researchers have explicitly focused on benefits of EDI application and challenges of EDI implementation and application in Kenya. There are several EDI standards in use today, including American National Standards Institute (ANSI), electronic data interchange for administration commerce and transport (EDIFACT), TRADACOMS and ebXML. And, for each standard there are many different versions, e.g., ANSI 5010 or EDIFACT version D12, Release A. When two businesses decide to exchange EDI documents, they must agree on the specific EDI standard and version. EDI documents are typically between two different companies, referred to as business partners or trading partners. For example, Company A may buy goods from Company B. Company A. sends orders to Company B. Company A. and Company B. are business partners.

2.1.5 Concept of Supplier Relationship Management

Supplier relationship management is a comprehensive approach to managing an enterprise's interactions with the organizations that supply the goods and services it uses. According to Lin and Zhou (2011), the goal of supplier relationship management (SRM) is to streamline and make more effective the processes between an enterprise and its suppliers just as customer relationship management (CRM) is intended to streamline and make more effective the processes between an enterprise and its customers. SRM includes both business practices and software and is part of the *information flow* component of supply chain management (SCM). SRM practices create a common frame of reference to enable effective communication between an enterprise and suppliers who may use quite different business practices and terminology. As a result, SRM increases the efficiency of processes associated with acquiring goods and services, managing inventory, and processing materials.

Supply chain processes and relationships increasingly are designed to exploit changes in technology. Changing supply chain processes have evolved from classical paper-based systems and documents, towards reengineered processes that involve electronic capture and transmission of less document information. Supply chain relationships have evolved from loosely coupled relationships into virtual organization, coupled with integrated enterprise resource planning systems. supply chain processes that have been designed to speed transaction and improve the quality of information exchange, including, Electronic data interchange integration to facilitate speed and quality of information interchange, Gathering information directly from the source, rather than have one central point of dissemination, Suppliers determining order quantities and order items for buyers.

These relationships are strengthened and facilitated by different enterprise systems such as Electronic Data Interchange(EDI), Enterprise Resource Planning(ERP),and Product Data Interchange (PDI).This is the second level of supply chain integration.

These partnering decreases inventory and improve the efficiency of their communications by having accurate information about materials delivery time(Simchi-Levi, Kaminsky and Simchi-Levi, 2003). It also may enhance firms 'competition capabilities (Vickery, Jayaram, Droge, and Calantone, 2003) and new entrants are deterred (Stroeken, 2000). Effective external integration with suppliers may enable organizations to reduce supply-side risks (Linand Zhou, 2011).This is through the alignment of business processes, information sharing, and joint planning between suppliers and customers (Flynn*et al.,*2010).Owing to the collaborative approach to establish mutual understanding, it improves the understanding of customers 'needs.

The sharing of timely market and operational information further enables suppliers to anticipate and respond to changing customer needs and therefore improve delivery performance (Zailaniand Rajagopal, 2005). Without sharing of accurate information, flows of materials and information may not be coordinated and bullwhip effect may arise, leading to poor inventory management. Closer supplier-customer collaboration helps to achieve task coordination and resolve conflicts. Better coordination and alignment of objectives help to reduce waste and redundancy of efforts in managing supply chain activities (Swinket etal, 2007).

Over the past decade, one of the main themes in the supply chain management literature has been integration as a key factor in achieving improvements (Tan et al., 1999; Romano, 2003). Many authors agree that integrative practices and a high level of integration have a positive impact on corporate and supply chain performance. Recent empirical work (Frohlich and Westbrook, 2001; Vickery et al., 2003; Childers house & Towill, 2003; Gimenez and Ventura, 2005) shows convincing empirical evidence for the relationship between integration and performance. Whereas the empirical evidence seems to be overwhelming, a part of the literature doubts the results and approach taken in supply chain integration studies. Firstly, starting from the well-known and often cited article of Fisher (1997) an increasing number of researchers have realized that supply chain integration might need a more tailored approach in order to be successful. One possible way to further explore that is to include context (Ho et al., 2002) or business conditions (Van Donk and Van der Vaart, 2004, 2005; Van der Vaart and Van Donk, 2006). Information Technology (IT) consists of hardware and software that captures analyses and provide information wherever it is needed. Since the supply chain management is defined as network of organizations, these organizations cannot form a network unless they are connected through IT resulting into transparency in the supply chain and aligning the supply chain activities towards customer.

2.1.6 Concept of Supply Chain Performance

Supply chain performance is defined as the entire chain's ability to meet end-customer needs through product availability and responsive, on-time delivery (Ndambuki,2013). Efficiency and effectiveness have been used as key indicators for measuring supply chain performance Holmberg,(2000).Two well-known indicators of efficiency and effectiveness are cost containment and performance reliability constructs(Lee, Kwon,& Severance, 2007).Cost containment indicator includes such activities as cost in and out bound activities, warehousing costs, inventory-holding cost and increasing asset turnover. Reliability indicator addresses such areas as order fulfillment rate, inventory turns, safety stocks, inventory obsolesces, quality and number of product warranty claims.

According to Burjar (2011), Performance Profitability is the ability to make profit from all business activities of an organization. A significant impact on the profitability increasing exerted the actions of lowering the all operating expenses. From that study it is clear that the lower the cost of operation the more positive impact is realized on the organizations profits. Warusawitharana (2014) in a study "Profitability and Lifecycle of firms" bring up the effect of age of a firm on profitability and documents that the profitability of firms follows a hump shape over the lifecycle, profitability rises for young firms, peaks, and then declines slowly as firms mature Operations Efficiency. Efficiency is generally a, measure or an indication of how well the resources such as time and energy are used for the intended purpose. According to Mihaiu, Opreana and Cristescu (2010), the efficiency can be achieved under the conditions of maximizing the results of an action in relation to the resources used; this can be calculated by comparing the effects obtained in their efforts. When measuring efficiency, we consider a given input into the system and how much output comes from it. Efficiency of a factory may be affected by several factors such as machine downtime, employee's performance and availability of raw material needed for operation, transportation, exchange of data from one end to the other, supplier's capacity and use of data integration. Operation cost is a very important parameter to consider when analyzing performance of a factory. Kremic et al. (2006) argues that outsourcing is one of the motivators in reducing the cost of operations.

Improving supply chain performances a continuous process that requires both an analytical performance measurement system, and a mechanism to initiate steps for realizing key performance indicator (KPI). Connects planning, execution and in corporate steps for realization of performance goals into routine daily works in manufacturing companies Cai,Xiangdong, & Zhihui, 2008. Supply Chain Management can be described as integration of all components of production and supply processes in the process from obtaining raw materials to delivery of the product to the end user. Another definition is: integration of flow of materials, information and money which enable delivery of the right product to the customer on right time, in the right place, for the right price and at the lowest possible cost for the entire supply chain. The flow is completed by integrating all components of the process from obtaining raw materials to delivery of the product to the end user (Seuring, 2004 and Krajewskive Ritzman, 2005).

Supply chain involves all the activities concerned with the transformation of raw materials into finished goods, flow to the end user and flow of information. According to Lambert & Cooper (2000), supply chain performance requires integration of key business activities from the supplier to the end user. This was affirmed by Narasimhan and Kim (2002) who noted that supply chain performance can be enhanced by different functions working together with seamless interface across processes. According to Winser (2005), a firm should have strategic fit to attain supply chain performance. These calls for supply chain capabilities such as aligning Electronic Data Interchange (EDI) applications with overall corporate strategy. As noted by Lee (2004), supply chain performance can also improve if it is more agile. An agile supply chain can be able to react to short term changes quickly. This can be enabled by the use of electronic data interchange (EDI) since it enables high responsiveness, fast responses and cost cutting in the supply chain (Lee, 2004).

The supply chain concept is theorized from the formation of a value chain network consisting of individual functional entities committed to providing resources and information to achieve the objectives of efficient management of suppliers as well as the flow of parts (Lauand Lee, 2000). SCM includes a set of approaches and practices to effectively integrate suppliers, manufacturers, distributors and customers for improving the long term performance of the individual firms and the supply chain as a whole in a cohesive and high-performing business model (Chopra and Meindl, 2001). As defined by the Council of Supply Chain Management Professionals (CSCMP), SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities as well as coordination and collaboration with channel partners.

Performance is a multi-dimensional concept. On the most basic level, Bormann and Motowidlo (1993) distinguish between task and contextual performance. Task performance refers to an individual's proficiency with which he or she performs activities which contribute to the organization's 'technical core'. This contribution can be both direct (e.g., in the case of production workers), or indirect (e.g., in the case of managers or staff personnel). Contextual performance refers to activities which do not contribute to the technical core but which support the organizational, social, and psychological environment in which organizational goals are pursued. Kulik*et al* (1999) Perspectives on performance, Researchers have adopted various perspectives for studying performance. On the most general level one can differentiate between three different perspectives: first an individual differences perspective which searches for individual characteristics e.g. general mental ability, personality as sources for variation in performance, secondly a situational perspective which focuses on situational aspects as facilitators and impediments for performance, and thirdly a performance regulation perspective which describes the performance process.

These perspectives are not mutually exclusive but approach the performance phenomenon from different angles which complement one another. In this section, we will present these three perspectives and the core questions to be addressed by each perspective in detail. We will summarize the major theoretical approaches and findings from empirical research and will describe the practical implications associated with these perspectives. There is a large body of research which showed that motivation is essential for performance. Motivational constructs related to performance can be partly subsumed under the individual differences perspectives (e.g., need for achievement), partly under the situational perspectives (e.g., extrinsic rewards), and partly under the performance regulation perspective (e.g., goal setting). We will refer to some of the most relevant motivational approaches within each perspective. However, a thorough review of the motivational literature is beyond the scope of this chapter kenfer *et al* (1992 Contextual performance includes not only behaviors such as helping coworkers or being a reliable member of the organization, but also making suggestions about how to improve work procedures. According to (Borman & Motowidlo, 1997; Motowidlo & Schmit, 1999): Three basic assumptions are associated with the differentiation between task and contextual performance Activities relevant for task performance vary between jobs whereas contextual performance activities are relatively similar across jobs; task performance is related to ability, whereas contextual performance is related to personality and motivation; and task performance is more prescribed and constitutes in-role behavior, whereas contextual performance is more discretionary and extra-role.

Vans *et al*(2000) relevance of individual performance Organizations need highly performing individuals in order to meet their goals, to deliver the products and services they specialized in, and finally to achieve competitive advantage. Performance is also important for the individual. Accomplishing tasks and performing at a high level can be a source of satisfaction, with feelings of mastery and pride. Low performance and not achieving the goals might be experienced as dissatisfying or even as a personal failure. Moreover, performance if it is recognized by others within the organization is often rewarded by financial and other benefits. Performance is a major although not the only prerequisite for future career development and success in the labor market. Although there might be exceptions, high performers get promoted more easily within an organization and generally have better career opportunities than low performers the high relevance of individual performance is also reflected in work and organizational psychological research.

2.2 Empirical Literature

2.2.1 Electronic Data Interchange integration and Supply Chain performance.

Ramamurthy, Premkumar & Crum (2009) developed a multidimensional measure for EDI diffusion to capture both external integration and internal integration. They then examined the influence of these 7 variables on the extent to which EDI adopter firms pursue diffusion and whether more diffusion leads to superior organizational-level outcomes. Two senior executives (the chief executive officer and a senior manager responsible for the IS function or EDI) from 83 firms in the motor carrier industry participated in a field survey. The results from a structural equation model (SEM), developed using LISREL, provided quite a strong support for the hypothesized relations. All 4 organizational variables and 2 of the 3 inter-organizational variables (customer support and competitive pressure) influence EDI diffusion. The results also indicated that external integration dimension of diffusion enables adopter firms to achieve improved operational and market-oriented performance, whereas internal integration contributes only to operational performance.

Han, Wang and Naim (2017) studied information technology flexibility for supply chain management. The study theorized a research model by integrating disparate streams of IT flexibility research with three types of IT flexibility, namely, operational, transactional, and strategic, and tested both the direct and indirect effects of the three IT flexibility types on firm performance. Our theoretical model uses an extended resource based view to highlight the role of IT flexibility in managing interdependent firm relationships in supply chains. Using a partial least squares approach to structured equation modeling analysis on 162 questionnaires from supply chain practitioners, we found two significant relationships: (1) transactional IT flexibility affects operational IT flexibility, and (2) operational IT flexibility affects strategic IT flexibility. Transactional IT flexibility also affects strategic IT flexibility, thus playing a pivotal role in the effectiveness of the other two flexibility types. In addition, it was identified that transactional and operational flexibilities affect firm performance indirectly, via process integration capability, while strategic flexibility directly affects firm performance. By classifying diverse IT flexibility attributes into three types, a comprehensive and explicit concept of IT flexibility in inter-organizational relationships is attained, which allows practitioners to target key resource investments to realize the full potential of IT in the supply chain

Kiggira *et. al* (2015) investigated the role of E.D.I on supply chain performance in the cargo distribution management in Kenya. The Port of Mombasa is the major gateway to Kenya's international trade by sea handling 22 million tons of goods in 2013 (KPA, 2014). This represents double the volume of Daresasalam Port and only 4% of the volume 557.5 million tons that was handled through the port of Singapore. Over the last decade, the Government and the private sector have invested heavily in the improvement and modernization of the transport infrastructure and services aimed at improving trade facilitation. Some of these investments include the dredging of the Mombasa Port, completion of Berth 19, construction of the second container terminal, development of Embakasi inland container deport (ICD), focus on regional road links, privatization and improvement of weighbridges, customs modernization project, the standard gauge railway line, development of KRA Simba 2005 System, and the E.D.I

Aina *et.al* (2017) argued that electronic data interchange (EDI) is possibly the most promising application of information technology witnessed in recent years. It has been noted that there is revolutionization of supply-chain management concept this has enormous potential contribution. The study attempted to define EDI and examined major EDI elements that link organizational systems. The application of EDI in manufacturing, retailing and service operations examined, and a framework for describing EDI components and their role in different areas of an organization proposed. The research focused on electronic data interchange (EDI), an important class of IT used for inter organizational information transfers in the supply chain. Survey of the roofing sheet manufacturing industry issued to examine the use of EDI with respect to interfirm coordination activities involving suppliers and customers. The results suggested that firms view EDI as a tool for improving effectiveness, efficiencies and also as a tool for facilitating supply chain integration. There is also a surprising difference in firms' use of EDI with suppliers. Firms tend to be much more accommodative of the desires of their customers than of their suppliers. Sproull, (2002) conducted an empirical analysis of electronic data interchange (EDI) implementation benefits in Kentucky on small and medium sized enterprises Some implications for adoption of EDI implementation and rutinalization concluded that the research method used was non experimental in nature, therefore results were not necessarily generalizable to all Small micro enterprise. However, results could be generalized to the industries and organizational sizes represented by the sample. Further, no cause and effect conclusions were drawn. Even though all efforts were taken to reduce nonresponsive bias and other errors, inferences, conclusions, recommendations from this type of research strategy are generally supported with lesser confidence than true experimental research, Further the study recommended for better management of cost reduction by application of EDI software systems in an organization. This can reduce time and effort required to complete purchasing transactions, for effective organizational policies that assist in lowering cost and backorders through EDI as such policies affect supply chain performance. Finally, the study recommends the use of EDI to fast truck integration of customers and suppliers' processes. This will strengthen buyer supplier collaboration to enhance competitive advantage through information sharing and making joint decisions.

According to Kiggira, R.W, Mwirigi, F.M. & Shale, N I. (2015) the role of E.D.I on supply chain performance in cargo distribution management in Kenya a case of Mombasa Port in Kenya, From the literature review in this study, it is evident that EDI application plays many roles beneficial to an organization.EDI Technology however, cannot guarantee the success of a business in all conditions. Therefore, a well planned and executed EDI adoption and application supply chain processes is necessary for the successful adoption of EDI. From the findings above the many requirements of changes in business processes than expected hinders the E.D.I corporate policies in the management of cargo at the Mombasa Port. Unforeseeable technical problems especially the hardware and other related technical apparatus. This study established that the gaps such as proper planning and cost reduction were every company's major concern in maximize profits. Research work done by other scholars in the past especially this field wasn't deep to analyze the roles of E.D.I on supply chain performance in the cargo distribution management according to Kiggira, Mwirigi and Shale (2015).

Romano (2003) and other authors agreed that integrative practices and a high level of integration have a positive impact on corporate and supply chain performance. Studies conducted more recently by Frohlich and Westbrook, 2001; Vickery et al., 2003; Childer house and Towill, (2003); Gimenez and Ventura, (2005) showed convincing empirical evidence for the relationship between integration and performance Whereas Fisher (1997), Ho et al., (2002), (Van der Vaart and Van Donk, 2006). Conclusions from these studies are that an increasing number of researchers have realized that supply chain integration might need a more tailored approach in order to be successful in determining impact on performance in various organizations. Such specific approaches include looking at EDI integration.

Many Studies that have been conducted found that pressure from a customer is a significant driver influencing the supplier's adoption decision (e.g., Chwelos, Benbasat, & Dexter, 2001; Gavidia, 2001; Kuan & Chau, 2001), yet others do not (e.g., O'Callaghan, Kaufmann, & Konsynski, 1992). In studying the barriers to EDI adoption, both Iskandar, Kurokawa, and Leblanc (2001a) and Premkumar, Ramamurthy, and Nilakanta (1994) find that the size of the initial investment is a significant barrier to EDI adoption, while Murphy, Daley, and Hall(1998) find no statistically significant relationship. Perhaps the most compelling conflicts are those regarding the benefits that firms have realized from the use of EDI. Riggins and Mukhopadhyay (1994) find that EDI integration leads to reduction in the overall error rates in document transaction; while Truman (2000) does not find any support for reduced errors. Lim and Palvia (2001) find that EDI

The studies are not clear on EDI integration and its effect on supply chain performance. They do not define clear constructs of EDI integration. Information is lacking on the effect of EDI integration on supply chain performance of firms. The sugar firms in Kenya similarly cannot benefit from this information as it is lacking from among them.

2.2.2 Supplier Relationship Management and Supply Chain Performance

Maraka, Kibet and Iravo (2015) studied effects of Supplier Relationship Management on the Performance of Organizations in Selected Sugar Companies in Western Kenya. This study was aimed at filling these gaps on how supplier relations management could be used to enhance the performance of the sugar industry in Kenya. The study was guided by the following research objectives, to: determine the effect of the organization structure in the performance of an organization, determine the effect of value measurement on the performance of an organization, determine the effect of collaboration on the performance of organizations and finally determine the effects of technology in the performance of organizations. The study adopted a survey and targeted the management and the procurement staff of the three selected sugar companies in western Kenya which are Mumias, West Kenya and Butali Sugar Companies. The study targeted the 25 departmental staff in the three companies' and inclusive of the three procurement managers who head the respective procurement departments in the companies. A total of 25 respondents were therefore targeted. The research employed a census study design. The sample size of the study comprised of 25 respondents. The questionnaires were issued to the procurement staff through their respective managers.

Al-Abdallah, Abdallah &Hamdan (2014) studied the impact of supplier relationship management on competitive performance of manufacturing firms. They attempted to examine the impact of supplier relationship management (SRM) on competitive performance in the manufacturing sector. Based on the literature review, they measured SRM through five main practices: supplier quality improvement, trust-based relationship with suppliers, supplier lead time reduction, supplier collaboration in new product development, and supplier partnership/development. We measure competitive performance through cost, quality, flexibility, delivery, and on time product launch. Using international data collected in Japan, Korea, USA, and Italy as part of round 3 of High Performance Manufacturing (HPM) project, and after using statistical package of social sciences (SPSS) to describe and analyze the data, the results showed that two practices of supplier relationship management, supplier partnership/development and supplier lead time reduction significantly and positively affect the competitive performance of the buying firms.

Wachira (2013) examined supplier relationship management and supply chain performance in alcoholic beverage industry in Kenya. The study applied a multistage sampling technique to select the sample size 38 respondents from 38 supply chain professionals in the alcoholic beverage companies. Questionnaires were used as the main data collection instruments. Descriptive statistics was used aided by Statistical Package for Social Scientists (SPSS) to analyze the quantitative data. The study utilized descriptive and multiple regression analysis to determine the relationship between Supplier Relationship Management and Supply Chain Performance. The objectives of the study was to establish the extent of SRM in alcoholic beverage industry, its impact on supply chain performance and challenges faced in implementation of SRM. This research indicated that by adopting collaborative relationships with their suppliers contribute to competitive advantage and value creation in Supply Chain Performance.

Kosgei and Gitau (2016) evaluated the impact of supplier relationship management on organizational performance. The study looked at two parameters; trust and commitment as elements of supplier relationships and the effect that these have on organizational performance. The research involved a cross sectional study design that was carried out in Kenya Airways, where a sample of 82 respondents was selected from a target population of 272 KQ employees to answer research questions of interest. Stratified random

sampling was used to come up with the sample size since the population in different departments at KQ was considered to be heterogeneous. The primary data for the study was collected using the questionnaires. The results of the study were presented using frequency tables. Quantitative data was analyzed using descriptive and regression statistics with the aid of Statistical Package for Social Sciences (SPSS 21.0). The study established that understanding and practicing of supply chain management with key focus on supplier relationships is an essential prerequisite for staying competitive in the global race and enhancing profitably in the market. The study also found out that there was a great opportunity for organizations to improve their performances through proper use of SRM strategies and therefore recommended that organizations should show more commitment in SRM by having systems to monitor, appraise and evaluate performance at a strategic level.

Green *et al.*, 2006 conducted studies and concluded that most of past research work had failed to address how Supply chain process dimensions are related to Supply chain performance and, more importantly, how the dimensions of supply chain process are related to organization performance. In other words, the mediating impact of SCM performance between supply chain process strategies/dimensions and organization performance has gone unnoticed and deserves immediate attention In conclusion the researcher implied that in addition, as recognized by Trent (2004), contrary to the popular notion that effective supply chain management is only in the hands of managers, in order to achieve a successful implementation of the supply chain, all units of the supply chain should fully embrace and understand the strategy.

Benton & Maloni, 2005; Duffy & Fearne, 2004; Humphreys et al, 2004; Johnston at al, 2004; Giménez & Ventura, 2003, 2005), conducted studies on supply chain performance measurement and concluded that performance aims at reducing reaction times and/or stocks, but also to increase the visibility in the chain or to attain a more effective and efficient way of communication. They also indicated that large amount of the current papers used subjective measurements of performance relative to the past or relative to competitors, that are hard to validate. Directly measuring the performance of the relationship could be relatively easy: e.g. reduction in inventory turns, improved service, and shorter lead time.

Avery, Swafford and Prater (2014) studied Impact of supplier relationship management Practices on buying firm performance: comparison of the United States and China. The Study was conducted in both manufacturing and service industries in the United States of America and China. The study found that the difference of information sharing between the two United States populations is the only difference attributed to industry differences. Overall study results indicate that buyer commitment positively impacted buying firm performance in China; while buyer commitment and shared values impacted buying firm performance in The United States.

Studies have been conducted in the area of supplier relationship management as part of supply chain processes. The contexts presented are varied. It is unclear what effect supplier relationship management would have on supply chain performance of sugar firms in Kenya as such no known study has been conducted in the same parameters.

2.2.3 Electronic Data Interchange Integration, Supplier Relationship Management and Supply Chain Performance

Li *et al* (2004) in their study argued that effective supply chain management (SCM) has become a potentially valuable way of securing competitive advantage and improving organizational performance since competition is no longer between organizations, but among supply chains. This research conceptualizes and develops five dimensions of SCM practice (strategic supplier partnership, customer relationship, level of information sharing, quality of information sharing, and postponement) and tests the relationships between SCM practices, competitive advantage, and organizational performance. Data for the study were collected from 196 organizations and the relationships proposed in the framework were tested using structural equation modeling. The results indicate that higher levels of SCM practice can lead to enhanced competitive advantage and improved organizational performance. Also, competitive advantage can have a direct, positive impact on organizational performance.

A study conducted by Basnetetal. (2003) reported that the situation is no better in New Zealand and confirms that New Zealand is lagging behind the US and Europe. Basnet et al. (2003notedthatinNZ, there has not been much progress when it comes to more advanced ideas such as supply chain teams, or information sharing, or use of EDI. They concluded from their survey data that future research opportunities existed in the identification and validation of SCM technique and practices that are particularly suited to manufacturing industries in New Zealand.

According to Ramdas & Spekman (2000) who concluded that more emphasized that there is need for applying sound constructs and methodologies to better understand their relationship between supply chain integration and performance. The study conducted by Tan (2001) and Croom et al. (2001), (Chen & Paulraj, 2004 Ho et al. (2002, reviewed their literature and stated that the variety of supply chain management and integration definitions is large. Johnston et al. (2004) and Frohlich & Westbrook (2001) conducted a study and concluded that the consistency of measures and constructs of supply chain performance is still limited; one point of concern is that different aspects of integration are measured, without explicitly addressing choices. Both studies addressed

performance measurements after the integration, but the first one measured patterns of behavior, while the second one focused on operational practices.

Njagi *et al* (2014) conducted a study on role of supply chain integration on supply chain performance in Kenyan state corporations. It was motivated by the scarcity of studies on impact of supply chain integration on supply chain performance in State Corporations in Kenya. The research project was limited to State Corporations whose functions are strategic in nature as per the reclassification by the Presidential Task force on Parastatal Reforms of October 2013.A census study was conducted in a bid to answer the following research questions; extent of integration, A total of 15 corporations were surveyed yielding a response rate of 78.9%. The study revealed that state corporations had achieved an above average level of integration in internal integration of operations, external integration with suppliers and external integration with suppliers at 57.6%, 54.8% and 59.4 % respectively.

Singh and Sohani (2011) examined the linkage within firm supply chain integration (WFSCI), between firm supply chain integration (BFSCI), customer service and firm performance. They found that the evidence from studies examining the relationship between the level of integration and performance is mixed. The purpose of this study is to investigate on an empirical basis the relationship between two supply chain integration dimensions- the integration of information flows and the integration of physical flows. Performance measurement activities have an important role to play in setting objective, evaluating firm performance and enhance customer service.

Magutu, Lelei and Nanjira (2010) investigated benefits and challenges of implementation and application of EDI in Kenya considering the case of Kilindini Waterfront Project. Data was collected from 45 managers of the firm's selected using convenient sampling. The respondents were asked about perceived benefits of EDI application and perceived challenges of EDI implementation and application. The questionnaires were mainly hand delivered to the respondents. The data collected was analyzed with the use of frequency tables, proportion, percentages, cross tabulations and factor analysis using SPSS. Majority of the firms that were studied had less than 1,000 employees which may possibly mean the firms are less labor intensive and therefore relying more on automated processes. This study also show that most of the respondents were experienced with EDI implementation and application and therefore had the necessary knowledge sought for. From the factor analysis carried out on the variables of the benefits of EDI application, the deduction drawn indicates that firms that apply EDI benefited. Some of the benefits include reduced errors, access to information, enhanced competitive capacity and improved trading partner relationship. Despite the benefits of EDI application, it was also found that there are several challenges encountered in the implementation of EDI. From the factor analysis carried out on the variables of the challenges in the EDI implementation, the deduction drawn indicates some of the challenges to be lack of top management support, negative staff attitude, inadequate IT staff training and inadequate non IT staff training. This study also indicated that there were challenges encountered in the application of EDI. From the factor analysis carried out on the variables of the challenges of EDI application, the deductions drawn indicate some of the challenges to be inadequate non IT staff training, lack of trust of other EDI partners, lack of flexibility, lack of maintainability and lack of awareness of benefits of EDI.

Chakrabortya, Bhattacharyab, Dobrzykowski (2014) conceptualized supply chain collaboration (SCC) and its components in the context of healthcare service sector. Using a service dominant logic (SDL) lens, the study established SCC as an antecedent to value co-creation (VCC); where VCC acts as a mediator in the relationship between SCC with firm performance. The study also introduced the conceptual construct of relationship complexity level and attempted investigating its influence on the framework relationships. The study by establishing parallels between the relational view and the SD logic view rationally converges to show that collaboration is the final prescribed outcome. The study logically put forth a set of propositions that offers an enticing scope of further empirical investigation through testable hypotheses.

Choe (2008) investigated and demonstrated changes of management control systems (MCSs) when electronic data interchange (EDI) is adopted and utilized. Using structural equation modeling, causal relationships among environmental uncertainty affecting EDI adoption, EDI usage, organic forms of MCSs and production performance were confirmed. This study also empirically showed the mediating effects of individual elements of MCSs on the relationship between EDI usage and production performance. The results presented that environmental uncertainty is a primary cause factor for the adoption of EDI. According to the results of this study, it was found that under high degrees of EDI usage, forms of MCSs become organic (i.e. characterized by decentralized structure, high degree of integration, decentralized communication and team-based rewards), and that both the high usage of EDI and the organic types of MCSs have a positive impact on production performance of a firm

The studies above show mixed results. An attempt has been made at introducing a mediator in the relationship between EDI usage and production performance but production performance is only one aspect of supply chain performance. There is no clear knowledge of what is moderating the relationship between EDI integration and supply chain performance. What effect supplier relationship management could have in the relationship between EDI integration and supply chain performance has not been investigated yet an important basis of free integrated electronic information flows is supplier relationship. Subsequently,

information on moderating effect of supplier relationship management in the relationship between EDI integration and supply chain performance of sugar firms in Kenya is not available

III. Methodology

This chapter sets out various stages and phases that were followed in completing the study. It involves a blueprint for the collection, measurement and analysis of data. This section is an overall scheme, plan or structure conceived to aid the researcher in answering the raised research question. The section identifies the procedures and techniques that were used in the collection, processing, and analysis of data. Research design, target population, data collection instruments, data collection procedures and data analysis and presentations are spelt out here.

3.1 Research Design

The study adopted co-relational research design which, according to Kothari (2014), is structured to examine the cause and effect situation within organizations. Kothari argues that co-relational design allows for both quantitative and qualitative data and consequent analysis.

3.2 Study Area

This study was conducted in western Kenya. In this study, Western Kenya is defined by the current administrative counties of Kisii, Nyamira, Migori, Kisumu, Homabay, Siaya, Bungoma, Kakamega, Vihiga and Busia. The area is chosen since it contains the highest concentration of sugar firms and is a large sugarcane farming belt. It is also the region where the head office of sugarcane development research initiative, KESREF is located.

3.3 Target Population

The target population was 300 Supply Chain officers of the 10 sugar manufacturing companies. Supply chain officers were chosen because they have the ability to articulate issues of electronic data interchange integration, supplier relationships and supply chain performance. The population is distributed as in table 3.1

Table 3.1 Population Distribution

No	Rank name of manufacturing	Supply chain staff (population)	Proportion	Sample
1	Mumias Sugar Company	47	(47/300)*169	26
2	West Kenya Sugar Limited	30	(30/300)*169	17
3	Nzoia Sugar Factory	31	(31/300)*169	17
4	South Nyanza Sugar Co.	45	(45/300)*169	25
5	Transmara Sugar Company	19	(19/300)*169	11
6	Butali Sugar Mills	23	(23/300)*169	13
7	Sukari Industries Limited	17	(17/300)*169	10
8	Kibos Sugar and Allied Industries Ltd	20	(20/300)*169	11
9	Muhoroni Sugar Company	33	(33/300)*169	19
10	Chemelil Sugar Factory	35	(35/300)*169	20
	Total	300		169

Source: Research Data, 2018

3.4 Sample Size and Sampling Technique

3.4.1 Sample Size

The sample size was169 staff members obtained as per Krejcie and Morgan (1970) (See appendix I).

3.4.2 Sampling Technique

Cluster sampling was adopted where each firm represented a cluster. This enabled the sample to be representative of each firm. Purposive sampling was used to pick all the staff at managerial level within the supply chain to be   part of the sample. Simple random sampling was then used to pick the remaining respondents from the population from each firm.

3.5 Data Collection

3.5.1 Data Type and Source

Both primary and secondary data was used. Data in qualitative and quantitative form is expected. Primary data was obtained from respondents' involved and secondary data from relevant documents in the custody of the firms and other institutions such as KESREF.

3.5.2 Data Collection Instrument

Primary data was collected using self administered structured and semi structured questionnaire. Interview guide was also used to collect data from key informants. Secondary data was collected through document review.

3.5.3 Instrument Validation and Reliability Test

Validity and reliability was tested on the pilot data of 17 respondents. Reliability was obtained from Cronbach's alpha analysis at $\geq 0.7.9$ Convergent and discriminant validity was confirmed from reliability values, face, constructs and translation validity was confirmed by experts and practitioners. A commonly acceptable rule of thumb for describing internal consistency using Cronbach's Alpha Table 3.2

Table 3.2: Cronbach's Alpha Ranges for Internal Consistency

Cronbach's alpha	Internal Consistency
$\langle \geq 0.9$	Excellent
$0.7 \leq \langle < 0.9$	Good
$0.6 \leq \langle < 0.7$	Acceptable
$0.5 \leq \langle < 0.6$	Poor
$\langle < 0.5$	Unacceptable

Source: Research Data 2018

3.5.4 Missing Value Analysis

The extent of missing data occurring randomly in the returned questionnaires was assessed through a missing value analysis. It is noted that due to reasons such as non-response, fatigue, and sensitive information, some data vital for the study may be missing (Baraldi & Enders, 2010). Missing values reportedly affect results of statistical analysis were addressed. Consequently, missing values were examined case wise and all cases found to have missing values above 5% were deleted. Only two cases, 128 and 131 were found to posses missing values. However, both had missing values below the 5% critical point and were therefore retained for further analysis.

3.5.5 Exploratory Factor Analysis

A desire to reduce the many items measuring the constructs under study, coupled with the need to explore the underlying factor structure of the constructs informed the choice of exploratory factor analysis (Reio Jr & Shuck, 2014). Indeed, exploratory factor analysis has been cited in extant literature as an appropriate tool for reducing a large number of variables into a few core variables (Hair et al, 2010).

The Principal components analysis (PCA) was therefore used to establish the factor structure in the electronic data interchange, supplier relationship management, and supply chain performance constructs. The Kaiser criterion that requires factors with Eigen values greater than 1 was used. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity (completeness) were used to examine sampling adequacy. As a result, the KMO was expected to have a minimum value of 0.6, while Bartlett's measure was required to be significant at the 5% level (Tabachnick & Fidell, 2013).

3.5.6 Factor Structure of the E-Sourcing Variable

Six items were initially suggested to measure e-sourcing. PCA was therefore undertaken to verify item loadings through which redundant items could be omitted from further analysis. Table 3.3 revealed that the KMO value was 0.605 which was greater than the minimum value of 0.6 and signified that sampling was adequate. The Bartlett's test of sphericity yielded a significant chi-square value of 112.352 ($p<0.05$). Five items loaded highly on two factors and explained 54.445% of the variance in e-sourcing. One item did not load highly on any factor and was therefore omitted from further analysis.

Table 3.3 factor structure of e-sourcing

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
e-sourcing	**.694***		
Factor 1		1.647	27.453
Electronic Bids and Quotes	.840		
Electronic sourcing proposals and products information	.821		
Factor 2		1.620	54.445
Availability of product information	.746		
Sourcing consistency with electronic Order placing errors	.683		
Level of electronic tendering and negotiations	.640		
Kaiser –Meyer-Olkin MSA	.605		
Bartlett's Test of sphericity ($\mathcal{X}^2$=112.352)	.000		

Source: From research data, 2018

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

3.5.7 Factor Structure of the E-Invoicing Variable

A total of seven items were initially proposed to measure e-invoicing as practiced in sugar firms. The results of the PCA presented in table 3.4 revealed that the KMO measure of sampling adequacy was 0.842. Besides, the Bartlett's test of sphericity yielded a significant chi square value of 290.036 ($p<0.05$). The results therefore affirmed that sampling was adequate for the e-invoicing variable. All the seven items measuring e-invoicing loaded highly on only one factor and explained 47.330% of the variance in e-invoicing. The factor structure as initially proposed was therefore vindicated and all items were retained for further analyses involving e-invoicing.

Table 3.4 PCA Results of the e-invoicing Variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
e-invoicing	.812*		
Factor 1		3.313	47.330
reduction in lead times	.730		
efficiency in storage	.725		
reduction of printing costs	.704		
control of the invoicing processes	.670		

Electronic issuance of invoices	.666		
Electronic approvals and reporting	.666		
Electronic issuance of purchase orders	.650		
Kaiser –Meyer-Olkin MSA	.842		
Bartlett's Test of sphericity ($\mathcal{X}^2$=290.036)	.000		

Source: From research data, 2018

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

3.5.8 Factor structure of e-ordering

E-ordering was conceptualized as another practice that signifies integration of electronic data interchange. Thirteen items were initially proposed to measure e-ordering as practiced in sugar firms in western Kenya. PCA results displayed in table 3.5 confirmed that sampling adequacy with respect to e-ordering was achieved. The KMO measure of sampling adequacy was above 0.6 (0.845), and the Bartlett's test of sphericity was significant ($\chi^2 = 432.584$, p<0.05). Only seven items loaded highly on three factors and explained a cumulative total of 61.921% of the variance in e-ordering. The results implied that the factor structure of e-ordering required only seven items that could be clustered into three factors. Six items were deemed redundant and were therefore omitted from further analyses involving the e-ordering variable.

Table 3.5 PCA Results of the e-ordering variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
e-ordering	**.766***		
Factor 1		**2.099**	**34.215**
Availability of online inventory interface for customers	0.833		
Online purchasing and receiving for vendors and customers	0.792		
Factor 2		**2.081**	**41.804**
Use of electronic data interchange in departments	0.828		
Reduction in paper work	0.733		
Use of modern mean of transportation that saves time in deliveries	0.696		
Factor 3		**2.012**	**61.921**
Online customers and prospective clients	0.831		
On-line product descriptions for customers	0.613		
Kaiser –Meyer-Olkin MSA	**0.845**		
Bartlett's Test of sphericity ($\mathcal{X}^2$=432.584)	**0.000**		

Source: From research data, 2018

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

3.5.9 Factor Structure of e-payment variable

E-payment was the fourth and last practice conceptualized for integration of electronic data interchange in the present study. Six items were consequently proposed to measure e-payment as practiced among sugar firms in western Kenya. PCA confirmed that sampling was adequate with regards to e-payment (Table 3.6). The KMO sampling adequacy measure was 0.789 and the Bartlett's measure of Sphericity was significant ($\chi2$= 163.775, p<0.05). Out of the six items measuring e-payment, five loaded highly on one factor, and explained cumulatively, 43.273% of the variance in e-payment. The connotation of these results is that only five items

were necessary to measure e-payment. One item was therefore deemed redundant and omitted from further analysis involving e-payment.

Table 3.6 PCA Results of the e-payment Variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
e-payment	.744*		
Factor 1		2.596	43.273
reduction in transaction risk	0.737		
e-payment system as core to long term strategy of the firm	0.720		
provision of new payment opportunities	0.694		
Handling payments and receivables electronically	0.668		
instantaneous reduction of transaction time	0.658		
Kaiser –Meyer-Olkin MSA	0.789		
Bartlett's Test of sphericity ($\mathcal{X}^2$=163.775)	0.000		

Source: from research data, 2018

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

3.5.1.0 Factor Structure of the Supplier Relationship Management Variable

Supplier relationship management was conceptualized as the moderating variable in the present study. Twenty seven items were initially proposed to represent the factor structure of supplier relationship management as practiced in sugar firms in western Kenya. PCA verified that sampling adequacy with respect to supplier relationship management was attained (Table 3.8).

The KMO measure of sampling adequacy was above 0.6 (0.823), while the Bartlett's test of sphericity was significant (χ^2= 1488.311, p<0.05). Eleven items were extracted and loaded highly on four factors explaining cumulatively, 62.409% of the variance in supplier relationship management. These results signify that the factor structure of supplier relationship management required 11 items clustered in four factors. Sixteen factors were found to be redundant and were therefore omitted from further analyses targeting supplier relationship management

Table 3.8 PCA Results of the supplier Relationship Management variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
Supply chain performance	**.804***		
Factor 1		**3.540**	**13.616**
Franchises and products designs	.768		
Frequent business reviews	.727		
Purchasing agreements	.655		
Factor 2		**2.805**	**24.404**
Value based interdependency	.780		
Organizational structures	.706		
Strong executive engagement and corporate strategic planning	.673		
Factor 3		**2.165**	**42.591**
Mergers collaborations and acquisitions	.781		
Long term relationship and business commitment	.744		

Factor 4		1.539	62.409
Reduced cost in delayed deliveries, obsolete and redundant stocks	.838		
Accurate approved supplier list	.651		
Customer, vendor, product and services reliability	.849		
Kaiser –Meyer-Olkin MSA	**0.823**		
Bartlett's Test of sphericity ($\mathcal{X}^2$=1488.311)	**0.000**		

Source: From research data, 2018

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

3.5.1.1 Factor Structure of the Supply Chain Performance Variable

Supply chain performance was conceptualized as the dependent variable in the present study. Twenty six items were originally proposed to measure supply chain performance among sugar firms in western Kenya. Results of the PCA displayed in Table (3.9) indicates that the KMO measure of sampling adequacy (0.638) was above the minimum value of 0.6, while the Bartlett's test of Sphericity was significant (χ^2= 1337.531, p<0.05). The implication is that sampling was adequate and achieved completeness.

A total of eleven items were extracted and loaded highly on five factors. The five factors explained cumulatively, 74.641% of the variance in supply chain performance. The inference from these results is that supply chain performance needed only eleven items spread in five factors. The other fifteen items were viewed to be redundant and were omitted from further analyses involving supply chain performance variable.

Table 3.9 PCA Results of the supply chain performance variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
Supply chain performance	**.748***		
Factor 1		**2.526**	**18.042**
Assembly lines	.938		
Occupational safety health	.933		
Labor productivity Quality output	.751		
Factor 2		**2.372**	**34.982**
Improved quality of the products	.853		
Production processes	.826		
Factor 3		**2.162**	**50.423**
Records of inspections tests and results	.932		
Increased financial portfolio	.919		
Factor 4		**1.870**	**63.777**
Resource allocation on Machinery equipments, buildings	.852		
Improved customer relationship	.851		
Factor 5		**1.521**	**74.641**
Motivated staffs and reduced employee turnover rates	.825		
Continuous operations of the manufacturing firm	.806		
Kaiser –Meyer-Olkin MSA	**0.638**		
Bartlett's Test of sphericity ($\mathcal{X}^2$=1337.531)	**0.000**		

Source: From research data, 2018

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

3.5.1.2 Outliers

Outliers are recognized as extreme values that may occur on one variable (univariate outliers) or on two or more variables (multivariate) and which may impact negatively on results of multivariate statistical analysis (Tabachnick & Fidell, 2007). Univariate outliers were therefore assessed using SPSS descriptive statistics–explore command, upon which examination of the resulting box plot revealed two outliers on the supplier relationship management (see figure 3.1). The two cases 37 and 129 were therefore deleted from further analysis (Hair et al, 2010). A total of 152 cases were therefore retained for further analysis.
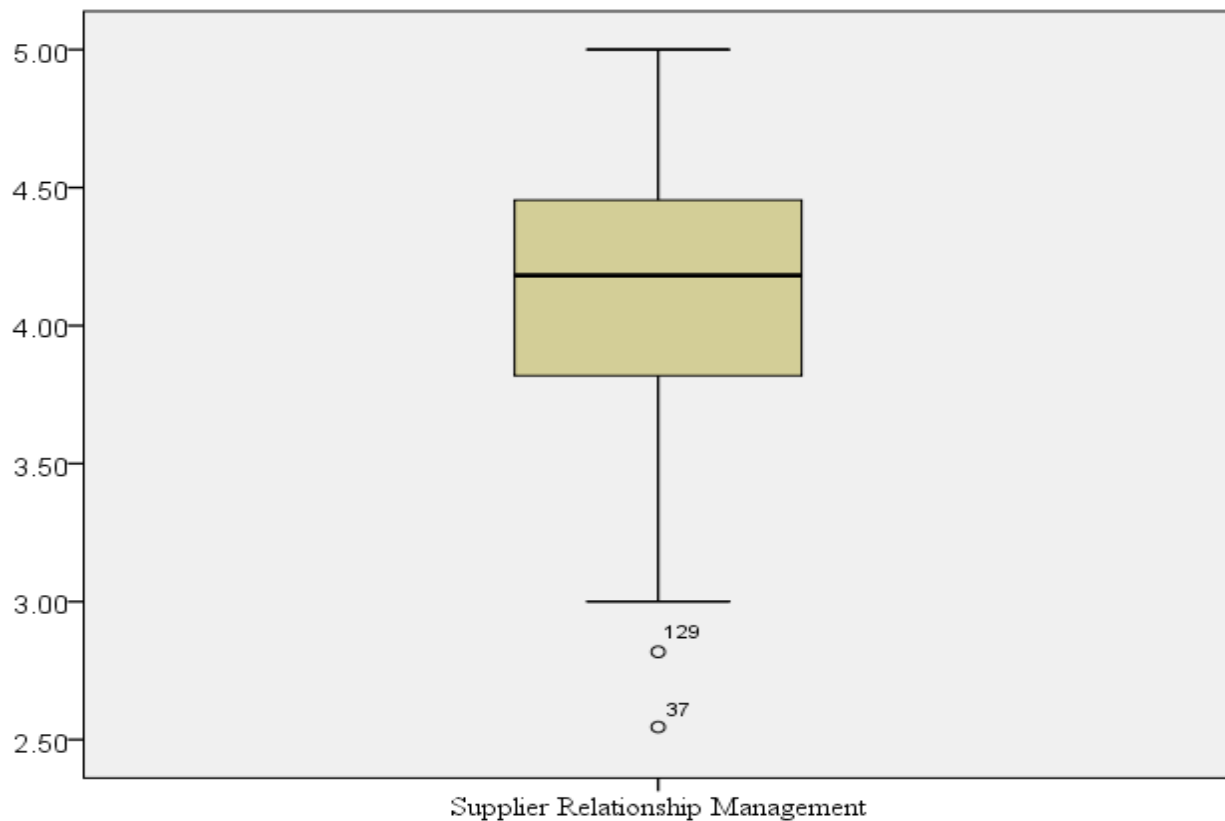
Figure 3.1 Box plot for outliers

Source: Research Data, 2018

Data were further examined for the presence of multivariate outliers. Distances of cases from the centroid of remaining cases created at the intersection of means of all variables were used to inspect multivariate outliers. According to Tabachnick and Fidell, (2013), a case that is viewed as a multivariate outlier lies outside a swarm around the centroid in Multivariate space. Consequently, Mahalanobis distances were computed using the SPSS regression, by evoking Mahalanobis values through the save command. A case was therefore presumed to be a multivariate outlier if the probabilities of the Mahalanobis chi-square values fell below 0.001. Examination of the probabilities of the mahalanobis chi square values yielded none with a probability less than 0.001. Data were therefore devoid of multivariate outliers.

3.6 Data Analysis and Presentation

Data was analyzed using descriptive and inferential statistics. Means, percentages, frequencies and standard deviation was used to describe data. Multiple regression analysis was conducted to obtain results for objectives one and two. Moderator regression analysis was done to obtain results for objective three.

3.6.1 Model

Objective 1(Multiple regression analysis)

To establish effect of electronic data interchange integration on supply chain performance

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + e_i \ldots\ldots\ldots\ldots\ldots \text{ (i)}$$

Where β_0, β_1, β_2, β_3, β_4–are constants to be determined

   Y_i- Supply Chain Performance

   X_{1i}- E-sourcing

   X_{2i}- E-invoicing

   X_{3i}- E-ordering

   X_{4i}- E-payment

   e_i- Error term assumed to be normally distributed with a mean of zero and constant variance

Objective 2 (Simple regression analysis)

To establish the effect of supplier relationship management on supply chain performance $Y_i = \beta_0 + \beta_1 Z_i + e \ldots\ldots\ldots\ldots\ldots.\text{(ii)}$

Where β_0, β_1 are constants to be determined

   Y_i- Supply Chain Performance

   Z- Supplier relationship management

   e- Error term assumed to be normally distributed with a mean of zero and constant variance

Objective 3 (Moderator Regression)

To determine the moderating effect of Supplier relationship management on the relationship between Electronic Data Interchange integration and Supply Chain Performance

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 Z_i + \beta_3 X_i Z_i + e_i \ldots\ldots\ldots\ldots\ldots.\text{(iii)}$$

Where $\beta_0, \beta_1, \beta_2, \beta_3$ –are constants to be determined

   Y_i- Supply Chain Performance

   X_i- Electronic Data Interchange Integration

   Z_i- Supplier Relationship Management

   $X_i Z_i$- Interaction between Electronic Data Interchange Integration and Supplier Relationship Management

   e_i- Error term assumed to be normally distributed with a mean of zero and constant variance

3.7 Testing for the Assumption of Normality

Normality of the distribution is a prerequisite for conducting multivariate statistics such as regression analysis (Cramer & Howitt, 2004). Consequently, distributions of all the study variables were tested for normality using the quantile–quantile plot (Q-Q). This is a normal probability plot that plots rank ordered values of a variable against expected normal distributions values (Stevens, 2002). In the Q-Q plot, normality is assumed if the plotted data representing a given variable follows a diagonal line usually produced by a normal distribution.

3.5.1.3 Normality of the E-Sourcing Data

The normal Q-Q plot for the e-sourcing variable is shown in figure 3.2. E-sourcing was categorized as an essential EDI component that could impact on supply chain management. Results show that data dots were alongside the diagonal signaling that the data distribution for the e-sourcing variable was normal and did not violate assumptions of multiple regressions analysis.
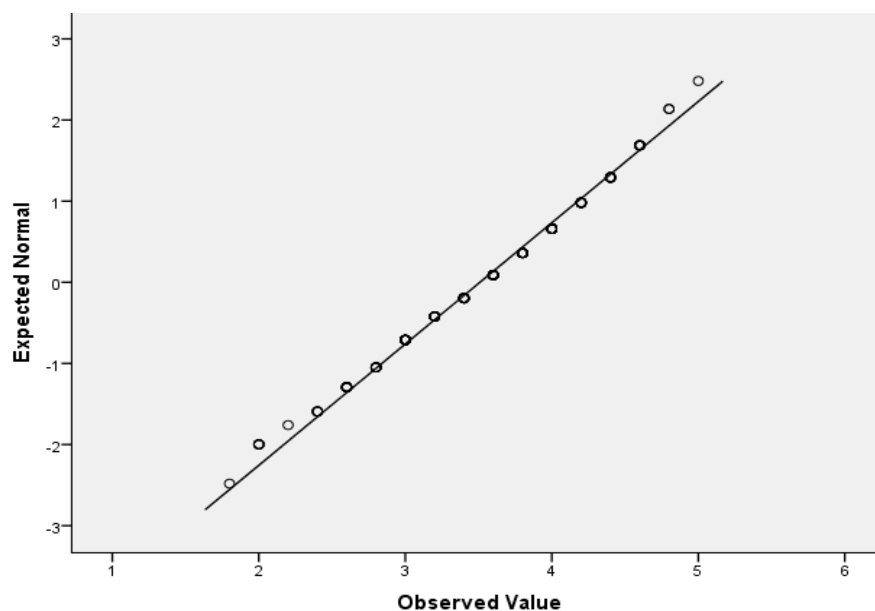
Figure 3.2 Normal Q-Q plots for e-sourcing variable

Source: Research Data, 2018

3.5.1.4 Normality for the E-Invoicing Data

E-invoicing was the second EDI component to be considered. The normal Q-Q plot of e-invoicing displayed in figure 3.3 indicates that the data dots stayed alongside the diagonal confirming that the data distribution of the e-invoicing variable followed a normal distribution with mean 3.72 and standard deviation 0.729. The normality assumption for e-invoicing was therefore not violated.
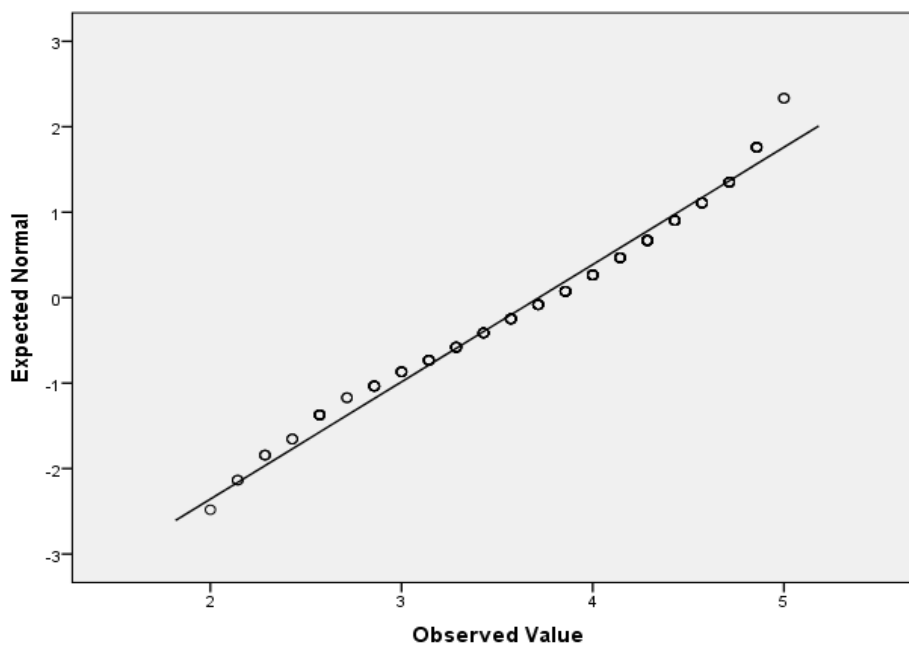
Figure 3.3 Normal Q-Q plot of e-invoicing

Source: Research Data, 2018

3.5.1. 5 Normality of the E-Ordering Data Set

E-ordering was conceptualized as the third component of EDI. The normal Q-Q plot of e-ordering (Figure 3.4) revealed data dots that remained alongside the diagonal line throughout. The connotation was that e-ordering was normally distributed with mean 3.53 and standard deviation 0.665. Normality assumption was upheld.
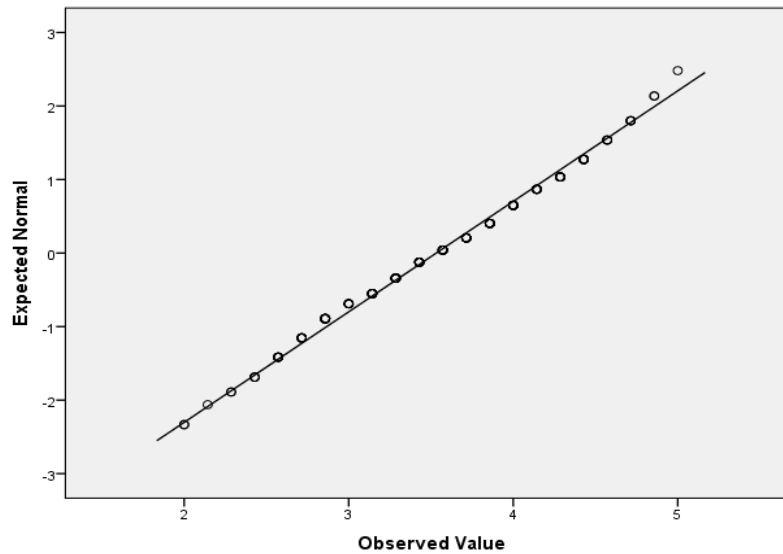
Figure 3.4 normal Q-Q plot of e-ordering

Source: Research Data, 2018

3.5.1.6 Normality of E-Payment Data

E-payment was the fourth and last component proposed to measure EDI integration. The normal Q-Q plot of e-payment presented in figure 3.5 revealed that data dots lay along the diagonal line, thus confirming that data points for e-payment followed a normal distribution with mean 3.64 and standard deviation 0.672.
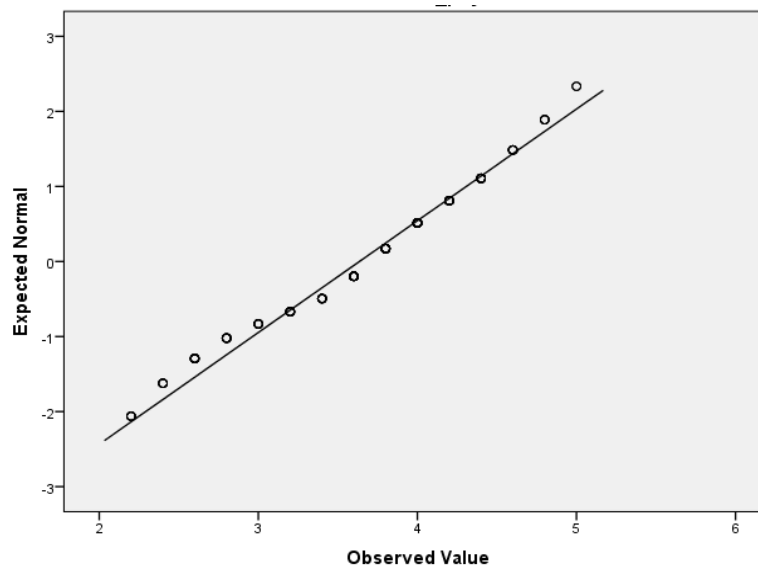
Figure 3.5 normal Q-Q plot of e-payment

Source: Research Data, 2018

3.5.1.7 Normality of the Supplier Relationship Variable

Supplier relationship management was conceptualized as the moderating variable in the present study. The normal Q-Q plot of supplier relationship management is shown in figure 3.6. Data dots were seen to lie alongside the diagonal line. However, data at the lower extreme were associated with curved patterns in the normal quantile plot, indicating a slight negative skew. On the basis of the central limit theorem (Charpentier, 2018), the distribution of data points in the supplier relationship management was considered to be a normal distribution with mean 4.12 and standard deviation 0.457.
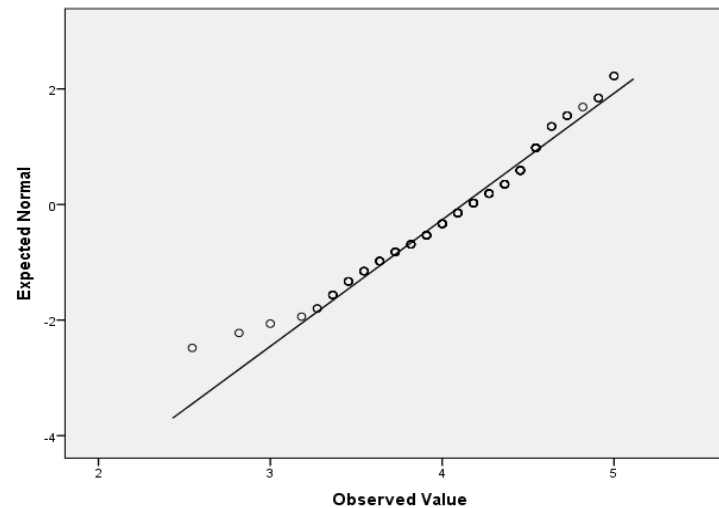
Figure 3.6 Normal Q-Q plot of supplier relationship management

Source: Research Data, 2018

35.1.8 Normality of Supply Chain Performance Variable

Supply chain performance was conceptualized as the dependent variable. Consequently, normality of the supply chain performance distribution was examined using the normal Q-Q plot. The plot presented in figure 3.7 indicates that data dots stayed alongside the diagonal throughout the distribution. Supply chain performance distribution therefore followed a normal distribution with mean 3.16 and standard deviation 0.346.

Figure 3.7 normal Q-Q plot of supplier chain performance

Source: Research Data, 2018

3.8.1 Test of Linearity

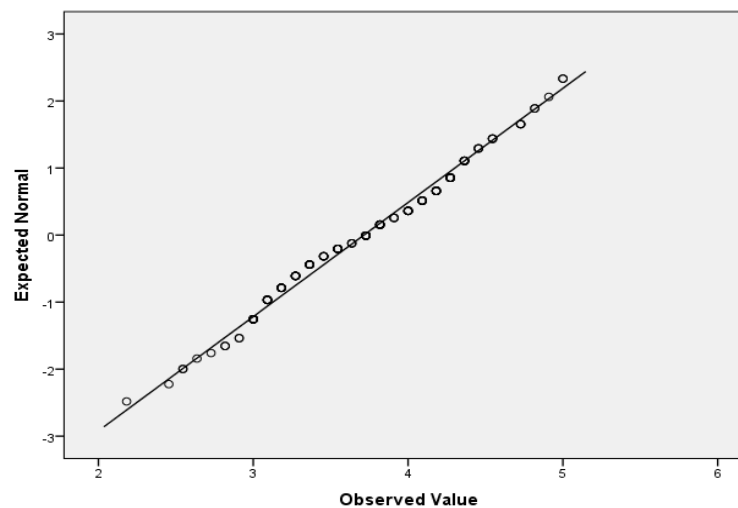One of the assumptions of regression analysis is that variables in the analysis are related to each other in a linear manner whereby the best fitting function representing a scatter plot is a straight line. The bivariate scatter plot was used to examine the degree of linear relationship. According to Tabachnick and Fidell, (2013), the bivariate scatter plot may be preferable than Pearson correlation approach which is limited in the degree of linearity as it only captures the linear component of the relationship.

Under the bivariate scatter plot approach, linearity assumption was deemed to be met if variables produced oval or elliptical scatter plots. Figure 3.8 indicates that the scatter plots were more or less oval, therefore confirming non violation of the linearity assumption.
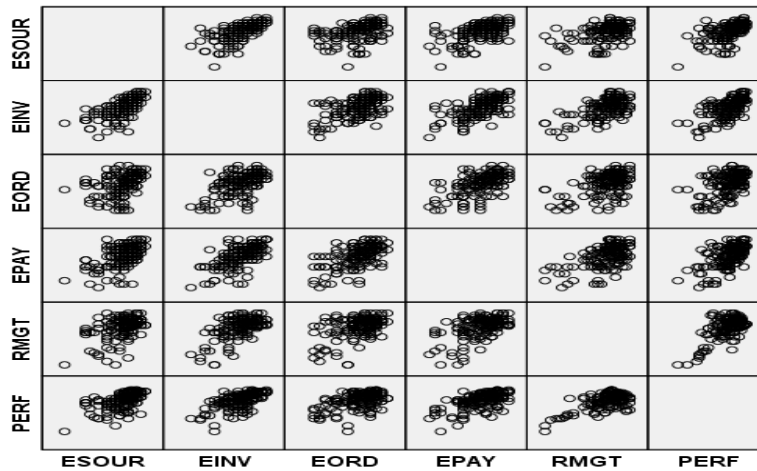
Figure 3.8 linearity assumption scatter plot

Source: Research Data, 2018

3.8.2 Testing for Homogeneity of Variances

Homogeneity of variances assumes that variability in the scores of one continuous variable is roughly the same at all values of another continuous variable (Tabachnick, & Fidell, 2013). Homogeneity of variances was therefore tested using Levene's test of equality of variances of the four EDI variables, and the supplier relationship management variable. Using a 5% level of significance, the study tested the null hypothesis that the variance in the scores of the EDI practices and supplier relationship management was the same across supply chain performance. Results displayed in Table (3.9.0) revealed that none of the Levene statistics was significant (p>0.05). This implies that homogeneity of variances assumption was not violated.

Table 3.9.0 Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
E sourcing	1.114	9	142	.347
E invoicing	1.521	9	142	.096
E ordering	1.458	9	142	.120
E payment	.881	9	142	.598
Supplier Rel. Management	1.730	9	142	.055

Source: Research Data, 2018

3.8.3 Testing for Multicollinearity

Multicollinearity is noted to be a problem with a correlation matrix that occurs when variables are highly correlated (Tabachnick & Fidel, 2013). Multicollinearity was therefore screened using the statistics–Collin instruction in SPSS. As seen from the collinearity diagnostics output (Table 3.9.1), multicollinearity was not evident. None of the dimensions (rows) had more than one variance proportion greater than 0.50 despite some condition indices approaching 30. Multicollinearity assumption was therefore not violated.

Table 3.9.1 Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	ESOUR	EINV	EORD	EPAY
1	1	4.957	1.000	.00	.00	.00	.00	.00
	2	.017	17.210	.09	.52	.01	.23	.00
	3	.012	19.979	.80	.00	.00	.19	.15
	4	.008	24.521	.02	.16	.00	.34	.75
	5	.006	29.432	.09	.31	.99	.04	.10
a. Dependent Variable: PERF								

3.8.4 Testing for independence of Errors

Independence of errors refers to the assumption that errors are independent of one another, implying that the subjects responded independent of each other (Hair et al, 2010). The Durbin-Watson (DW) statistics was used to test independence of errors by assessing the degree of autocorrelation. In retrospect, a DW statistic in the range $1.4 \leq d \leq 2.5$ was deemed to suggest lack of autocorrelation (Verbeek, 2012). As indicated in Table (3.9.2) the Durbin–Watson value was 1.994 indicating lack of autocorrelation and therefore independence of errors.

Table 3.9.2 Independence of Errors

Model	Std. Error of the Estimate	Durbin-Watson
	.42228	1.994
b. Dependent Variable: PERF		

Table 4.6 PCA Results of the supply chain performance variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
Supply chain performance	**.748***		
Factor 1		**2.526**	**18.042**
Assembly lines	.938		
Occupational safety health	.933		
Labor productivity Quality output	.751		
Factor 2		**2.372**	**34.982**
Improved quality of the products	.853		
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Resource allocation on Machinery equipments, buildings	.852		
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Factor 5		**1.521**	**74.641**
Motivated staffs and reduced employee turnover rates	.825		
Continuous operations of the manufacturing firm	.806		
Kaiser –Meyer-Olkin MSA	**0.638**		
Bartlett's Test of sphericity (X^2=1337.531)	**0.000**		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

IV. Results and Discussions

This chapter presents a summary of results, discussions of the Data screening and cleaning for response rate, missing values, factor structure of study variables, and presence of outliers.

4.1 Data Screening and Cleaning

Data was screened and cleaned for response rate, missing values, factor structure of study variables, and presence of outliers. It is noted that once data are in hand, there is need to critically examine the quality of the collected data before plunging ahead with multivariate statistical analyses (Tabachnick & Fidell, 2013).

4.1.1 Response Rate

The study population comprised of 300 supply chain officers drawn from the ten sugar manufacturing firms located in the study area. A sample of 169 officers was drawn from this population on the basis of the Krejcie and Morgan sampling table. Out of the anticipated 169 officers, a total of 154 returned their questionnaire satisfactorily filled. This amounted to a response rate of 91.1%. Sounders, Lewis and Thornhill (2009) advocates for a response rate of 50% as adequate and that of 70% as excellent. The 91.1% response rate was therefore considered an excellent return for the present study.

4.1.2 Missing Value Analysis

The extent of missing data occurring randomly in the returned questionnaires was assessed through a missing value analysis. It is noted that due to reasons such as non-response, fatigue, and sensitive information, some data vital for the study may be missing (Baraldi & Enders, 2010). Missing values reportedly affect results of statistical analysis were addressed. Consequently, missing values were examined case wise and all cases found to have missing values above 5% were deleted. Only two cases, 128 and 131 were found to posses missing values. However, both had missing values below the 5% critical point and were therefore retained for further analysis.

4.1.3 Exploratory Factor Analysis

A desire to reduce the many items measuring the constructs under study, coupled with the need to explore the underlying factor structure of the constructs informed the choice of exploratory factor analysis (Reio Jr & Shuck, 2014). Indeed, exploratory factor analysis has been cited in extant literature as an appropriate tool for reducing a large number of variables into a few core variables (Hair et al, 2010).

The Principal components analysis (PCA) was therefore used to establish the factor structure in the electronic data interchange, supplier relationship management, and supply chain performance constructs. The Kaiser criterion that requires factors with eigen values greater than 1 was used. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity (completeness) were used to examine sampling adequacy. As a result, the KMO was expected to have a minimum value of 0.6, while Bartlett's measure was required to be significant at the 5% level (Tabachnick & Fidell, 2013).

4.1.3.1 Factor Structure of the E-Sourcing Variable

Six items were initially suggested to measure e-sourcing. PCA was therefore undertaken to verify item loadings through which redundant items could be omitted from further analysis. Table 4.1 revealed that the KMO value was 0.605 which was greater than the minimum value of 0.6 and signified that sampling was adequate. The Bartlett's test of sphericity yielded a significant chi-square value of 112.352 ($p<0.05$). Five items loaded highly on two factors and explained 54.445% of the variance in e-sourcing. One item did not load highly on any factor and was therefore omitted from further analysis.

Table 4.1 factor structure of e-sourcing

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
e-sourcing	**.694***		
Factor 1		1.647	27.453
Electronic Bids and Quotes	.840		
Electronic sourcing proposals and products information	.821		

Factor 2		1.620	54.445
Availability of product information	.746		
Sourcing consistency with electronic Order placing errors	.683		
Level of electronic tendering and negotiations	.640		
Kaiser –Meyer-Olkin MSA	.605		
Bartlett's Test of sphericity ($\mathcal{X}^2$=112.352)	.000		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

4.1.3.2 Factor Structure of the E-Invoicing Variable

A total of seven items were initially proposed to measure e-invoicing as practiced in sugar firms. The results of the PCA presented in table 4.2 revealed that the KMO measure of sampling adequacy was 0.842. Besides, the Bartlett's test of sphericity yielded a significant chi square value of 290.036 (p<0.05). The results therefore affirmed that sampling was adequate for the e-invoicing variable. All the seven items measuring e-invoicing loaded highly on only one factor and explained 47.330% of the variance in e-invoicing. The factor structure as initially proposed was therefore vindicated and all items were retained for further analyses involving e-invoicing.

Table 4.2 PCA Results of the e-invoicing Variable

Variables and Scales	**Loading**	**Eigen values**	**Cumulative % Variance explained**
e-invoicing	.812*		
Factor 1		3.313	47.330
reduction in lead times	.730		
efficiency in storage	.725		
reduction of printing costs	.704		
control of the invoicing processes	.670		
Electronic issuance of invoices	.666		
Electronic approvals and reporting	.666		
Electronic issuance of purchase orders	.650		
Kaiser –Meyer-Olkin MSA	.842		
Bartlett's Test of sphericity ($\mathcal{X}^2$=290.036)	.000		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

4.1.3.3 Factor structure of e-ordering

E-ordering was conceptualized as another practice that signifies integration of electronic data interchange. Thirteen items were initially proposed to measure e-ordering as practiced in sugar firms in western Kenya. PCA results displayed in table 4.3 confirmed that sampling adequacy with respect to e-ordering was achieved. The KMO measure of sampling adequacy was above 0.6 (0.845), and the Bartlett's test of sphericity was significant (χ^2 = 432.584, p<0.05). Only seven items loaded highly on three factors and explained a cumulative total of 61.921% of the variance in e-ordering. The results implied that the factor structure of e-ordering required only seven items that could be clustered into three factors. Six items were deemed redundant and were therefore omitted from further analyses involving the e-ordering variable.

Table 4.3 PCA Results of the e-ordering variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
e-ordering	**.766***		
Factor 1		**2.099**	**34.215**
Availability of online inventory interface for customers	0.833		
Online purchasing and receiving for vendors and customers	0.792		
Factor 2		**2.081**	**41.804**
Use of electronic data interchange in departments	0.828		
Reduction in paper work	0.733		
Use of modern mean of transportation that saves time in deliveries	0.696		
Factor 3		**2.012**	**61.921**
Online customers and prospective clients	0.831		
On-line product descriptions for customers	0.613		
Kaiser –Meyer-Olkin MSA	**0.845**		
Bartlett's Test of sphericity ($\mathcal{X}^2$=432.584)	**0.000**		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

4.1.3.4 Factor Structure of e-payment variable

E-payment was the fourth and last practice conceptualized for integration of electronic data interchange in the present study. Six items were consequently proposed to measure e-payment as practiced among sugar firms in western Kenya. PCA confirmed that sampling was adequate with regards to e-payment (Table 4.4). The KMO sampling adequacy measure was 0.789 and the Bartlett's measure of Sphericity was significant ($\chi2$= 163.775, $p<0.05$). Out of the six items measuring e-payment, five loaded highly on one factor, and explained cumulatively, 43.273% of the variance in e-payment. The connotation of these results is that only five items were necessary to measure e-payment. One item was therefore deemed redundant and omitted from further analysis involving e-payment.

Table 4.4: PCA Results of the e-payment Variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
e-payment	.744*		
Factor 1		2.596	43.273
reduction in transaction risk	0.737		
e-payment system as core to long term strategy of the firm	0.720		
provision of new payment opportunities	0.694		
Handling payments and receivables electronically	0.668		
instantaneous reduction of transaction time	0.658		
Kaiser –Meyer-Olkin MSA	0.789		
Bartlett's Test of sphericity ($\mathcal{X}^2$=163.775)	0.000		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

4.1.3.5 Factor Structure of the Supplier Relationship Management Variable

Supplier relationship management was conceptualized as the moderating variable in the present study. Twenty seven items were initially proposed to represent the factor structure of supplier relationship management as practiced in sugar firms in western Kenya. PCA verified that sampling adequacy with respect to supplier relationship management was attained (Table 4.5).

The KMO measure of sampling adequacy was above 0.6 (0.823), while the Bartlett's test of sphericity was significant (χ^2= 1488.311, p<0.05). Eleven items were extracted and loaded highly on four factors explaining cumulatively, 62.409% of the variance in supplier relationship management. These results signify that the factor structure of supplier relationship management required 11 items clustered in four factors. Sixteen factors were found to be redundant and were therefore omitted from further analyses targeting supplier relationship management

Table 4.5 PCA Results of the supplier Relationship Management variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
Supply chain performance	**.804***		
Factor 1		**3.540**	**13.616**
Franchises and products designs	.768		
Frequent business reviews	.727		
Purchasing agreements	.655		
Factor 2		**2.805**	**24.404**
Value based interdependency	.780		
Organizational structures	.706		
Strong executive engagement and corporate strategic planning	.673		
Factor 3		**2.165**	**42.591**
Mergers collaborations and acquisitions	.781		
Long term relationship and business commitment	.744		
Factor 4		**1.539**	**62.409**
Reduced cost in delayed deliveries, obsolete and redundant stocks	.838		
Accurate approved supplier list	.651		
Customer, vendor, product and services reliability	.849		
Kaiser –Meyer-Olkin MSA	**0.823**		
Bartlett's Test of sphericity ($\mathcal{X}^2$=1488.311)	**0.000**		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

4.1.3.6 Factor Structure of the Supply Chain Performance Variable

Supply chain performance was conceptualized as the dependent variable in the present study. Twenty six items were originally proposed to measure supply chain performance among sugar firms in western Kenya. Results of the PCA displayed in Table 4.6 indicates that the KMO measure of sampling adequacy (0.638) was above the minimum value of 0.6, while the Bartlett's test of Sphericity was significant (χ^2= 1337.531, p<0.05). The implication is that sampling was adequate and achieved completeness.

A total of eleven items were extracted and loaded highly on five factors. The five factors explained cumulatively, 74.641% of the variance in supply chain performance. The inference from these results is that supply chain performance needed only eleven items spread in five factors. The other fifteen items were viewed to be redundant and were omitted from further analyses involving supply chain performance variable.

Table 4.6 PCA Results of the supply chain performance variable

Variables and Scales	Loading	Eigen values	Cumulative % Variance explained
Supply chain performance	**.748***		
Factor 1		**2.526**	**18.042**
Assembly lines	.938		
Occupational safety health	.933		
Labor productivity Quality output	.751		
Factor 2		**2.372**	**34.982**
Improved quality of the products	.853		
Production processes	.826		
Factor 3		**2.162**	**50.423**
Records of inspections tests and results	.932		
Increased financial portfolio	.919		
Factor 4		**1.870**	**63.777**
Resource allocation on Machinery equipments, buildings	.852		
Improved customer relationship	.851		
Factor 5		**1.521**	**74.641**
Motivated staffs and reduced employee turnover rates	.825		
Continuous operations of the manufacturing firm	.806		
Kaiser –Meyer-Olkin MSA	**0.638**		
Bartlett's Test of sphericity (X^2=1337.531)	**0.000**		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization

4.1.4 Outliers

Outliers are recognized as extreme values that may occur on one variable (univariate outliers) or on two or more variables (multivariate) and which may impact negatively on results of multivariate statistical analysis (Tabachnick & Fidell, 2007). Univariate outliers were therefore assessed using SPSS descriptive statistics–explore command, upon which examination of the resulting box plot revealed two outliers on the supplier relationship management (see figure 4.1). The two cases 37 and 129 were therefore deleted from further analysis (Hair et al, 2010). A total of 152 cases were therefore retained for further analysis.
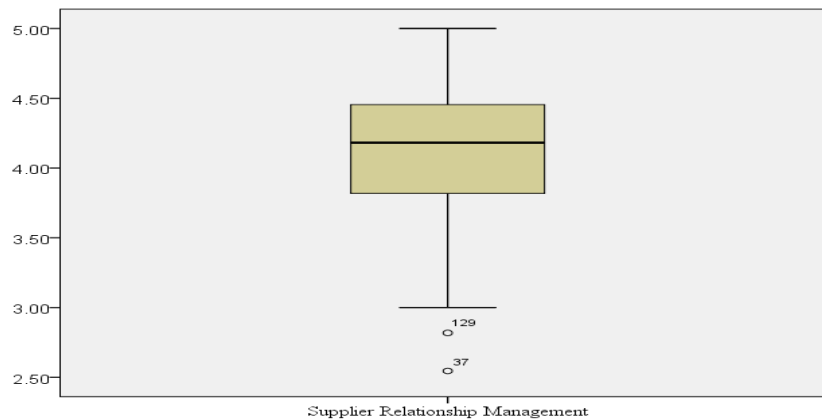

Figure 4.1 Box plot for outliers

Data were further examined for the presence of multivariate outliers. Distances of cases from the centroid of remaining cases created at the intersection of means of all variables were used to inspect multivariate outliers. According to Tabachnick and Fidell, (2013), a case that is viewed as a multivariate outlier lies outside a swarm around the centroid in multivariate space. Consequently, Mahalanobis distances were computed using the SPSS regression, by evoking Mahalanobis values through the save command. A case was therefore presumed to be a multivariate outlier if the probabilities of the Mahalanobis chi-square values fell below 0.001. Examination of the probabilities of the mahalanobis chi square values yielded none with a probability less than 0.001. Data were therefore devoid of multivariate outliers.

4.2 Descriptive Analysis of Study Variables

Study variables were explored using descriptive statistics to establish the extent to which they are put to use in sugar manufacturing firms in western Kenya. The mean score was used to capture the typical response among respondents with regards to various variables. On the contrary, the standard deviation indicated variations in typical responses among the respondents. The mean response was interpreted on the following threshold: M<1.5-very low; $1.5 \leq M < 2.5$-low; $2.5 \leq M < 3.5$-moderate; $3.5 \leq M < 4.5$-high; and $M \geq 4.5$-very high.

4.2.1 Descriptive Analysis of E-sourcing

E-sourcing as practiced in sugar manufacturing firms in western Kenya was measured using the five items extracted from the principal components analysis. Buoyed by the understanding that e-sourcing is identified as one of various forms of communication technology applied in procurement (Harink, 2003), it was necessary to understand the prevailing state of e-sourcing among these firms.

The overall mean response score of 3.51 was in the threshold $3.5 \leq M < 4.5$, which indicates that respondents were of the view that e-sourcing received high usage in sugar manufacturing firms. The low standard deviation (SD = 0.669) indicates that respondents did not vary as much in their views with respect to use of e-sourcing in the firms. It is however apparent that access to product information (M=3.63, SD= 0.981) and electronic bidding and quotations (M=3.61, SD=0.936) were the main e-sourcing practices that received high consideration. Sourcing consistency (M=3.48, SD= 1.261); electronic tendering and negotiations (M=3.38, SD= 1.132); and electronic proposals for sourcing (M= 3.38, SD=1.132) only received moderate use (Table 4.7).

Table 4.7 overall means response		
	M	SD
Electronic access to, and availability of product information	3.63	.981
Bids and Quotes being in electronic format	3.61	.936
Sourcing consistency with electronic Order placing errors	3.48	1.261
Level of electronic tendering and negotiations	3.45	1.212
Sourcing proposals and products information being electronic	3.38	1.132
Overall response	**3.51**	**.669**

The implication of these results is that sugar manufacturing firms in western Kenya have endeavored to integrate EDI practices that promote electronic sourcing by for instance, promoting online product information and use of electronic bidding and quotations. This undoubtedly bespeaks volumes on their desire to eliminate corrupt practices. Sugar manufacturing firms in western Kenya however, need to be more robust in practices such electronic tendering and negotiations, electronic proposals, and be consistent in the e-sourcing practice in order to perhaps eliminate loopholes that may occur in the sourcing process.

4.2.2 Descriptive Analysis of E-invoicing

E-invoicing as practiced in sugar manufacturing firms in western Kenya was measured using the seven items extracted by the principal components analysis. Results of the descriptive exploration of the prevailing status of e-invoicing in the firms are displayed in Table 4.8. From the results, the overall mean response score (M= 3.72) indicated that e-invoicing is practiced highly in the firms. Respondents appeared consistent in stating that e-invoicing receives high usage in the firms (SD=0.729). Practices such as electronic approvals and reporting (M=3.89, SD= 1.000); control of invoicing processes (M=3.84, SD= 1.136); and reduction of printing costs (M=3.77, SD=1.013) received high ratings among respondents although high variability in the response scores were observed. Reduction in lead times and efficiency in storage were also noted to be high in the respective firms.

Table 4.8 Descriptive Statistics of e-invoicing		
	M	SD
Electronic approvals and reporting	3.89	1.000
Control of the invoicing processes	3.84	1.136
Reduction of printing costs as a result of adoption of e-invoicing	3.77	1.013
Reduction in lead times	3.76	.956
Efficiency in storage	3.68	1.253
Electronic issuance of purchase orders	3.55	1.022
Electronic issuance of invoices	3.55	1.028
Overall response	**3.72**	**.729**

These results connote that e-sourcing is a practice that is high on the agenda of sugar manufacturing firms in western Kenya and has seen a reduction in costs often associated with paper work. Indeed efficiency in storage and reduction in lead times portends good fortunes in the overall supply chain performance considering that invoicing constitutes a major part of the chain drivers. The view among respondents that e-invoicing as a component of EDI results in efficiency and reduced lead times resonated with views by Gunasekaran (2001), who contends that EDI allows efficiency hence shorter lead times.

4.2.3 Descriptive Analysis of E-Ordering

E-ordering has been regarded as a key element of EDI with regards to supply chain management. Consequently, e-ordering as applied in sugar manufacturing firms in western Kenya was examined using the seven items extracted by the principal components analysis. Data exploration results (Table 4.9) indicates acknowledgement among respondents that although e-ordering appears to get a high rating on its use (M = 3.53, SD = 0.665), certain aspects of the practice are only used moderately.

It does appear that sugar manufacturing firms in western Kenya use e-ordering highly with regards to; order processing, selection, printing and picking (M=3.74, SD=0.952); availing inventory interface for customers (M=3.74, SD= 0.988); on line order entries, return inwards and return outwards (M=3.66, SD=1.016), and online purchasing and order receiving for vendors and customers (M=3.61, SD=1.037). Practices such as online marketing prices and catalogue prices (M=3.49, SD=1.029); online product description (M=3.25, SD=1.123); and use of electronic ordering across departments (M=3.24, SD=1.066) on the contrary, received moderate ratings.

Table 4.9 Descriptive Statistics on e-ordering		
	M	SD
Order processing, selection, printing, packing, picking	3.74	.952
Availability of online inventory interface for customers	3.74	.988
Online order entries, return inwards and return outwards	3.66	1.016
Online purchasing and order receiving for vendors and customers	3.61	1.037
Online marketing prices, catalogues prices	3.49	1.029
On-line product descriptions for customers	3.25	1.123
Frequent use of electronic ordering across departments	3.24	1.066
Overall response score	**3.53**	**.665**

The significance of these results is that e-ordering though not vibrantly used is given due diligence in sugar manufacturing firms in western Kenya. Practices such as processing of orders; availing the inventory interface to customers; and making order entries online among others, are given high regard. Perhaps, the firms do need to be keener on activities such as displaying product pricing online and also giving detailed descriptions of products online. Besides, firms should encourage inter-departmental e-ordering.

These results show that sugar manufacturing firms in western Kenya do appreciate the important role e-ordering plays in overall efficiency in the supply chain and would as a consequence wish to bring the order cycle time to a bare minimum. The view that

order placing and processing are rated highly in the firms is consistent with Harink's (2013) views that EDI ought to include order placing and processing as well.

4.2.4 Descriptive Analysis of E-payment

The use of electronic payment in Sugar manufacturing firms in western Kenya was assessed using five items extracted at the principal component analysis phase. Respondents were asked to rate use of e-payment practices in the respective firms on a 5-point scale. The overall mean response score and associated standard deviation (Table 4.11) indicated a high rating on the use of e-payment among the respondents (M=3.64, SD= 0.672). Notable benefits that appear to have accrued highly from e-payment include: reduction in transaction time (M=3.76, SD=0.929); provision of new payment opportunities for exploitation (M=3.74, SD=0.903); long term strategy of firms (M= 3.68, SD=1.001) and reduction in transaction risk (M=3.66, SD=0.920); Results however show that electronic handling of fund transfers, payments and receivables only received moderate ratings (M= 3.33, SD= 1.021).

Table 4.10 Descriptive Statistics on e-payment		
	M	SD
flexibility and instantaneous reduction of transaction time	3.76	.929
provision of new payment opportunities for exploitation	3.74	.903
The e-payment system is core to long term strategy of the firm	3.68	1.001
reduction in transaction risk	3.66	.920
fund transfers, Payments and receivables are handled electronically	3.33	1.021
Overall response score	**3.64**	**.672**

The bottom line of these findings is that adoption of e-payment among sugar manufacturing firms portends a bright future in terms of reduced transaction time and reduction in transaction risk. This in essence is bound to translate into accrual of operational and strategic benefits. Indeed, the explored data reveals that most firms tend to consider e-payment as their long term strategy, echoing findings by others (Parsa & Popa, Ngai & Gunasekaran, 2004).

4.2.5 Descriptive Analysis of Supplier Relationship management

Supplier relationship management in the present study was conceptualized as the moderating variable. Buoyed by the knowledge that supplier relationship management has potential to streamline processes between enterprises and suppliers (Lin & Zhou, 2011), the researcher deemed it right to examine the prevailing mechanisms for supplier relationship management in sugar manufacturing firms. Examination of the prevailing state of supplier relationship management was conducted using the eleven items extracted from the initial set of items.

The overall mean response score of 4.11 and the associated standard deviation score of 0.457 suggested a high and consistent rating of supplier relationship management across the firms. The indication was that several mechanisms that promote supplier relationship were being highly observed. For instance, firms highly adhered to the following; long term relationship and business commitment (M=4.40, SD=0.700); reduction in delayed deliveries, obsolete and redundant stocks (M=4.45, SD=0.689); accurate and approved supplier list (M=4.40, SD = 0.703) and improved customer–supplier relationship (M=4.37, SD=0884). All in all, respondents tended to approve endeavors put towards managing supplier relationship.

Table 4.11 Descriptive Statistics on supplier relationship		
	M	SD
Long term relationship and business commitment	4.49	.700
Reduced cost in delayed deliveries, obsolete and redundant stocks	4.45	.689
Accurate approved supplier list	4.40	.703
customer supplier relationship	4.37	.753
Frequent business reviews	4.09	.884
Purchasing agreements	4.06	.832
Value based interdependency	4.00	.846
Organizational structures	4.00	.891

Strong executive engagement and corporate strategic planning	3.98	.801
Franchises and products designs	3.97	.979
Customer, vendor, product and services reliability	3.51	1.212
Overall response score	**4.12**	**.457**

The message portrayed by these results is that sugar manufacturing firms in western Kenya highly value supplier relationship and have in essence put forth mechanisms to management these relationships. Maintaining approved suppliers and entering into purchase agreements is no doubt aimed at nurturing a close working relationship founded on trust and destined to improve future relationships. As a matter of fact supplier relationship has been noted to reduce supply side risks (Lin & Zhou, 2011) which in essence streamlines supplies. Besides, by closely relating with enterprises, suppliers receive market and operational information in a timely manner allowing them to respond to changes in customer needs promptly (Zailan & Rayagopal, 2005).

The results therefore underscore the value sugar firms attach to suppliers. In the recent past in Kenya, there has been cut throat competition for cane with sugar firms opening up collection points in zones outside their operational areas. This is testimony to the fact that firms require to invest on supplier relationship management to remain competitive.

4.2.6 Descriptive Analysis of Supply Chain Performance

Supply chain performance was conceptualized as the dependent variable. Bolstered by the understanding that supply chain performance relates to the ability of the entire chain to meet customer needs (Ndambuki, 2013), it was necessary to explore respondents views on the level of supply chain performance experienced within the firms. Eleven items extracted from the original twenty six were used to examine the prevailing levels of supply chain performance.

Results of the prevailing state of supply chain performance portray a desolate picture with regards to the performance of the supply chain in the sugar sector in western Kenya. As displayed in Table 4.12, the overall response score indicates a moderate rating of the supply chain performance (M=3.16, SD=0.346). Respondents appeared to disagree that operational costs had reduced (M=2.26, SD=0.963); that supplier relationship had improved (M=2.31, SD=0.920) and that the production processes are smooth (M=2.43, 0.918). Despite this however, respondents noted that maintenance of inspection and performance records was high (M=3.72, SD=1.018); that labor productivity aimed at quality output (M=3.59, SD=1.08) and that order delivery and transportation was moderately timely (M=3.40, SD=1.012).

Table 4.12 Descriptive Statistics supply chain performance		
	M	SD
Records of inspections tests and results	3.72	1.018
Labor productivity Quality output	3.59	1.095
Timeliness of order delivery and transportation	3.40	1.012
Customers responsiveness	3.30	1.079
Improved quality of the products	3.16	1.030
Motivated staffs and reduced employee turnover rates	3.07	.889
Increased financial portfolio	2.99	.956
Resource allocation on Machinery equipments, buildings	2.94	.937
Smooth Production processes	2.43	.918
Improved supplier relationship	2.31	.920
Reduced operational cost	2.26	.963
Overall response score	**3.16**	**.346**

The significance of these results is that sugar manufacturing firms in western Kenya are experiencing challenges in their performance. They have not been able to streamline their production processes and have continued to incur high productivity costs. Moreover, it appears that most of them have not been able to maintain good supplier relationships. Indeed, results with regards to inability to streamline production processes and high productivity costs reflect the findings of the report presented to the 11th parliament by the departmental committee on agriculture, livestock and cooperatives regarding the crisis facing the sugar industry in Kenya (2015). According to this report, the high cost of sugar production in Kenya has made the country ideal for both legal and

illegal imports leading to declined performance of Kenyan firms. In addition, the report points to imprudent business decisions, corruption, impunity and fraud as key impediments to smooth production processes.

4.3 Results of Tests of Hypotheses

4.3.1 Electronic Data Interchange Integration and Supply Chain Performance

The first null hypothesis **H₀1** presupposed that electronic data interchange had no effect on supply chain performance of sugar manufacturing firms in western Kenya. Regressing the four EDI practices on supply chain Performance revealed that variations in the EDI practices explained up to 55.1% of the variation in supply chain performance (Table 4.13)

Table 4.13Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.742[a]	.551	.539	.42228	1.994
a. Predictors: (Constant), EPAY, ESOUR, EORD, EINV					
b. Dependent Variable: PERF					

Moreover, the significant F static ($F_{4, 147} = 45.143$, $p<0.05$) indicates that the conceived regression model relating supply chain performance to EDI practices was statistically adequate

Table 4.14ANOVA[a]						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.200	4	8.050	45.143	.000[b]
	Residual	26.213	147	.178		
	Total	58.413	151			
a. Dependent Variable: PERF						
b. Predictors: (Constant), EPAY, ESOUR, EORD, EINV						

The multiple regression weights (Table 4.19) affirmed that all the four EDI practices, e-sourcing ($\beta = 0.170$, $p<0.05$); e-invoicing ($\beta = 0.255$, $p<0.05$), e-ordering ($\beta = 0.208$, $p<0.05$), and e-payment ($\beta = 0.264$, $p<0.05$) were positive and significant predictors of supply chain performance. On the basis of the t-values, e-payment (t = 3.111) had the larger impact on supply chain performance, followed by e-invoicing (t=2.986); e-ordering (t = 2.885), and e-sourcing (t=2.202) respectively.

Table 4.15Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.335	.278		1.202	.231		
	ESOUR	.155	.071	.170	2.202	.029	.509	1.963
	EINV	.285	.096	.255	2.986	.003	.417	2.397
	EORD	.209	.072	.208	2.885	.005	.585	1.710
	EPAY	.258	.083	.264	3.111	.002	.424	2.356
a. Dependent Variable: PERF								

Consequently, the multiple regressions model was found to be:

SCP = 0.335 + 0.170Esourc + 0.255Einv+ 0.208Eord+ 0.264Epay

Where;

SCP=Supply Chain Performance

Esourc= e-sourcing

Einv= e-invoicing

Eord= e-ordering

Epay= e-payment

The study posited that electronic data interchange integration has direct effects on supply chain performance, and that supplier relationship management has indirect effects by moderating the relationship between EDI integration and supply chain performance. Regression analysis was therefore used to ascertain the actual relationships. Prior to running regressions, assumptions of multiple regressions were first tested. Tabachnick and Fidell, (2013) contend that multiple regressions require certain key assumptions to be in place.

The implication of the regression weights is that holding other practices constant, a 1 standard deviation increase in e-sourcing can occasion a 0.170 standard deviations increase in supply chain performance; similarly, holding other practices constant a 1 standard deviation increase in e-invoicing results in 0.255 standard deviations increase in supply chain performance; 1 standard deviation increase in e-ordering leads to a 0.208 standard deviations increase in supply chain performance when other practices are held constant, and a 1 standard deviations increase in e-payment occasions a 0.264 standard deviations increase in supply chain performance as long as other practices are held constant.

The significance of these results is that electronic data interchange integration provides potential for improved performance of the supply chain of sugar manufacturing firms. Indeed to forestall corruption, the Government of Kenya has leveraged attainment of its vision 2030 on integration of EDI (Njuguna, 2009). The finding in the present study that integration of EDI impacts positively on the performance of the supply chain in the sugar industry therefore lends credence to the Governments' expectations.

Previous studies have shown that adoption of electronic data interchange has been credited with reduction in costs and flow of information. As a result, the descriptive findings, showing that sugar manufacturing firms in western Kenya have integrated practices such as electronic bidding and quotations; electronic approvals and reporting; and control of invoicing processes no doubt point to an urge among the firms to cut costs while relaying information with ease. The findings pointing to reduction in lead times and efficiency in storage among the firms as a result of integration of electronic data interchange, support a plethora of other findings that have identified competitive advantage; reduction in lead times; and cost controls as among key benefits accruing from adoption of electronic data interchange

The findings showing that e-sourcing in sugar manufacturing firms' impacts positively and significantly on supply chain performance resonates with the views of Wins (2017). According to Wins, e-sourcing comes with a host of sustainable benefits that includes; reduction of cost in terms of more competitive supplier quotations; improving supplier relationships by enhancing transparency in the purchasing process; shortening the sourcing cycle; and effective communication among others. The aforementioned would indeed be a boost to the Kenyan sugar industry which is riddled by corrupt dealings that erode suppliers' confidence and relationships.

The descriptive analysis findings that sugar manufacturing firms in western Kenya practice e-invoicing on a high scale is indeed a fundamental step in seeking efficiency among the firms. It is argued that e-invoicing lessens manual work through digital capturing of invoices; limits errors through automated validation of invoices; and reduces cost among other key benefits (Nazish, 2016). Moreover, the finding in the present study that e-invoicing results in reduction of printing costs in sugar manufacturing firms is consistent with findings by Spanic, Ristic and Vrdoljak (2011), who contend that companies that adopt e-invoicing benefits from a reduction in postage and printing costs.

The bottom line is that the established positive effects of e-invoicing on supply chain performance requires the sugar firms to exploit best practices in procurement management that would see enhanced use of e-invoicing and in turn result in better returns. Besides, the finding indicating that sugar manufacturing firms in western Kenya rate highly the use of e-invoicing in the control of invoicing process supports findings by Potapenko (2010) showing that the use of technology in invoice handling enhances control over company invoicing besides, increasing labor productivity.

The finding that e-ordering positively and significantly affects performance of sugar manufacturing firms in western Kenya is indeed consistent with discourse that points to the positives gained from online ordering. According to Grensing–Pophal (2013), benefits of online ordering surpasses increased sales; Grensing–Pophal argues that through online ordering, customers too have an opportunity to among other benefits, place orders at their convenience, check order status at any time, and receive correct orders in timely manner. The findings showing that, sugar manufacturing firms in western Kenya regard order processing, selection and picking highly is therefore, a crucial cog in the endeavor to improve the supply chain ordering component.

The findings that e-payment offers the largest impact on supply chain performance was not surprising. Evidence in extant literature identifies e-payment as a system that has gained popularity in relation to the simplification of payments and financial transactions (Kabir et al. 2015). Indeed the discovery in the present study rating e-payment in sugar firms as being high in terms of reduction of transaction time, and in reducing transactions risk backs others (Oginni *et al.,* 2013). Oginni and colleagues concur that the e-payment system significantly cuts transaction time, and more importantly reduces risk of loss and theft. Consequently, the results showing that the sugar firms may not be performing well cannot be attributed to e-payment.

It is prudent therefore, to argue that integration of EDI in sugar manufacturing firms in western Kenya can reap massive operational and strategic benefits when they fully commit to integrating the key practices of EDI. Previous studies have noted that companies that have integrated EDI have realized handsome benefits (Ngai, & Gunasekaran, 2004; Parsa & Popa, 2003).

4.3.2 Supplier Relationship Management and Supply Chain Performance

The second null hypothesis H_02 postulated that supplier relationship management has no effect on supply chain performance of sugar manufacturing firms in western Kenya. Supply chain performance was therefore regressed on supplier relationship management. The model summary results (Table 4.16) revealed that supplier relationship management explained up to 40.2% of the variance in supply chain performance.

Table 4.16 Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.634[a]	.402	.398	.48255	.457
a. Predictors: (Constant), SRM					
b. Dependent Variable: PERF					

The ANOVA output (Table 4.17) further affirmed that the regression model relating supply chain performance to supplier relationship management was statistically adequate. The F statistic was significant at the 5% level of confidence ($F_{1, 150} = 100.861$, p<0.05).

Table 4.17 ANOVA[a]						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23.486	1	23.486	100.861	.000[b]
	Residual	34.928	150	.233		
	Total	58.413	151			
a. Dependent Variable: PERF						
b. Predictors: (Constant), SRM						

In addition, the regression analysis (Table 4.18) revealed that supplier relationship management was a positive and significant predictor of supply chain performance in the sugar manufacturing firms in western Kenya (β = 0.634, p<0.05). The presumption of these results is that an increase of 1 standard deviation in supplier relationship management results in a 0.634 standard deviations increase in supply chain performance.

Table 4.18 **Coefficients**[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	1.253	.273		4.584	.000		
SRM	.648	.064	.634	10.043	.000	1.000	1.000
a. Dependent Variable: PERF							

Therefore supply chain performance can be deemed as a function of supplier relationship and is represented by the model.

SCP = 1.253 + 0.634 SRM

Where; SCP=Supply chain performance

SRM= Supplier relationship management

The significance of these results is that for supply chains of sugar manufacturing firms in western Kenya to perform well, relationships with suppliers ought to be maintained. Previous studies have enumerated the potential benefits firms may accrue by nurturing a positive relationship with suppliers. Wachira (2013) for instance, points out that firms that adopt collaborative relationships with suppliers become more competitive and create value in their supply chains. Kosgei and Gitau (2016) on the other hand focused on Kenya Airways to show that the airline concentrates on supplier relationship parameters such as trust and commitment to remain competitive globally.

Similar results showing a positive impact of supplier relationship management on supply chain performance have been replicated in contexts other than Kenyan. Al-Abdallah *et al.,* (2014) used data from Japan, Korea, Italy and USA to show that supplier partnership and supplier relationship management, positively and significantly impacted on competitiveness among buying firms. Besides, Avery Swafford and Prater (2014) established that supplier relationship management through its components of buyer commitment and shared values, had positive impacts on the performance of buying firms drawn firm both China and the United States.

The findings of import showing that supplier relationship management has a positive effect on the supply chain performance of the sugar manufacturing firms in Kenya is that; in view of recurrent issues facing public sugar firms, there is a need to reach out to suppliers for purposes of re-establishing confidence and trust so that the strained supply chain is re-aligned.

4.3.3 Moderating Effects of Supplier Relationship Management

The third null hypothesis H_03 posited that supplier relationship management had no moderating effect on the relationship between electronic data interchange integration and supply chain performance. To test for moderation, the Hayes' PROCESS tool in SPSS was used. The test of highest order unconditional interaction (Table 4.19) revealed that the interaction between electronic data interchange and supplier relationship management had a significant R^2 change (R^2 change = 0.0354, p=0.0012). The implication is that supplier relationship moderated the relationship between electronic data interchange integration and supply chain performance in sugar manufacturing firms in western Kenya.

Table 4.19Test(s) of highest order unconditional interaction(s):

	R^2-chng	F	df1	df2	p
X*W	.0354	10.9111	1.0000	148.0000	.0012

The model (Table 4.20) shows that the direct effect of EDTI on supply chain performance, represented by the coefficient 0.4935 was significant (p<0.05) similarly the direct effect of supplier relationship management was positive and significant (β = 0.2081, p<0.05). The moderating effect was negative and significant (β = -0.3608, p<0.05).

Table 4.20 Moderation Model

	coeff	se	T	p	LLCI	ULCI
Constant	4.0405	.0412	98.1827	.0000	3.9592	4.1218
EDTI	.4935	.1028	4.8015	.0000	.2904	.6966
SRM	.2081	.0943	2.2061	.0289	.0217	.3945
Int_1	-.3608	.1092	-3.3032	.0012	-.5766	-.1449

Consequently, the moderation model was thus confirmed to be.

SCP = 4.041 + 0.494 EDII + 0.208 SRM – 0.361 EDII* SRM

Where

SCP = Supply chain performance

EDII= Electronic data interchange integration

SRM=Supplier relationship management

EDII*SRM= Interaction

The associated moderation plot (Figure 4.9) confirms that the slopes of the linear functions of supply chain performance on EDII vary with varying values of supplier relationship management indicating existence of moderation.
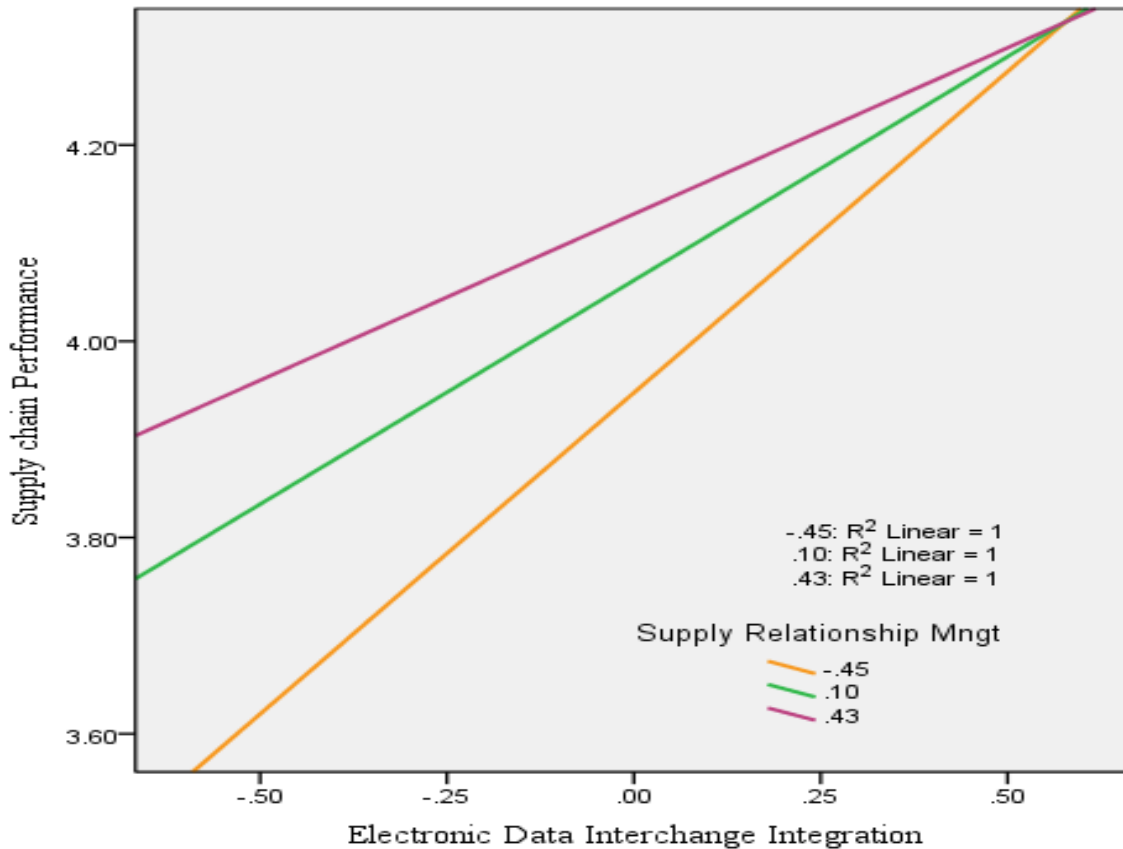

Fig 4.2 Moderation plot

Source: Research Data, 2018

The moderation results no doubt confirm that integration of electronic data interchange cannot on its own bring out the best from the supply chain of sugar manufacturing firms in Kenya. But rather requires management of supplier relationship to be done alongside integration of EDI to enhance the expected performance.

The findings showing that supplier relationship management moderates the relationship between integration of EDI and supply chain performance resonates with findings by Chakrabortya et al(2014) who found out that supplier relationships in form of supply chain collaborations acted as antecedents to value creation, which in latter stages mediate the relationship between technology adoption and firm performance.

V. Summary of Findings, Conclusions and Recommendations

The chapter presents a summary of the findings, conclusions and recommendations based on research objectives, and also outline contributions of the study to theory and practice and gives recommendations for future research. The present study examined the moderating effect of supplier relationship management on the relationship between electronic data interchange integration and supply chain performance in sugar manufacturing firms in western Kenya. Specifically, Section 5.2 presents a summary of the findings. Section 5.3 provides the conclusions. Section 5.4 gives the practical and theoretical implications of the study, whereas, Section 5.5 gives recommendations.

5.1 Summary of the Findings

This study sought to establish the effect of supplier relationship management on the relationship between electronic data interchange integration on supply chain performance in sugar manufacturing firms in western Kenya.

Objective one sought to establish the effect of electronic data interchange integration on supply chain performance of sugar manufacturing firms in Kenya. The study established that all the four EDI practices, e-sourcing, e-invoicing; e-ordering and e-payment were positive and significant predictors of supply chain performance. Based on these findings, the null hypotheses was rejected and the alternative hypotheses that there is an effect of electronic data interchange integration on supply chain performance in sugar manufacturing firms in Kenya

The second objective of the study sought to establish the effect of supplier relationship management on the supply chain performance of sugar manufacturing firms in Kenya. The study revealed that supplier relationship management has a positive and significant predictor of supply chain performance in the sugar manufacturing firms in western Kenya. Based on this findings the alternative hypotheses was accepted

Objective three sought to determine the moderating effect of supplier relationship management on the relationship between electronic data interchange integration and supply chain performance of sugar manufacturing firms in Kenya. The study found that supplier relationship moderated the relationship between electronic data interchange integration and supply chain performance in sugar manufacturing firms in western Kenya. Therefore the alternative hypothesis: the supplier relationship management has no moderating effect on the relationship between electronic data interchange integration and supply chain performance of the sugar manufacturing firms in western Kenya.

5.3 Conclusions

In view of the above findings, the following conclusions were drawn in line with the research Hypotheses:

The first null hypothesis that Electronic data interchange integration has no significant effect on supply chain performance of sugar manufacturing firms in Kenya was rejected accepted and the alternative was accepted

The second null hypothesis that Supplier relationship management has no significant effect on supply chain performance of sugar manufacturing firms in Kenya was rejected and the alternative accepted

The third null hypothesis that Supply relationship management has no moderating effect on the relationship between electronic data interchange integration and supply chain performance was no accepted.

Recommendations

Based on the conclusions of the first objective, that Sugar manufacturing firms in western Kenya recognized benefits such as accuracy and efficiency, cost reduction, and improvement in speed that may accrue from integration of electronic data interchange. To this end, most of the firms have adopted practices such as e-sourcing, e-invoicing, e-ordering, and e-payment in order to remain competitive. The study recommends the consistent implementation of the adopted electronic data interchange integration on supply chain performances this will propel manufacturing firms to realize increased performance of supply chain.

Based on the findings of the study results it recommends, that sugar manufacturing firms, should embrace the Supplier relationship management as an important and integral component that has a direct influence on the performance of the sugar industry supply chain. Most firms are therefore trying to entice suppliers through long term contracts and maintaining supplier base records. This concept will reduce costs and wastages along the supply chain and enhance efficiency and high productivity.

The study results found out that the Supplier relationship management moderates the relationship between EDI integration and supply chain performance in the sugar industry. Therefore the study recommends that Sugar manufacturing firms should do more than just integrating the EDI framework. Good working relationship should be enhanced to avoid stock outs and interruption of production for this will increase the cost of production and reduce profits. Suppliers remain a critical component of the sugar industry supply chain and are pivotal to the requisite turn around in fortunes among the sugar manufacturing firms in western Kenya should it be fully adopted in the supply chain.

5.4. Limitations of the Study

Government should seek for more funding to equip state owned manufacturing companies with needed resources. At the same time legislate on friendly laws that cushions local farmers. The government can outsource the dire needed services to enhance performance.

Based on the foregoing conclusions on the findings of the study, the researcher suggests that following future research directional trends relating to moderating effect of supplier relationship management between supply chain and supply chain performances, Other longitudinal research on the sugar manufacturing firms should also be incorporated in future studies, since this study only focused on 10 manufacturing firms in western Kenya due to limited resources from the researchers end points.

5.5 Suggestions for Further Research

Future research efforts could also be focused on investigating the adoption and rutinalization moderation effects of the supplier relationship management between electronic data interchange integration and supply chain performance in both private and Government owned entities. Proper implementation of the adoptions however on the other hand the both private and state owned millers are faced with accusations and invasions of cartels and corruptions that doesn't give room for the implementations of the policies

Consequent to the study findings as well as forfeited opportunities in using the selected research methodology and techniques at the expense of others, the findings indicated that with supplier relationship as a moderator has significant interplay on electronic data interchange integration and supply chain performance and this is key in the procurement practitioner's trend.

This study therefore suggests future research on the possibility of other factors that directly affects the supply chain performance of sugar manufacturing firms in Kenya.

It's therefore worth noting that this study was based on the electronic data interchange integration on supply chain performance and the moderator as supplier relationship management on the electronic data interchange integration and supply chain performance. There are other parameters of measuring performances apart from the supply chain that needs to be researched about. There is therefore need to conduct similar study in other manufacturing firms in Kenya since this study only concentrated on 10 manufacturing firms and in western can.

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APPENDICES: APPENDIX I: QUESTIONNAIRE

SECTION A: Electronic Data Interchange integration

What is the status of electronic data interchange in your firm?

Very high=4,   2. High=3,   3. Low=2,   4. very low=1

No	Elements	4	3	2	1
e-sourcing					
1.	Electronic access to and availability of product information				
2.	Electronic Bids and Quotes				
3.	Level of Electronic Tendering and negotiations				
4.	Availability of product information				
5.	Sourcing consistency with electronic order				
e-invoicing					
6.	Electronic invoices				
7.	Electronic purchase orders				
8.	Control of the invoicing processes				
9.	Reduced lead times				
10.	Reduction of printing costs as adoption result of e-invoicing				
11.	Efficiency in storage				
12.	Electronic approvals and reporting				
e-ordering					
13.	Availability of online inventory interface for customers				
14.	Use of electronic data interchange in the department				
15.	Online purchasing and receiving orders for vendors and customers				
16.	Reduction in paper work				
17.	Use of modern means of transportation that saving time on deliveries				
18.	Online customers and prospective clients				
19.	Online product descriptions for customers				

e-payment					
20.	e-payment systems as core to long term strategy of the firm				
21.	Handling payments and receivables electronically				
22.	Provisions of new payment opportunities				
23.	Reduction in transactions risk				
24.	Instantaneous reduction of transaction time				

SECTION B: supply chain performance

What supply chain process is your firm involved in?

Very high=4, 2. High=3,   3. Low=2,   4. Very low=1

No	Indicators	4	3	2	1
Supply efficiency					
1.	Assembly lines				
2.	Occupational safety health				
3.	Labor productivity quality output				
Supply quality					
4.	Improved quality of the products				
5.	Production processes				
Supply effectiveness					
6.	Records of inspections tests and results				
7.	Increased financial portfolio				
Supply productivity					
8.	Resource allocation on machinery equipments buildings				
9.	Improved customer relationship				
10.	Motivated staffs and reduced employees turnover rates				
11.	Continuous operations of the manufacturing firm				

SECTION C; Supply relationship management

This section elicits responses on the constructs of supplier relationship management: strategic, preferred, and approved elements

Very high=4, 2. High=3,   3. Low=2,   4. Very low=1

No	Rate	4	3	2	1
Long term relationships					
1	Franchise and product designs				
2	Purchasing agreements				
3	Frequent business reviews				
Formal 5contracts					
4	Value based interdependency				
5	Organizational structures				
6	Strong executive management and corporate strategic planning				
Management control					
7	Mergers collaborations and acquisitions				
8	Reduced costs in delayed deliveries				
9	Customer, vendor, product and services reliability				
10	Accurate approvals of supplier list				
11	Obsolete and redundant stocks				

APPENDIX II: OUT PUT MARKET FOR SUGAR

Table 1.1 output and market share of sugar companies in western Kenya source export processing zones (EPZ December 2014)

No	Rank name of manufacturing	Output (metric tons)	Market share %	Year built	capacity
1	Mumias Sugar Company	592,034	100.00%	1973	8,400
2	West Kenya Sugar Limited	117,966	19.93	1981	900
3	Nzoia Sugar Factory	73,696	12.45	1978	3,250
4	South Nyanza Sugar Co.	66,462	11.23	1979	2,400
5	Transmara Sugar Company	60,028	10.14		
6	Butali Sugar Mills	58,887	9.95		
7	Sukari Industries Limited	56,853	9.60		
8	Kibos Sugar and Allied Industries Ltd	42,143	7.12		

9	Muhoroni Sugar Company	39,415	6.66	1966	2,200
10	Chemelil Sugar Factory	38,864	6.56	1968	3,500

Western Kenya sugar factories output, establishment and market share. Source EPZ (2014)

APPENDIX III: KREJCIE AND MORAGN TABLE

Table 2.1 for determining sample size for finite population

To simplify the process of determining the sample size for a finite population, Krejcie & Morgan (1970), came up with a table using sample size formula for finite population.

Table 3.1

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size   Source: Krejcie & Morgan, 1970

Note:

There is no need of using sample size determination formula for 'known' population since the table has all the provisions one requires to arrive at the required sample size. For a population which is equal to or greater than 1,000,000, the required sample size is 384.

APPENDIX IV: UNITS OF STUDY

1   Kisumu County has the following Sub Counties, Kisumu East, Kisumu West, Kisumu Central, Seme, Nyando, Muhoroni, Nyakach

1.   Kakamega County has the following counties: Malava Constituency, Constituency, Constituency, Mumias, and Lugari Constituency

2.   Siaya County: It is the capital of Siaya County. It is located 74 kilometers northwest of Kisumu, the provincial capital. Siaya forms municipal council with population of 41,174, of whom 13,787 are classified urban 1999 census

2   Bungoma is a town in Bungoma County of Kenya, bordered by Uganda in the west. Bungoma town was established as a trading centre in the early 20th century. The town is the headquarters of Kenya's Bungoma County.

3   Homa Bay County is a bay and town on the south shore of Winam Gulf of Lake Victoria, in western Kenya. It lies near Mount Homa (in the Luo language *Got Marahuma* or *God Uma* "famous mountain"] and Ruma National Park, the latter noted for Jackson's hartebeests and roan antelope

APPENIX VI: RESEARCH BUDGET

Items	Quantity	Unit cots ksh	Totals amount Ksh
Transport fuel	10	5000	50,000
Printing and Stationeries services: questionnaires,	1	50,000	50,000
Research assistant	2	10,000	20,000
Meals and accommodation	10	3500	35,000
Report development	1	10,000	10,000
Contingencies	1	20,000	20,000
Total Amount in ksh			185,000

Appendix VIII: CONSENT FORM

TITLE: **E**ffect of supplier relationship management on the relationship between electronic data interchange integration and supply chain performance in sugar manufacturing firms in western

CONTACT ADRESS: BOX 19554-40123 KISUMU: cell: 0704371225

Email: agwandapeter@yahoo.com

	Please Tick Box	
1. Do you understand that we have asked you to participate in a research study?	**YES**	**NO**
2. Have you read and received a copy of the attached information letter?	**YES**	**NO**
3. Do you understand the benefits and risks involved in taking part in this research study?	**YES**	**NO**
4. Do you understand that you are free contact the research team to take the opportunity to ask questions and discuss this study?	**YES**	**NO**

5. Do you understand that you are free to refuse participation, or to withdraw from the study at any time, without consequence, and that your information will be withdrawn at your request?	**YES**	**NO**
6. Do you understand that we will keep your data confidential and you will have access to your information?	**YES**	**NO**
7. Do you agree to take part in the above study?	**YES**	**NO**

Name of the participant　　　　　　　　Date　　　　　　　　　Signature

Name of Researcher　　　　　　　　　　　　Date　　　　　　　　　Signature