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Cost as a determinant of technology adoption among small engineering firms in Kisumu city, Kenya

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Abstract
Modern technologies offer businesses great opportunities to expand their productivity and market reach. However, technologies also pose a great challenge. The main challenge for small firms is meeting the costs of acquiring, adopting and creating human resource capacity to apply them in the production processes. This paper explores the relationship between the perceived cost of technology and the rate of adoption based on a study of small engineering firms in Kisumu city, Kenya. This study adopted explanatory survey research design. The study applied census inquiry technique to select small engineering firms within Kisumu central business district. The target population comprised owner-managers of 287 firms registered with the County government of Kisumu. Data was collected using questionnaires, structured interview schedule and document analysis and analysed descriptively. Binary logit regression was used to analyse technology adoption behaviour. Chi-square test of independence was computed to compare differences between categorical frequencies of study variables. The logistic regression model was statistically significant, χ^2 (5) = 60.833, p< .000. The model explained 26.6.0% (Nagelkerke R^2) of the variance in technology adoption, indicating modest improvement in fit and correctly classified 72.5% of cases. The results of the binary logistic model indicated that perceived cost of technology (p=0.001) significantly influenced technology adoption behaviour. It is recommended that the Kenya Government and other stakeholders should provide financial support to small industrialists. The government, through the Ministry of Industrialization, should also formulate policies to promote low cost technologies to enable small engineering firms to compete globally.

Keywords: cost, determinant, technology adoption, small engineering firms, Kisumu city, Kenya

Introduction
In recent years, rapid technological progress has heightened the strategic importance of new technologies in a competitive marketplace (Porter & Miller, 2005). In contemporary technology-driven world economies, new innovations develop rapidly, and managers have to constantly make adoption decisions. Companies often invest in new technologies in the hope to gain competitive edge across the market (Clemons, 2001; Parsons, 2004). The varied process and pattern of new technology adoption has attracted much scholarly attention in recent years. However, a clear consensus has not yet been reached over specific set of determinants that could provide a valid explanation of variation in adoption of new technologies in light of temporal and spatial differences (Karshena & Stoneman, 2008). Looking at the very complex socio-economic core of the adoption process, it is not surprising that such consensus has not been reached.

Generally, technology adoption could be impacted in seven key areas: functional performance, acquisition cost, operating cost, ease-of-use, reliability, compatibility and serviceability. Functional performance is the characteristic of how the technology will perform. Acquisition cost is the cost of technology that adopters have to pay in order to possess the product. Ease-of-use is referred to as how easy to users in order to use the technology. Operating cost is the cost that occurs when a user utilize the technology. Reliability relates to how free the technology is from mal-functionality, including its useful lifetime. Serviceability refers to how long it takes and how expensive it is to repair the technology if it breaks down. Compatibility is the way that the new technology fits with other existing devices or business requirements.

The most frequently cited model addressing technology adoption process is the technology acceptance model (TAM), which identifies the relationships between perceived attributes of a technology, attitudes toward a technology, behavioural intention to use technology and actual usage. The theory employs the perceptions towards a technology, perceived usefulness and perceived ease-of-use, as main determinants explaining the adoption process. Perceived usefulness is referred to as the degree to which an adopter believes the new technology would improve job performance, and perceived ease-of-use refers to an adopter's perception of the minimum effort required for the use of new technology.

Several factors determine a firms' adoption of a new technology. These varied factors can be grouped into several homogeneous categories as follows: internal resources and absorptive capability of the firm; demand and market conditions; perceived benefits (incentives); and linkages to external sources of knowledge.

Business Environment and Adoption of Technology by Small Engineering Firms
The adoption of technology by small engineering firms is affected by business environmental factors such as extent of competition, government policies and customer requirements. Past studies have found that external pressures such as competition, government policies and customer requirements play a critical role in technology adoption by small firms

(Beatty, 1998; Webster, 1994; Swatman & Swatman, 1991). A study conducted by Beatty (1998) has shown that external pressure has a positive relationship with technology adoption intentions, although this relationship is not significant. One possible reason is that some engineering SMEs are not involved in the global business and technology adoption. Therefore, there is not much pressure from customer or suppliers to adopt technology in their business operations.

The extent of competition refers to the business environment. Economists generally argue that the extent of competition increases the likelihood of innovation and technology adoption (Link & Bozeman, 2001). Tough rivalry pushes small engineering firms to be innovative. Empirically, studies have shown that more intense competition is associated with higher adoption rated of technology in large firms. Porter and Miller (2008) suggest that by adopting technology, businesses will be able to compete in three ways. Technology can change the industry structure and, in so doing, alter the rules of competition. Technology can also create competitive advantage by giving businesses new ways to outperform their rivals.

Finally, advances in technology gives birth new small engineering firms, often from within existing operations of the firm. Therefore, small engineering firms that are more competitive would feel a greater need to turn to technology adoption to gain competitive advantage. On the other hand, such small businesses in a less competitive environment may not feel the push to be more innovative. Therefore, the greater the extent and level of competition, the greater the likelihood of technology adoption (Lange, Ottens & Taylor, 2000) [16].

For many firms, pressure to keep up with the competition, provide a means to enhance survival and/or growth, manage change, promote services to customers and stay competitive and/or enhance innovation abilities have forced them to adopt technology. Existing literature suggests that as small businesses are susceptible to customer pressure, they are forced to adopt technology as a result of demand from customers to develop efficiency of their inter-organizational dealings. Therefore, it has become an indispensable strategy for firms to have these technologies. Meanwhile other scholars suggest that the main driving force to technology adoption in firms are internal factors, including industry changes and trends, maintaining current market, finding new markets, opportunities for growth and the necessity to keep up with competition. A more inclusive view on the innovation literature draws attention to relevance and importance of both internal and external drivers for change. Mehrtens *et al*. (2011) [20] observe that the issue of credibility has risen as a significant motivator for adopting IT tools within SMEs.

A study by Dutta and Evrard (2007) [9] on European small enterprises has shown that the main focus of European small enterprises is to make use of technology to deliver a superior level of customer service and better communication with distant partners/customers. Moreover, a study by Prem kumar and Roberts (2009) [27] on rural small businesses suggests that external pressure and competitive pressure are important determinants to the adoption of ICTs. Likewise, client and supplier pressure to adopt technology are important factors influencing the levels of IS/IT adoption and success in Portuguese manufacturing SMEs (De Burca, 2010) [7].

Porter and Miller (2008) argue that the nature of competition might change through the adoption of technology. They posit that technology has changed the rules of competition by changing industrial structure, creating competitive advantage by delivering businesses in new ways to outperform their competitors and spawning new businesses by making new business technologically feasible, creating demand for products and regenerating old businesses. SMEs active in industries having a high rate of innovation and intense competitive challenge are more likely to perceive IT tools as a stronger driver for strategic change than those in other types of industries. A study by Pontikakis (2005) on technology adoption within Greek SMEs has suggested that highly competitive industries are often technologically intensive and SMEs operating in innovation-intensive industries might face intense competition initiated by innovations than those who are generally inclined to be more risk-averse.

Efforts to establish a national information infrastructure in the US, Singapore and Malaysia have shown that governments have a role to play in providing a legitimate and positive leadership innovation and adoption in the increasingly digital modern economies (Tan, 2008) [34]. Perceived cost was not found to have any direct impact on technology adoption. One possible reason is that recently, the Malaysian government has been providing all types of financial support to the small engineering firms, due to the promotion of technology by the government through Multimedia Super Corridor (MSC) and Small and Medium scale engineering Industries Development Corporation.

According to Lim (2006), most small engineering firms in Malaysia realize that technology is critical to the productivity and performance of their companies. However, implementation and maintenance of these technology systems is restricted due to inability to handle, owing to high staff turnover and lack of technology project management expertise. Lim (2006) also stresses that many Malaysian family-based SMEs are still operating their business the conventional way. Consequently SMEs which have invested in technology systems fail to implement and maintain these systems successfully.

Similarly, Tan (2006) [34] argues that technology in Malaysia is facing big challenges due to the government policies and slow adoption of technology by SMEs in Malaysia. In addition, small engineering firms must learn to adopt technology to increase their global competitiveness (Premkuma & Roberts, 2009) [27]. According to the literature, significant positive relationships could be found between technology adoption and government support. Because of their size and lack of resources, firms generally depend more on external resources and support than other companies. According to Fink (2008) [10], government support for facilitating information transfers to SMEs is incrementally increasing. Government initiatives and policies could directly and/or indirectly stimulate the development of technology infrastructure and information provision to energize faster technology diffusion.

A study by Tan *et al.* (2012) [34] has found that Malaysian SMEs generally disagree with the view that cost is a significant determinant of technology adoption. Tan *et al.* (2012) [34] posit that since most SMEs are aware of government financial support and incentives, ICT costs are not regarded as a major barrier by Malaysian SMEs. This view is empirically supported by Alam and Noor (2012) [2] who has demonstrated that technology adoption in Malaysian SMEs is not directly affected by perceived technology costs. According

to them, the underlying rationale is that all types of financial support to these businesses have been provided by government for ICT adoption. For example, Malaysian SMEs do not perceive the costs of training required for successful IT adoption as a barrier since government agencies have offered and provided a number of necessary training programs. Therefore, it could be concluded that, with regard to the supportive policies and comprehensive technology support provided by the Malaysian government, for example through the Malaysian Technology Development Corporation, Multimedia Super Corridor (MSC), newly established SME Bank, and Small and Medium scale Industries Development Corporation (SMIDEC), the IT adoption process seems to be considerably simplified for Malaysian SMEs.

Customer requirements on the adoption of technology in small engineering firms have become critical. According to Courtier and Gilpatric (1999), small engineering firms must survey customers' requirements on a regular basis in order to understand factors that can affect their adoption or usage of technology. Since the onset of technology in Kenya 1990, the number of online customers has been very low. However, there has been a notable increase as firms continue to intensify marketing and the infrastructures continues to mature. Privacy and security are perceived to be the most important issues that inhibit customers from using technology. Yamakawa (2012) observes that businesses are increasingly reliant on technology to gain and retain a competitive edge. Technology is under pressure to provide services that meet the current and future needs of the business driven by changes in the market and in the needs or requirements of the customers (Scupola, 2003) [33].

Initially it was a challenge to actually demonstrate the value of technology in service delivery in an organization. This was because emphasis was always put more on how to control or reduce cost rather than how to actually prove definable value is being gotten from something that is not very visible. In the recent years most firms have developed innovative products and offered a wider range of services in an effort to increase customer satisfaction, requirements and efficiency, which is their main goal. More recent developments in technology have provided the opportunity for customers to access services without necessarily going to the branches.

This technological development has intensified in recent years and has led to the reduction of costs (Mutula & Brakel, 2006) [22].

Patterns of Technology Adoption

Numerous theories have been put forward to interpret patterns of new technology adoption. The technology adoption elements highlighted by these theories include: the role of information and time; the cost-performance of technology relative to other production factors; individual firm characteristics such as size, age, or ownership; managerial and labour qualities; industry, product and market factors; inter-firm linkages and relationships; spatial agglomeration and proximity; aggregate business and economic conditions, and the institutional and policy environment (Carter & Williams, 2007) [5].

A series of empirical studies have sought to operationalize and measure the importance and direction of these various elements. These studies have not always been conclusive and in agreement, but the weight of evidence to date suggests that new industrial technology adopters can be characterized by several features. They are generally companies with relatively better trained workers who are also more likely to be better paid and unionized (Mansfield, 2009; Romeo, 2005) [19]. Such companies are more active in promoting internal and external informational sources for new technology and development (Globerman, 2005). This includes greater reliance on assistance from customers, suppliers, and other firms. In addition, they are more likely to employ other new technologies and be drawn disproportionately from newer plants (Besant, 2002) [4]. In addition, technology adopters are more likely to be found where customers are demanding and supportive. They are also more likely to be prevalent in urban agglomerations and other locations where positive industrial, information and technological externalities exist (Rees *et al.*, 2004).

However, on other attributes there is little consensus among researchers. For example, no simple significant relationship seems to exist between technology adoption and firm sales or employment growth (Davelaar, 2004) [6]. More fundamentally, changes in business, technological, and policy environments have stimulated fresh argument about the factors favouring technological adoption and the impact of new policy interventions. Thus, despite the disproportionate influence, past studies have ascribed to urban agglomeration, recent success stories among semi-rural regions in Denmark, Northern Italy, and Japan have pointed to a broader constellation of regional social, economic, and institutional variables that may affect technological adoption behaviour (Friedman, 2001; Hansen, 2003) [11]. It has also been argued that global transformations in markets, technology, business, and society have diminished the advantages of size, making it easier than previously for smaller firms to develop and adopt flexible new technologies and successfully compete against larger firms (Piore & Sabel, 2004).

Cost of Technology and its Adoption

Cost of technology is critical to effective and efficient adoption by small engineering firms. Rashid and Al-Qirim (2001) stress the need to analyse the technology characteristics, especially in terms of cost in which the potential adopter is expected to use or adopt the technology. This process entails identifying the relevant physical and use characteristics of the instructional situation, cost of technology and the support system. The approach is intended to ensure actual, correct and continual technology use and adoption. Cost of technology affects the four basic areas of: hardware, software, personnel and space.

The hardware refers to all of the equipment necessary for data input, processing, communication and archiving (e.g., personal computers, servers, routers, network cabling or wireless access points, and storage devices). One should also factor in the equipment necessary to insure system reliability, including battery backup systems, off-site data storage and fail-over systems and even on-site emergency power generators. Software includes all of the programs required to keep the organization functioning. This should include system software such as the operating systems, database management systems, network operating systems, data communication software, and compilers (in the event that the organization is developing their own applications). Personnel represents all of the people required to keep the systems working, including management,

developers, implementers, technicians, and those charged with system and application maintenance.

Space number should reflect the costs to purchase, maintain and manage the space or real estate required to house all of the personnel and equipment associated with the IT department. In addition to the purchase price, rent or leasing fees and their associated amortization and depreciation costs, one should also factor in the costs of providing heat, lighting and cleaning services within these areas (Rullani & Micelli, 2008) [32].

Dong and Fleischer (2009) [8] maintain that cost of the technology encourages technology usage and better user performance, adoption of the technology itself, influences positive user perceptions and improves the overall technology adoption uptake. Similarly, Gambatese and Hallowell (2011) [12] have found that effective upper management cost control on technology used was one of the strongest enablers on innovation implementation in engineering firms.

Cost of the technology is viewed as a clear commitment and allocation of sufficient resources to the innovation and if needed active involvement in managing change and innovation adoption (Gambatese & Hallowell, 2011) [12]. According to Neufeld *et al*. (2007) [23], cost of the technology plays a crucial role in determining technology implementation success and failure. Baldwin and Lin (2002) [34] have carried out a survey of Canadian manufacturers on impediments of advanced technology adoption and found out that cost related factors were the most impediments of technology adoption among the users compared to non-users. Today's businesses are facing increased competition and are under pressure to cut costs. They face escalating labour, energy or material costs and are concerned about their business's environmental impact.

It is imperative that managers consider the elements of technology costs (hardware and software) closely during technology adoption process within small engineering firms. From a similar perspective, Walczuch *et al.* (2010) [35] have studied internet adoption barriers for small firms in the Netherlands and explained that high costs are the important reason for Dutch small firms not having internet access and their own websites. Moreover, most US businesses have significant difficulty affording the costs of technology tools while 90% of these businesses consider lack of financial resources and skills as the main barriers to ICT adoption (Premkumar & Roberts, 2009) [27].

With regard to the financial constraints experienced by the majority of the small engineering firms, as well as the high start-up costs of technology or very expensive software or ready-to-use online packages, it is expected that the firms generally cannot afford to adopt technology or reap its benefits through the effective use of technology, in short or medium period of time. Premkumar and Roberts (2009) [27], however, argues that technology adoption cost is not a significant factor in determining adoption within small engineering firms.

This view is empirically supported by a study by Tan *et al*. (2009) who says that despite technology costs being one of the major risks perceived by engineering firms, there are no significant associations between high technology infrastructure costs and technology adoption in these businesses. Love *et al*. (2011) [17] argue that although the prices of hardware and software have noticeably decreased and become more affordable, the difficulty of estimating the costs of technology adoption (which leads to uncertainty about anticipated technology benefits) is still a significant barrier to technology investment in small engineering firms. According to Love *et al*. (2011) [17], although IT's direct costs result from the implementation of new technology, these direct costs are usually underestimated and regarded as the cost of hardware, software and installation. It is suggested that beside initial costs of software and hardware, costs of technology implementation should include personnel training and development expenses, as well as costs of post implementation. In addition, indirect costs of technology adoption may be more significant than direct costs. Indirect costs also comprise the early cost of any temporary loss in a firm's productivity, human factors costs, organizational costs for transforming from former systems to new work practices, and costs associated with any changes to systems and business procedures, while management time is the main, considerable indirect cost in various organizations.

With regard to the aforementioned perspectives, it could be inferred that cost is still regarded as an essential issue when it comes to adoption and implementation of technology in small engineering firms. The rationale behind it is that in spite of decreases in the initial and direct costs of technology adoption, such as costs of hardware, installation and configuration, software and/or licensing in recent years, small engineering firms, characterized by minimal financial resources, typically experience difficulty in estimating and affording total and long-term expenses associated with technology adoption. It should be noted that, in addition to direct costs, such as hardware, software and installation costs, IT adoption expenses also go beyond indirect costs. They include costs of staff training and motivation, transformation from old to new systems in terms of procedures and organizational structure, as well as post IT implementation expenses, cost of management time and effort, productivity losses and finally expenses encompassing the costs of maintenance and development.

Statement of the Problem

The growth and survival of firms is linked both to the creation of new products and services and to the adoption of novel ways of doing business whilst constantly improving the internal business processes, procedures, policies and business models (Damanpour & Schneider, 2006). High-technology firms try to incorporate the more advanced technology into their processes and products in order to find new market niches and to reap available profits before other firms introduce competing products. Lower-technology firms must also remain competitive. As such they must use the latest state-of-the-art technology in their operations.

Small engineering firms have stood out due to the important role they play in nations' economic development, especially in job creation; however, technology is one the factors apart from lack of managerial skills, finances, regulatory issues and access to international markets that hamper their developments (Abor & Quartey, 2010) [1]. Although small engineering firms are considered the key drivers of economic growth any country, most of these firms in Kenya discontinue or remain inefficient. According to Muchara (2009) [21], most manufacturing companies in Kenya continue to fold up because they cannot match competition from imported cheap quality products.

Most manufacturing firms in Kenya still apply traditional technology which is labour intensive, time consuming,

inefficient and uneconmical. There is, therefore, a gap between imported goods, which are cheap and of high quality, and locally manufactured ones. The manufacturing sector in Kenya decelerated from an expansion 3.4 per cent in 2011 to a growth rate of 3.1 per cent in 2012 due to, among other reasons, high cost of production and stiff competition from imported goods (Kenya National Bureau of Statistics [KNBS], 2013) [14].

Kenya's manufacturing sector has also been marked by unproductivity, inefficiency and excessive reliance on out-dated imported technology. Most engineering firms in Kenya still use the out-dated manufacturing technology which makes their products expensive and uncompetitive both locally and internationally. The use of modern technology can make locally manufactured products more competitive in terms of quality and price. Kenya expects to become a middle-income nation by the year 2030, capable of providing a high quality life for Kenyans (Republic of Kenya, 2007) [30].

For this goal to be realized small engineering firms, considered a part of SME sector, must be put into the plan. The Kenya Vision 2030 identifies strategies in science, technology and innovation as key to the development of SMEs in Kenya. Tan *et al*. (2009) [34] and Premkumar and Roberts (2009) [27] argue that the cost of technology does not significantly affect its adoption. On the other hand, Neufeld and Davis (2007) [23] and Dong and Fleischer (2009) [8] posit that cost plays a significant role in technology adoption. Perceived usefulness is an important factor in determining technology adoption (Teo & Tan, 2002; Chan-Olmstead & Chang, 2003; Lugmayr, 2009) [34, 18]. Nevertheless, Lin (2004) [17] argues that perceived usefulness does not significantly affect technology adoption. While past research has explored the factors that are related to the adoption of technological innovations by organizations (Kimberly & Evanisko, 1982; Meyer & Goes, 1988) [15], most studies do not agree on perceived determinants of technology adoption and little research has examined the relationship between attributes of technology and its adoption as well as subsequent performance of these organizations, especially small engineering firms (Irwim *et al.,* 2009). This paper, therefore, examines the relationship between perceived cost of technology and its adoption by small engineering firms in Kisumu City, Kenya.

Materials and Methods

The study targeted 287 registered small engineering firms in Kisumu city central business district (County office, 2015). The choice of Kisumu city was based on the fact that the city has the largest metal market in East and Central Africa known as Kibuye market. The specific participants were owner-managers since they are the decision-makers on whether to adopt technology or not. The study used pragmatism as the research philosophy. Pragmatism relates to matters of fact or practical affairs often to the exclusion of intellectual or artistic matters: practical as opposed to idealistic. The study also adopted an explanatory survey design.

The main factor considered in determining the sample size was the need to have the right representation of the research population that is manageable enough. This enabled the author to derive from it detailed data at affordable costs in terms of time, finances and human resources (Creswell, 2003). The firms that were included in the study were selected using stratified sampling technique. The basis of stratification was the size of the firm. Only those firms that were registered with the Kisumu County trade office were included in the study.

Census technique was also used to select small engineering firms in Kisumu City central business district (CBD). Questionnaire, interview schedule, participant observation and content analysis were the main instruments used for data collection. For analysis, the author fitted the study observations into a table where an observation of each category for firms was counted in each corresponding cell of the table and analysed appropriately. The approximation for the Chi-square value was improved by using an adjustment known as "Yates correction for continuity." This gave the researcher a p-value whose strength was used to measure the significant relationship between the study variables. All data was analysed at a level of significance of 0.05 and at appropriate degrees of freedom. This value (α=0.05) was chosen because the sample size was adopted from figures calculated on the basis of 0.95 level of confidence. Once analysed, the data was presented in form of tables, charts, frequency counts and percentages. A logistic regression analysis was also computed and findings presented in form of a logistic curve.

Results and Discussion

Effect of perceived Cost of Technology on its Adoption

The study sought to establish the effect of perceived cost of technology on its adoption. The results were as presented in Table 1 below.

Table 1: Effect of perceived Cost of Technology on its Adoption

Perceived cost	Mean	% mean	SD	Kurtosis	Skewness	Skewness error
Acquisition cost	4.57	91.4	0.496	-1.936	-0.28	0.147
Delivery cost	4.54	90.8	0.499	-1.989	-0.161	0.147
Training cost	4.55	91	0.498	-1.972	-0.205	0.147
Installation cost	4.58	91.6	0.495	-1.908	-0.325	0.147
Transition cost	4.59	91.8	0.493	-1.876	-0.37	0.147
Maintenance cost	4.63	92.6	0.484	-1.717	-0.543	0.147
Replacement cost	4.64	92.8	0.482	-1.680	-0.576	0.147

Source: Field Research (2016)

The study findings revealed that 91.4% (mean=0.496) of the respondents were of the opinion that acquisition cost of technology determined its adoption, 90.8% (mean=0.499) of them said that delivery cost of technology determined its adoption, 91.0% (mean=0.498) held the view that training cost of technology determined its adoption, 91.6% (mean=0.495) of the respondents were of the view that installation cost of technology determined its adoption, 91.8% (mean=0.496) of

the research participants were of the opinion that transition cost of technology determined its adoption. The findings also showed that 92.6% (mean=0.484) of the respondents indicated that maintenance cost of technology determined its adoption and 92.8% (mean=0.482) of them said that replacement cost of technology determined its adoption.

The owner-managers all agreed that perceived cost of technology was an important determinant of technology adoption. Since managers and owners are in business with the sole objective of profit maximization, they will always focus much attention on cost of technology compared to other determinants. These findings concur with those of Neufeld and Davis (2007) [23] who state that cost of technology plays a vital role in technology adoption. The findings, however, contradict those of Premkumar and Roberts (2009) [27] who argues that cost of technology is not a significant factor in its adoption.

The study findings further revealed that the skeweness and the kurtosis of the main finding was within the acceptable limits of -3 and + 3. This implies that the main finding was correct for interpretation. From the results of the research majority of the respondents were of the opinion that replacement costs were a determinant of technology adoption. This means that replacement costs were highly perceived by the respondents as the determinant of technology adoption. As such, technology innovators should come up with technologies that are affordable to small engineering firms.

Hypothesis Test Results

It was hypothesized that the perceived cost of technology has no statistically significant effect on its adoption by small engineering firms in Kenya. A logistic regression analysis conducted on perceived cost of technology and its adoption was statistically significant, χ^2 (1) = 24.498, p< .000. The model explained 11.4.0% (Nagelkerke R^2) of the variance in technology adoption, indicating modest improvement in fit over the baseline model and correctly classified 67.8% of cases. The results of the binary logistic model indicated that perceived cost of technology (p=0.000), added significantly to technology adoption was 1.85 times more likely to increase the likelihood of technology adoption as shown in Table 2 below.

Table 2: Logistic regression Results of perceived Cost on Technology Adoption

Omnibus Tests of Model Coefficients							
		Chi-square		df		Sig.	
Step 1	Step	24.498		1		.000	
	Block	24.498		1		.000	
	Model	24.498		1		.000	
Model Summary							
Step		-2 Log likelihood		Cox & Snell R Square		Nagelkerke R Square	
1		351.703[a]		.085		.114	
Classification Table[a]							
	Observed		Predicted				
			Adoption			Percentage Correct	
			Do not adopt		Adopt		
Step 1	Adoption	Do not adopt	64		53	54.7	
		Adopt	36		123	77.4	
	Overall Percentage					67.8	
Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	PC	.615	.127	23.345	1	.000	1.850
	Constant	.329	.128	6.620	1	.007	1.389

a. Variable(s) entered on step 1: PC.

Source: Field Research (2016)

The study findings concur with those of Dong and Fleischer (2009) [8] who argue that the cost of technology significantly influences its adoption. The authors suggest that it is imperative that managers closely consider elements of IT costs (hardware and software costs) during IT adoption process within firms. Premkumar and Roberts (2009) [27], however, argue that IT adoption cost is not a significant factor in determining adoption within Firms. This view is empirically supported by Tan *et al*. (2009) [34] who posit that despite IT costs in one of the major risks perceived by Malaysian Firms, there are no significant associations between high costs of ICT infrastructure and ICT adoption in these businesses. The authors suggest that although the prices of hardware and software have noticeably decreased, the difficulty in estimating costs of IT adoption continue to be a significant barrier to IT investment in firms.

According to Love *et al.* (2005) [17], although direct costs of IT result from the implementation of new technology, these costs are usually underestimated. Premkumar and Roberts (2009) [27] observes that besides the initial costs of software and hardware, costs of IT implementation should include personnel training and development expenses as well as costs of post implementation.

In addition, indirect costs of IT adoption may be more significant than the direct costs. Indirect costs comprise the early cost of temporary loss in firm's productivity, costs of human factors (e.g. training), organizational costs raised from transformation from former system to new work practice, and costs of any changes to the systems and business procedures, whilst management time is the main considerable indirect cost in various organizations. Gambatese and Hallowell (2011) [12] have found that effective upper management cost control on technology used is one of the strongest enablers in innovation implementation in engineering firms. The cost of the technology is viewed as a clear commitment and allocation of sufficient resources to the innovation and if needed active

involvement in managing change and innovation adoption (Gambatese & Hallowell, 2011) [12]. Studies by Neufeld and Davis (2007) [23] and Piore and Sabel (1984) [26], Parasuraman and Colby (2001) [25] and OECD (2004) [24] all concur that the cost of the technology plays a crucial role in determining technology implementation n success and failure.

Conclusion and Recommendations

The study findings established that perceived costs of technology influences the adoption of technology by small engineering firms in Kenya. The firms have various technologies including those for automated inspection, numeric control, and pick-up and place robots among others.

Perceived cost of technology is, therefore, a significant determinant of adoption of industrial technologies by small engineering firms in Kisumu city, Kenya. As such, it is recommended that the Government and other stakeholders should provide financial support to small industrialists. This may be done by increasing access to credit from financial institutions that provide tailor made services to industrialist. The government, through the Ministry of Industrialization, should formulate policies to promote low cost technologies to enable small engineering firms to compete globally.

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