EFFECT OF E-COMMERCE ON OPERATION COST REDUCTIONS OF MANUFACTURING FIRMS IN KENYA: A CASE OF KALUWORKS LIMITED

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ABSTRACT

With the realization that e-commerce has a great potential for economic growth, the government of Kenya has committed itself in providing an enabling environment for its growth through initiatives like zero-rating ICT equipment, laying the under-sea fiber cable and establishing legislation like Communication Act 2008. Despite this importance of e-commerce, the adoption of the technology is still low in Kenyan businesses. A significant number of SMEs in Kenya are however ignorant of ICTs and are unaware of their importance in conducting business, even in this era of globalization. Studies indicate that e-commerce helps to manage operation costs but despite that, there is still low adoption of e-commerce. The study hence sought to evaluate the role of e-commerce in reducing operational cost in an organization. The study specifically aims to establish the effect of Business-to-business e-commerce, Business-to-consumer e-commerce, Consumer-to-business e-commerce and Consumer-to-consumer e-commerce on operation costs of organizations. This study is guided by the systems theory, communication theory, resource based
theory and organizational fit theory. The target population for the study was 57 employees that work in the IT department, production department, administrative departments, Sales & Marketing and finished goods department. The study adopted a census survey since the population of the study is small. Therefore the sample size consisted of 57 employees. Statistical Package for Social Sciences computer software was used for analysis. An ordinary least square regression model was used. The study findings indicated that Business-to-consumer e-commerce, Consumer-to-business e-commerce and Consumer-to-consumer e-commerce have a positive and significant effect on operation cost while Business-to-business e-commerce does not significantly affect operation cost reduction. The study recommends that the management of Kaluworks should also consider using Business to consumer e-commerce more in activities such as consumers places their orders online, company placing quotations online, the company placing information on prices of goods online and consumers purchasing physical goods online since it will lead to a significant reduction of operation cost.

**Key words:** Business-to-business e-commerce, Business-to-consumer e-commerce Consumer-to-business e-commerce, Consumer-to-consumer e-commerce, operational cost
Background of the Study

Electronic commerce (e-commerce) is the paperless exchange of business information using electronic platforms like electronic data interchange (EDI), e-mail, electronic bulletin boards, fax transmissions, and electronic funds transfer. It refers to Internet shopping, online stock and bond transactions, the downloading and selling of “soft merchandise” (software, documents, graphics, music, etc.), and business-to-business transactions (Asiabugwa & Munyoki, 2012). It has become a vital strategic-management tool. An increasing number of companies are gaining competitive advantage by using the Internet for direct selling and for communication with suppliers, customers, creditors, partners, shareholders, clients, and competitors who may be dispersed globally. E-commerce allows firms to sell products, advertise, purchase supplies, bypass intermediaries, track inventory, eliminate paperwork, and share information. In total, electronic commerce is minimizing the expense and cumbersomeness of time, distance and space in doing business, which yields better customer service, greater efficiency, improved products and higher profitability (Afua & Tucci, 2001).

Afua and Tucci (2001), argue that most firms adopt new technologies to fend off new competitors, reinforce an existing competitive advantage or leapfrog competitor and to enhance better performance. In order to survive this has led to firms changing their business models to confirm to the rapidly changing environment. According to Afua et.al, (2001), to take advantage of change or to avoid competitors, firms may want to undergo a strategic management process to answer the question of where the firm is now concerning the internet. Organizational performance assesses how firms are able to meet their stated objectives over time. The management of an organization should be in a position to evaluate the performance level of the organization in order to ensure the organization is both effective and efficient in order to be successful.

EC is expanding because of the greater number of businesses and individuals who are able to use these networks and the growing number of ways in which businesses can conduct transactions electronically with other organizations and directly with consumers. At present, business-to-business EC seems still to be of greater volume than business-to-consumer EC, but this may change in the future. These trends are important to the global economy and to the economy of individual countries because EC contributes to economic efficiency. EC contributes to economic efficiency in five important ways namely: shrinking distances and timescale, lowering distribution and transaction costs, speeding product development, providing more information to buyers and sellers and enlarging customer choice and supplier reach (Gunasekaran, Marri, McGaughey & Nebhwani, 2002).

In its report UNCTAD (2005) confirms that there is now growing evidence that enterprises benefit substantially from e-business. New technologies, and in particular the Internet, transform economic sectors and allow them to do business faster and better. With the increased use of mobile money transfer, Kenyan businessmen and individuals are now paying for their electricity and water bills as well as honoring other obligations (e.g. paying for goods/services delivered/rendered).

Hinson and Sorenson (2006) affirms that in the earlier years for instance, business-to-business (B2B) e-commerce figures soared with estimates ranging between $200 and $600 billion globally for the year 2000 and was predicted to reach $12 trillion by 2006 (UNCTAD, 2004). The swift and incessant growth of e-commerce reportedly brought with it enormous benefits to organizations including MSMEs by providing them with the ability to access international markets hitherto difficult to penetrate due to high transaction costs and other market access barriers.
(UNCTAD, 2004). Despite an increase in e-commerce revenues reported by a number of participating MSMEs, however, e-commerce growth for the sector was confined mostly to the industrialized countries (UNCTAD, 2004).

Statement of the Problem

Business enterprises can better position themselves to engage in trade as a tool for development if they adopt e-commerce. Firms are expected to benefit for two main reasons. First, the products produced by firms in Kenya are often uncompetitive because of high transport costs and inefficient trade procedures, the latter of which can be partially overcome by the use of e-commerce. Second, e-commerce may allow these firms to diversify into new sectors where they can benefit from their low labour costs; e-commerce is expected to ease the entry of firms into global markets by allowing them better access to information and to overcome inefficiencies, thereby enabling them to make more advantageous decisions about their participation in international trade (UNCTAD, 2001).

With the realization that e-commerce has a great potential for economic growth, the government of Kenya has committed itself in providing an enabling environment for its growth through initiatives like zero-rating ICT equipment, laying the under-sea fiber cable and establishing legislation e.g. Communication Act 2008 (Wanyonyi, 2010). Despite this importance of e-commerce, the adoption of the technology is still low in Kenyan businesses.

Mitullah and Odek (2010) indicate that a significant number of firms in Kenya are however ignorant of ICTs and are unaware of their importance in conducting business, even in this era of globalization.Odhiambo (2013) further argues that Micro, Medium and Small Enterprises (MSMEs) in Africa are lagging behind most of the world’s economies in tapping into the possibilities linked to the emerging technologies and have, in effect, failed to realize the full potential benefits of e-commerce.

Many initiatives have risen in a short period of time like Innovative smart cards to facilitate E-commerce, remote payments and electronic checking, online trading of stocks, bonds and related Financial Instruments, online Banking and e-tailing. However its effect on the operation Cost reduction on manufacturing firms has been examined in several ways compared to brick and mortar firms. For instance money received for every transaction will be used to pay wages, transportation and bills whereas money received from e-commerce transaction pay for web hosting, shopping cart software hence saving on transport and wages expenses.

Further, the existing studies report conflicting results; they have used incomprehensive key variables, and have taken a largely broad perspective in the context of business process and operations. This presented key conceptual and contextual knowledge gaps which were essential for the current study to focus on evaluating the role of e-commerce on operational cost reduction on manufacturing firms.

Objectives of the Study

i. To examine the effect of Business-to-business e-commerce on operational cost on manufacturing firms in Kenya.

ii. To establish the effect of Business-to-consumere-commerce on operational cost on manufacturing firms in Kenya.

iii. To determine the effect of Consumer-to-business-e-commerce on operational cost on manufacturing firms in Kenya.
iv. To find out the effect of Consumer-to-consumer-commerce on operational cost on manufacturing firms in Kenya.

LITERATURE REVIEW

System Theory

System theory was developed by Bertalanffy (1968) as the basis for the field of study known as ‘general system theory’, a multidisciplinary field. Some influences from the contingency approach can be found in system theory. Systems theory is the interdisciplinary study of systems in general, with the goal of elucidating principles that can be applied to all types of systems at all nesting levels in all fields of research (Bertalanffy, 1968). General systems theory emphasizes the way in which organized systems (human and non-human) respond in an adaptive way to cope with significant changes in their external environments so as to maintain their basic structures intact. Systems theory models of decision-making in human groups and organizations emphasize their interaction with "outside" actors and organizations and concentrate on identifying the particular elements in the environment of the group or organization that significantly affect the outcomes of its decision-making. To understand what an organization did, try to find out what threat or opportunity it was responding to and how its pre-existing response mechanisms worked to do this (Bertalanffy, 1968). According to this school of thought, systems (such as enterprise resource planning systems) are characterized by a combination of interdependent parts (e-commerce system modules) that result in flows across these parts. Among the flows that link parts of a system, the flow of information is viewed as the most critical (Scott, 2003). Hence, an understanding of information flows is necessary to exploit the strength of each of the parts (e-commerce planning modules) and the system as a whole (the e-commerce system).

Communication Theory

Shannon and Weaver (1949) developed the communication theory for sending and receiving messages through a channel and analyzing communication problems. In this research, e-commerce can mainly focus on using a website and a website is viewed as an information system that includes a large number of users who are not enclosed by its Organisational context and for whom use is volitional. In addition, a website is a mutual communication channel between the organization and its clients (Straub, Hoffman, Weber, &Steinfield, 2002). Hence, communication theory can be adopted to explain e-commerce effect on performance (DeLone & McLean, 2004; Molla & Licker, 2001). The model includes an information sender (a source of information), a transmission medium (with noise and distortion), and an information receiver (whose goal is to reconstruct the information sender’s message).

Resource Based View Theory

The resource-based view (RBV) developed by Barney (1991) as a basis for the competitive advantage of a firm lies primarily in the application of a bundle of valuable tangible or intangible resources at the firm's disposal. This theory states that to transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogeneous in nature and not perfectly mobile. Effectively this translates into valuable resources that are neither perfectly imitable nor substitutable without great effort. If these conditions hold, the bundle of resources can sustain the firm’s above average. Barney (1991) argues that the RBV approach has evolved from a nascent, upstart perspective to one of the most prominent and powerful theories for describing, explaining, and predicting organizational relationships. The RBV theory attempts
to explain how technology creates value (Zhu & Kraemer, 2005). The RBV theory attributes improvement in firm performance to valuable resources or resource bundles (Barney 1991, Peteraf 1993). ICT creates value to the firm indirectly as it affects other resources or processes which in turn lead to performance improvement and hence competitive advantage.

**Contingency theory of Fit**

The theory was proposed by Drazin and Van de Ven (1985). This theory is also known as cultural fit theory. This theory observes that “no one acts alone” and everyone placed in his environment has technical and nontechnical elements that shape or influence the innovation of technology. This theory is dependent on the perfect mix of strategy, technology, task, organizational size, structure, and culture of the organization as there is no universal way to management for maximum efficiency and optimal performance to form a proper 'fit' with the environment and its systems (Reinking, 2012). Hence, there must be congruence between the information system and the organizational as information systems become more and more integral to the business. The institution must strive to find a system that is a good fit for the organization that quickly and naturally fall into the rhythm with the organization.

**Conceptual Framework**

**Business to business e-commerce**
- Outsourcing of Logistics (Warehousing and Transport)
- Outsourcing of functions
- Customer care solutions.

**Business to consumer e-commerce**
- Placing quotation information online.
- Reduced Capital commitment and overproduction.
- Purchase of goods online.

**Consumer to business e-commerce**
- Repurchase services
- Reverse auction services
- Online orders placement

**Consumer to consumer e-commerce**
- Online auctions
- Purchase from suppliers
- Prices information sharing

**Operation cost reduction**
- Costs of executing the sale
- Marketing cost
- Delivery costs

**Independent Variables**

**Dependent Variable**

Figure 1 Conceptual Framework
**Business-to-business e-commerce**

In B2B e-commerce, it is where inter-organizational coordination business partner’s relationship can be improved. About 80% of e-commerce is of this type, and most experts predict that B2B e-commerce will continue to grow faster than the B2C segment. The B2B market has two primary components: e-structure and e-markets. E-structure is the architecture of B2B, primarily consisting of the following: Logistics - transportation, warehousing and distribution (for example Procter and Gamble); Application service providers - deployment, hosting and management of packaged software from a central facility (for example Oracle and Link share); Outsourcing of functions in the process of e-commerce, such as Web-hosting, Security and customer care solutions (for example outsourcing providers such as e-share, Net Sales, IXL Enterprises and Universal Access); Auction solutions software for the operation and maintenance of real-time auctions in the Internet (for example Moai Technologies and Open Site Technologies); Content management software for the facilitation of Web site content management and delivery (for example Interwoven and Procure Net); and Web-based commerce enablers (for example Commerce One, a browser-based, XML-enabled purchasing automation software) (Gupta, 2014).

**Business-to-consumer e-commerce**

In B2C e-commerce, companies/businesses conduct transaction with consumer through electronic channels. Businesses-to-Consumers (B2C e-commerce) e-commerce involves retailing transactions between organizations and individual shoppers. Business-to-consumer e-commerce, or commerce between companies and consumers, involves customers gathering information; purchasing physical goods (tangibles such as books or consumer products) or information goods (or goods of electronic material or digitized content, such as software, or e-books); and, for information goods, receiving products over an electronic network. B2C e-commerce reduces transactions costs (particularly search costs) by increasing consumer access to information and allowing consumers to find the most competitive price for a product or service. B2C e-commerce also reduces market entry barriers since the cost of putting up and maintaining a Web site is much cheaper than installing a "brick-and-mortar" structure for a firm. In the case of information goods, B2C e-commerce is even more attractive because it saves firms from factoring in the additional cost of a physical distribution network. Moreover, for countries with a growing and robust Internet population, delivering information goods becomes increasingly feasible (Gupta, 2014).

**Consumer-to-business e-commerce**

By adopting the e-commerce for instance C2B practices the organizational performance increases. Consumer-to-Business (C2B e-commerce) allows consumers to sell products and services to businesses; an example is freelancer sites such as Task Rabbit and www.monster.com. Any business organization that is interested in deploying the services of the consumer can contact him and offer him opportunities. Consumer-to-business (C2B) transactions involve reverse auctions, which empower the consumer to drive transactions. A concrete example of this when competing airlines gives a traveler best travel and ticket offers in response to the traveler's post that she wants to fly from New York to San Francisco.

The organizations that implement e-commerce have tremendous advantage in quality, cost, profit, and employee motivation (Singh, 2002). It is observed that by adopting e-commerce the organizational performance like profit, market share, and customer services improved. And we see significant improvement in organization’s practices regarding marketing, finance, manufacturing, selling and administration (Richard et al., 2009). Electronic commerce has dramatically affected
the operations of the business and companies spend a large portion of investment in e-commerce applications which may lead toward the organizational achievements. Rapidly adoption of Electronic commerce applications like internet, electronic mail, video conferencing and fax changed the nature of the business. These applications lead towards the substantial changes in traditional businesses and companies. Many firms are trying to understand and measure the electronic commerce so that they can do wise decisions regarding the operations of the firm (Singh, 2002).

**Consumer-to-consumer-commerce**

Consumer-to-consumer e-commerce or C2C is simply commerce between private individuals or consumers. This type of e-commerce is characterized by the growth of electronic marketplaces and online auctions, particularly in vertical industries where firms/businesses can bid for what they want from among multiple suppliers. It perhaps has the greatest potential for developing new markets. There is little information on the relative size of global C2C e-commerce. However, C2C figures of popular C2C sites such as eBay and Napster indicate that this market is quite large. These sites produce millions of dollars in sales every day (Gupta, 2014). Consumer-to-Consumer (C2C e-commerce) involves transactions between consumers, the e-commerce website serves to facilitate the transaction, while the seller needs to pay a fixed fee to the online auction house to sell their products, the buyer can bid without paying any fee, and good examples of such auction sites are eBay and www.bazee.com. In many businesses there is strong need to share the information with general public based on the nature of business so at that time if information is not accessible to everyone then business bears the loss or miss the opportunity that it can achieve.

**RESEARCH METHODOLOGY**

This study adopted a descriptive survey design. Upgrade and Shende (2013) averred that a descriptive research design is mainly concerned with only explaining the facts of a phenomenon. It is a self-report that requires the collection of equitable information from sample. The target population for the study was 57 employees that work in the IT department, production department, administrative departments, Sales & Marketing and finished goods department. The study adopted a census survey since the population of the study was small. Therefore the respondents consisted of 57 employees who are in the five departments. Israel (2012) argues that a census approach can be adopted for a population less than 200. Primary data was gathered by use of structured questionnaires and captured through a 5-point likert scale type. SPSS which generate both descriptive and inferential statistics was employed. Descriptive statistics including the mean and standard deviation were used to capture the characteristics of the variables under study. Inferential statistics; regression coefficient and bivariate correlation were used to analyze the relationship of the dependent variable and the independent variables. The following regression model aided in determination of coefficients of the independent in relation to the dependent variable. The multivariate model is as follows:

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon \]

Where;

- \( Y \) = Operation cost Reduction.
- \( X_1 \) = Business to business e-commerce
- \( X_2 \) = Business to consumer e-commerce
\( X_3 = \text{Consumer to business e-commerce} \)
\( X_4 = \text{Consumer to consumer e-commerce} \)

\( \varepsilon = \text{Error term} \)

**RESULTS**

4.1 **Response rate**

Figure 2 below indicates the response rate of the study.

**Figure 4.1 Response Rate**

The number of questionnaires that were administered was 57. A total of 49 questionnaires were responded to. This represented an overall successful response rate of 86% as shown on Figure 2. Mugenda and Mugenda (2003) argue that a return rate of 50% is acceptable. According to Awino (2011), a response of above 65 percent is acceptable. A response rate of 86% is hence good for the current study. The high response rate was achieved because the method of drop and pick was effective. The respondents who were busy were given more time to respond to the questionnaire before they were picked. Persistence by the researcher also played a role in achieving the high response rate.

**Demographics Analysis**

**Respondents age**

The study sought to establish the age bracket of the respondents. The results are as shown in Figure 3. The study findings indicate that of the 49 respondents, 22 were aged between 30 and 39 years while 29 were aged below 29 years. Only 11 respondents were aged above 40 years. The results imply that those spearheading the use of e-commerce at Kaluworks limited are younger generations below the age of 40 years. The findings are consistent with Bolo, Muchemi and Ogutu (2011) who argued that the young generations are more comfortable with embracing ICT technology as compared to the older generations. The findings are also consistent with Odhiambo (2013) who indicated that manufacturing firms have younger firm owners/managers with high levels of education and whose perception of innovation characteristics had a significant bearing on e-commerce investment decisions.
The study sought to establish the level of education of the respondents. The results are as shown in Figure 4. The findings indicated that 45% of the respondents have a diploma, 33% have certificate and 22% of the employees at Kaluworks are graduates. The findings imply that majority of the respondents are diploma holders. Overall, majority of the respondents are literate. This indicates that with literacy, interpretation of the questions was easy and it contributed to the high reliability. Barricke et al. (2007) argues that the more literate a person is, the more knowledgeable and able to comprehend ideas they are.

The study sought to examine the effect of Business-to-business e-commerce on operational cost on manufacturing firms in Kenya. The descriptive results are presented in Table 1. The findings indicate that 75.5% of the respondents agreed that the company uses e-commerce in logistics for instance distribution, 57.1% agreed that the company uses e-commerce in outsourcing of functions and those who agreed that the company has auction solutions software for the operation and maintenance of real-time auctions in the Internet were 44.9%. Those who agreed that the company has content management software for the facilitation of web site content management and delivery as well as using IT in Security and customer care solutions were 81.7% and 89.8% respectively.

On average, the respondents agreed on statements concerning B2B e-commerce. The standard deviation also indicates that there was a small variation in the responses given by the respondents.
The findings imply that using IT in Security and customer care solutions, using e-commerce in logistics for instance distribution and outsourcing of functions has the largest effect on operation costs in that order. This therefore implies that Kaluworks should consider using e-commerce in those activities so as to have reduced operations costs. The findings of the study are consistent with an argument by Gupta (2014) that some of the activities under B2B e-commerce are Logistics - transportation, warehousing and distribution (for example Procter and Gamble); Application service providers - deployment, hosting and management of packaged software from a central facility; Outsourcing of functions in the process of e-commerce, such as Web-hosting, Security and customer care solutions, Content management software for the facilitation of Web site content management and delivery (for example Interwoven and Procure Net); and Web-based commerce enablers (for example Commerce One, a browser-based, XML enabled purchasing automation software) (Gupta, 2014).

Table 1: Business to business e-commerce

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
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<th>4</th>
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<th>Mean</th>
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<tbody>
<tr>
<td>The company uses e-commerce in logistics for instance distribution</td>
<td>6.10%</td>
<td>6.10%</td>
<td>12.20%</td>
<td>36.70%</td>
<td>38.80%</td>
<td>3.96</td>
<td>1.15</td>
</tr>
<tr>
<td>The company uses e-commerce in outsourcing of functions</td>
<td>4.10%</td>
<td>20.40%</td>
<td>18.40%</td>
<td>40.80%</td>
<td>16.30%</td>
<td>3.45</td>
<td>1.12</td>
</tr>
<tr>
<td>The company has auction solutions software for the operation and maintenance of real-time auctions in the Internet</td>
<td>8.20%</td>
<td>26.50%</td>
<td>20.40%</td>
<td>24.50%</td>
<td>20.40%</td>
<td>3.22</td>
<td>1.28</td>
</tr>
<tr>
<td>The company has content management software for the facilitation of web site content management and delivery</td>
<td>2.00%</td>
<td>2.00%</td>
<td>14.30%</td>
<td>38.80%</td>
<td>42.90%</td>
<td>4.18</td>
<td>0.91</td>
</tr>
<tr>
<td>The company uses IT in Security and customer care solutions</td>
<td>2.00%</td>
<td>2.00%</td>
<td>6.10%</td>
<td>40.80%</td>
<td>49.00%</td>
<td>4.33</td>
<td>0.85</td>
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<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>3.83</strong></td>
<td><strong>1.06</strong></td>
</tr>
</tbody>
</table>

**Business to Consumer e-commerce**

The study sought to establish the effect of Business-to-consumer-e-commerce on operational cost on manufacturing firms in Kenya. The descriptive results are presented in Table 2. The findings indicated that majority of the respondents, 65.3% indicated that the company places quotations online, 51.0% indicated that the company has placed information on prices of goods online and 51.0% also indicated that the consumers purchases physical goods online. The respondents who agreed that the consumers place their orders online and that the company determines the daily production to minimize capital requirement were 73.5% and 87.8% respectively. The average results indicate that respondents agreed on most statements of B2C e-commerce. The variation in the responses was also small. The implication of the study findings is that the use of e-commerce in activities such as consumers places their orders online, company placing quotations online, the company placing information on prices of goods online and consumers purchasing physical goods online greatly reduce the operation cost of the company. The study therefore encourages the company to apply e-commerce in these activities in order to cut the operation costs.
The findings of the study are consistent with Khairul & Ahmad (2005) who indicated that Businesses-to-Consumers (B2C e-commerce) involves retailing transactions between organizations and individual shoppers. Business-to-consumer e-commerce, or commerce between companies and consumers, involves customers gathering information; purchasing physical goods (tangibles such as books or consumer products) or information goods (or goods of electronic material or digitized content, such as software, or e-books); and, for information goods, receiving products over an electronic network.

**Table 2: Business to Consumer e-commerce**

<table>
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<th>Statement</th>
<th>1</th>
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<th>Mean</th>
<th>StdDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>The company places quotations online.</td>
<td>6.10%</td>
<td>10.20%</td>
<td>18.40%</td>
<td>36.70%</td>
<td>28.60%</td>
<td>3.71</td>
<td>1.17</td>
</tr>
<tr>
<td>The company has placed information on prices of goods online.</td>
<td>10.20%</td>
<td>34.70%</td>
<td>4.10%</td>
<td>28.60%</td>
<td>22.40%</td>
<td>3.18</td>
<td>1.39</td>
</tr>
<tr>
<td>The consumers purchases physical goods online.</td>
<td>10.20%</td>
<td>20.40%</td>
<td>18.40%</td>
<td>26.50%</td>
<td>24.50%</td>
<td>3.35</td>
<td>1.33</td>
</tr>
<tr>
<td>The consumers place their orders online.</td>
<td>6.10%</td>
<td>4.10%</td>
<td>16.30%</td>
<td>38.80%</td>
<td>34.70%</td>
<td>3.92</td>
<td>1.11</td>
</tr>
<tr>
<td>The company determines the daily production to minimize capital requirement.</td>
<td>6.10%</td>
<td>0.00%</td>
<td>6.10%</td>
<td>38.80%</td>
<td>49.00%</td>
<td>4.24</td>
<td>1.03</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>6.10%</td>
<td>10.20%</td>
<td>18.40%</td>
<td>36.70%</td>
<td>28.60%</td>
<td>3.71</td>
<td>1.17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3.68</strong></td>
<td><strong>1.21</strong></td>
<td><strong>1.21</strong></td>
<td><strong>1.21</strong></td>
<td><strong>1.21</strong></td>
<td><strong>1.21</strong></td>
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</tr>
</tbody>
</table>

**Consumer to Business e-commerce**

The study sought to establish the effect of Consumer-to-business-e-commerce on operational cost on manufacturing firms in Kenya. The descriptive results are presented in Table 3. Out of the 49 respondents who took part in the study, 73.4% agreed that the consumers receive products over an electronic framework, 55.1% agreed that the company provides online repurchase services and those who indicated that the company provides online reverse auction services were 36.7%. The respondents who indicated that the company system allows for online placement of orders by the customers were 81.6% and those who agreed that the company provides a framework to receive customer complains on online platforms were 61.2%. The overall mean indicated an agreement with statements on consumer to business e-commerce. The variation in the responses was also small as indicated by the standard deviation. The results imply that the use of C2B e-commerce has an effect on operations costs. The activities which the company can use e-commerce in order to cut operations costs were allowing for online placement of orders by the customers, creating a platform for consumers to receive products over an electronic framework, providing a framework to receive customer complains on online platforms and providing online repurchase services. The findings are consistent with Singh (2002) who indicated that consumer-to-business (C2B) transactions involve reverse auctions, which empower the consumer to drive transactions. The findings also indicate that organizations that implement e-commerce have tremendous advantage in quality, cost, profit, and employee motivation (Singh, 2002).
Table 3: Consumer to Business e-commerce

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Mean</th>
<th>StdDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>The consumers receive products over an electronic framework</td>
<td>2.00%</td>
<td>14.30%</td>
<td>10.20%</td>
<td>36.70%</td>
<td>36.70%</td>
<td>3.92</td>
<td>1.11</td>
</tr>
<tr>
<td>The company provides online repurchase services</td>
<td>8.20%</td>
<td>18.40%</td>
<td>18.40%</td>
<td>34.70%</td>
<td>20.40%</td>
<td>3.41</td>
<td>1.24</td>
</tr>
<tr>
<td>The company provides online reverse auction services</td>
<td>14.30%</td>
<td>28.60%</td>
<td>20.40%</td>
<td>30.60%</td>
<td>6.10%</td>
<td>2.86</td>
<td>1.19</td>
</tr>
<tr>
<td>The company system allows for online placement of orders by the customers</td>
<td>4.10%</td>
<td>8.20%</td>
<td>6.10%</td>
<td>46.90%</td>
<td>34.70%</td>
<td>4.00</td>
<td>1.06</td>
</tr>
<tr>
<td>The company provides a framework to receive customer complains on online platforms</td>
<td>2.00%</td>
<td>16.30%</td>
<td>20.40%</td>
<td>26.50%</td>
<td>34.70%</td>
<td>3.76</td>
<td>1.16</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>3.59</strong></td>
<td><strong>1.15</strong></td>
</tr>
</tbody>
</table>

Consumer to Consumer e-commerce

The study sought to find out the effect of Consumer-to-consumere-commerce on operational cost on manufacturing firms in Kenya. The descriptive results are presented in Table 4. The findings indicated that those who agreed that there is online auctions between the company and suppliers were 44.9%, 63.3% agreed that the company conducts transactions with its supplier’s online while 65.4% agreed that the company shares information with its suppliers online. Only 40.8% and 34.6% of the respondents agreed that there is online sharing of information with fellow purchasers as well as provision of a platform through which customers can communicate to each other and share their views about the products. On average the respondents were neutral on most statements regarding consumers to consumers e-commerce. There was also a wide variation in the responses as shown by the standard deviation. These results imply that C2C e-commerce has an effect on operations costs although the effect is small. Activities with the most effect on operations cost were the use of internet to conducts transactions with supplier’s online and the use of internet to share information with suppliers online. Other activities involving communication between consumers online have a small effect on the operations cost. The findings agree with Azeem, Ozari, Marsap, Arhab & Jilani (2015) who indicated that Consumer-to-Consumer (C2C e-commerce) involves transactions between consumers, through the company website and the buyer bidding online.

Table 4: Consumer to Consumer e-commerce

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Mean</th>
<th>StdDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is online auctions between the company and suppliers</td>
<td>10.20%</td>
<td>26.50%</td>
<td>18.40%</td>
<td>32.70%</td>
<td>12.20%</td>
<td>3.10</td>
<td>1.23</td>
</tr>
<tr>
<td>The company conducts transactions with its suppliers online</td>
<td>3.67</td>
<td>1.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company shares information with its suppliers online</td>
<td>3.78</td>
<td>1.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
There is online sharing of information with fellow purchasers

<table>
<thead>
<tr>
<th>Percentage Change</th>
<th>14.30%</th>
<th>16.30%</th>
<th>28.60%</th>
<th>20.40%</th>
<th>20.40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>2.98</td>
<td>1.44</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The company provides a platform through which customers can communicate to each other and share their views about the products

<table>
<thead>
<tr>
<th>Percentage Change</th>
<th>20.40%</th>
<th>18.40%</th>
<th>26.50%</th>
<th>12.20%</th>
<th>22.40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>3.16</td>
<td>1.33</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Operation Costs

The respondents were requested to indicate the changes in the operation costs for the past one year (2016). The results are presented in Figure 5. The findings indicated that majority of the respondents, 61.2% agreed that for the past one year, operation cost has decreased by less than 50% as a result of using e-commerce in most operations. However, 32.6% of the respondents indicated that operation costs have increased for the last one year despite the fact that e-commerce has been used. The results imply that the use of e-commerce plays a positive role in reduction of operation costs.

![Figure 5 Operation Cost](image)

**Figure 5 Operation Cost**

Compared to the total costs, the respondents were asked to indicate the proportion of operation costs as a percentage of the total costs in the last one year. The results are indicated in Figure 6. The results indicated that up to 23 of the possible 49 respondents indicated that the operation cost is between 40% to 60% of the total cost which implies that the operation cost has the largest share of the total cost incurred by the company.
The respondents were then requested to rate statements on operation cost on a scale of 1 to 5. The descriptive findings are indicated on Table 4.6. Out of the 49 respondents, 67.4% agreed that there has been a reduction in marketing and advertisement costs while 65.3% and 67.4% agreed that there has been a decrease in information search cost and the cost of executing a sale respectively. Those who indicated a decrease in the costs associated with procurement of production inputs as well as delivery were 75.5% and 51.0 percent respectively. Majority of the respondents on average agreed that there has been a reduction in operation costs with the use of e-commerce costs. The results imply that the use of e-commerce for various activities leads to a reduction in operation costs for instance marketing and advertisement costs, information search cost and costs associated with procurement of production inputs. The study therefore recommends that Kaluworks should consider the use of the four type of e-commerce namely; B2B, B2C, C2B and C2C in its operations so as to cut the costs of operation.

Table 5: Operation Cost

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Mean</th>
<th>StdDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>There has been a reduction in marketing and advertisement costs</td>
<td>10.20%</td>
<td>12.20%</td>
<td>10.20%</td>
<td>38.80%</td>
<td>28.60%</td>
<td>3.63</td>
<td>1.30</td>
</tr>
<tr>
<td>There has been a decrease in information search cost</td>
<td>0.00%</td>
<td>8.20%</td>
<td>26.50%</td>
<td>46.90%</td>
<td>18.40%</td>
<td>3.76</td>
<td>0.85</td>
</tr>
<tr>
<td>There has been a reduction in the cost of executing a sale</td>
<td>4.10%</td>
<td>16.30%</td>
<td>12.20%</td>
<td>49.00%</td>
<td>18.40%</td>
<td>3.61</td>
<td>1.10</td>
</tr>
<tr>
<td>The costs associated with procurement of production inputs has decreased</td>
<td>6.10%</td>
<td>4.10%</td>
<td>14.30%</td>
<td>55.10%</td>
<td>20.40%</td>
<td>3.80</td>
<td>1.02</td>
</tr>
<tr>
<td>Delivery costs has decreased</td>
<td>14.30%</td>
<td>12.20%</td>
<td>22.40%</td>
<td>38.80%</td>
<td>12.20%</td>
<td>3.22</td>
<td>1.25</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>3.60</strong></td>
<td><strong>12.20%</strong></td>
<td><strong>22.40%</strong></td>
<td><strong>38.80%</strong></td>
<td><strong>12.20%</strong></td>
<td><strong>3.22</strong></td>
<td><strong>1.25</strong></td>
</tr>
</tbody>
</table>
Correlation analysis

The study used a correlation analysis to establish the association among the variables used in the study. A Pearson correlation was used since the data was discrete. The findings indicate that three variables that is Consumer to consumer, consumer to business and business to consumer have a significant effect on operation cost reduction. The results indicate that an increase in the use of business to consumer e-commerce leads to an increase in the reduction of operation costs in the company. This implies that the use of business to consumer e-commerce in activities such as consumers places their orders online, company placing quotations online, the company placing information on prices of goods online and consumers purchasing physical goods online are associated with a reduction in the operation cost of the company. The findings are consistent with Hoq, Kamal & Chowdhury (2005) who indicated that e-commerce has the potential to be the application that ushers in the large productivity gains.

The results also indicate that an increase in the use of consumer to business e-commerce also leads to an increase in the reduction of operation costs in the company. This implies that the use of C2B e-commerce in activities like allowing for online placement of orders by the customers, creating a platform for consumers to receive products over an electronic framework, providing a framework to receive customer complaints on online platforms and providing online repurchase services positively leads to a reduction in operations costs. The correlation between consumer to consumer e-commerce and reduction in operation costs is positive and significant. This means that an increase in the practice of consumer to consumer e-commerce is associated with a reduction in operation costs at Kaluworks. Kaluworks are hence advised to use e-commerce in consumer to consumer activities like the use of internet to conduct transactions with supplier’s online and the use of internet to share information with suppliers online. The findings are also consistent with Odhiambo (2013) who indicated that after adoption of e-commerce, businesses had an improved overall performance.

Table 6: Correlation Results

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B2B  Pearson Correlation</td>
<td></td>
<td>.342*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2C  Pearson Correlation</td>
<td>.427**</td>
<td>.756**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.002</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2B  Pearson Correlation</td>
<td>.507**</td>
<td>.639**</td>
<td>.752**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>C2C  Pearson Correlation</td>
<td>0.147</td>
<td>.375**</td>
<td>0.276*</td>
<td>.344*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.312</td>
<td>0.008</td>
<td>0.045</td>
<td>0.016</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).
Effect of e-commerce on operation cost reduction

The study used a regression model to establish the effect of e-commerce on operation cost reduction. This enabled the study to answer the research questions. The overall regression model was:

\[ Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon \]

Where:
- \( Y \) = Operation cost Reduction,
- \( X_1 \) = Business to business e-commerce,
- \( X_2 \) = Business to consumer e-commerce,
- \( X_3 \) = Consumer to business e-commerce,
- \( X_4 \) = Consumer to consumer e-commerce and 
- \( \epsilon \) = Error term.

The results for model summary, fitness and coefficients are presented in a combined Table 7. The results indicate that e-commerce accounts for up to 27% of the changes in the operation costs at Kaluworks. This is indicated by an R-square value of 0.27. The findings reveal that the other factors not investigated in the study account for the remaining 73%.

**Table 7: Regression Results**

<table>
<thead>
<tr>
<th>Model Summary</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.412a</td>
<td>0.27</td>
<td>0.24</td>
<td>0.772699</td>
</tr>
</tbody>
</table>

The results in Table 8 indicate that the overall model linking e-commerce to operation costs was significant as indicated by a significant F statistic. The value was less than 0.05 which implies that e-commerce can be used to predict and reduction of operation costs at Kaluworks. In addition to this, the calculated F statistic value of 3.248 was compared with the F (4, 44) critical from the F distribution table which gave a value of 2.61. Since F calculated is greater than F (4, 44) value of 2.61, the study concluded that the model was significant to predict cost reduction.

**Table 8: ANOVA Results**

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>5.368</td>
<td>4</td>
<td>1.342</td>
<td>3.248</td>
<td>0.049</td>
</tr>
<tr>
<td>Residual</td>
<td>26.271</td>
<td>44</td>
<td>0.597</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>31.639</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results for the model coefficients are presented in Table 9. Business to consumer e-commerce has a positive and significant effect in the reduction of operation costs at Kaluworks. This confirms the correlation results that the use of business to consumer e-commerce in activities such as consumers places their orders online, company placing quotations online, the company placing information on prices of goods online and consumers purchasing physical goods online leads to a reduction in the operation cost of the company. A one unit increase in the application of business to consumer e-commerce leads to a 0.307 units increase in the reduction of operation costs. The results are also consistent with Azeem, Ozari, Marsap, Arhab & Jilani (2015) who sought to establish the impact of E-Commerce on Organization Performance with evidence from Banking Sector of Pakistan and the findings showed that there is positive relationship between e-commerce and organization performance and by implementing e commerce; organizations improve its performance in terms of business operations, job performance and customer satisfaction.
Consumer to business e-commerce has a positive and significant effect in the reduction of operation costs at Kaluworks. This confirms the correlation results that the use of C2B e-commerce in activities like allowing for online placement of orders by the customers, creating a platform for consumers to receive products over an electronic framework, providing a framework to receive customer complaints on online platforms and providing online repurchase services positively leads to a reduction in operations costs. A one unit increase in the application of consumer to business e-commerce leads to a 0.152 units increase in the reduction of operation costs. The findings also agree with Sandy and Graham (2007) who indicated that intensity of competitive advantage among businesses is associated with the degree of e-commerce adoption.

Consumer to consumer e-commerce also has a positive and significant effect in the reduction of operation costs at Kaluworks. This implies that the use of e-commerce in consumer to consumer activities like the use of internet to conducts transactions with supplier’s online and the use of internet to share information with supplier’s online leads to a significant reduction in operation costs. A one unit increase in the application of consumer to consumer e-commerce leads to a 0.215 units increase in the reduction of operation costs. The findings are also consistent with the findings of a study by Porter (2008) who found out that the adoption of IT will change the competitive environment in three ways: through changing the structure of the industry, changing the rules of competition, and giving businesses new methods by which to gain competitive advantage over the competition. The effect of business to business e-commerce on operation costs was not significant.

### Table 9 Model Coefficients

<table>
<thead>
<tr>
<th>Model Coefficients</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>2.463</td>
<td>0.718</td>
<td>3.432</td>
<td>0.001</td>
</tr>
<tr>
<td>B2B</td>
<td>0.042</td>
<td>0.198</td>
<td>0.212</td>
<td>0.833</td>
</tr>
<tr>
<td>B2C</td>
<td>0.307</td>
<td>0.189</td>
<td>3.623</td>
<td>0.042</td>
</tr>
<tr>
<td>C2B</td>
<td>0.152</td>
<td>0.217</td>
<td>3.701</td>
<td>0.038</td>
</tr>
<tr>
<td>C2C</td>
<td>0.215</td>
<td>0.176</td>
<td>2.224</td>
<td>0.048</td>
</tr>
</tbody>
</table>

The overall revised regression model that links e-commerce to operation costs reduction is as indicated below:

\[
Y = 2.463 + 0.307 X_1 + 0.215 X_2 + 0.152 X_3
\]

Where:
- \(Y\) = Operation cost Reduction
- \(X_1\) = Business to consumer e-commerce
- \(X_2\) = Consumer to consumer e-commerce
- \(X_3\) = Consumer to business e-commerce
Conclusion of the Study

The study concluded that the effect of business to business e-commerce on reduction of operation costs is positive but not significant. The use of business to business e-commerce in the use of IT in Security and customer care solutions, logistics for instance distribution and outsourcing of functions has a positive but small effect on reduction of operation costs. Business to consumer e-commerce has a positive and significant effect in the reduction of operation costs at Kaluworks. The use of business to consumer e-commerce in activities such as consumers places their orders online, company placing quotations online, the company placing information on prices of goods online and consumers purchasing physical goods online has a significant effect on reduction of operation cost of the company.

Consumer to business e-commerce has a positive and significant effect in the reduction of operation costs at Kaluworks. The use of consumer to business e-commerce in activities like online placement of orders by the customers, creating a platform for consumers to receive products over an electronic framework, providing a framework to receive customer complains on online platforms and providing online repurchase services has a significant effect on reduction of operation costs. The study also concluded that consumer to consumer e-commerce has a positive and significant effect in the reduction of operation costs at Kaluworks. The use of consumer to consumer e-commerce to conduct transactions with suppliers online and the use of internet to share information with suppliers online has a significant effect on reduction of operation costs.

Recommendations

The management of Kaluworks should also consider using business to consumer e-commerce more in activities such as consumers places their orders online, company placing quotations online, the company placing information on prices of goods online and consumers purchasing physical goods online since it will lead to a significant reduction of operation cost. The study also recommends that Kaluworks should use consumer to business e-commerce in activities like online placement of orders by the customers, creating a platform for consumers to receive products over an electronic framework, providing a framework to receive customer complains on online platforms and providing online repurchase services since that will lead to a reduction in operations costs. The study also recommends that the management of Kaluworks should invest more in the creation of platforms for consumer to consumer e-commerce to be used to conduct transactions with suppliers online and the use of internet to share information with suppliers online since it will lead to a significant reduction on operation costs. Other Manufacturing firms can also consider introducing e-commerce in their operations so as to have a reduction in their operation costs. The Export Promotion Council, an arm of the government, which interacts with SMEs on a day-to-day basis helping them to use ICT to conduct international trade, can encourage SMEs in the manufacturing sector and other businesses to adopt B2C, C2B and C2C e-commerce in their businesses so as to cut on operation costs and enable them compete competitively.

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