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The Role of Compatibility in Technology Adoption among Automobile Mechanics in Micro and Small Enterprises in Kenya

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Micro and Small Enterprises (MSEs) are facing tremendous challenges and threats to survive in a competitive environment. As a matter of fact, MSEs are faced with the threat of failure with past statistics indicating that three out five fail within the first few months. In spite of this fact, automobile mechanics in this informal sector have been slow in adopting modern technology despite the advantages that are attributed to new innovations. This study aimed to determine factors that influence technology adoption among automobile mechanics in micro and small enterprises in Nakuru town; Kenya. One of the specific objectives of the study was to establish the role of compatibility in the adoption of technology. The research used a descriptive cross sectional survey design and employed both probability and non-probability sampling techniques to collect quantitative and qualitative data. Applying the Binary logistic regression analysis and using SPSS to analyze, the study found that, adoption of various modern automobile technologies are influenced; among other factors, the perceived attitude in terms of compatibility of a particular innovation. However, it was revealed that although a larger proportion of the innovations are compatible, adoption to the same is significantly quite low. The study recommended that the government should emphasize and create an innovation awareness system and invest in appropriate technology by way of developing relevant training curriculum for the mechanics based on industry and environmental needs. This study is significant as its findings, if implemented; can jump-start the informal mechanics towards achieving quality, competitiveness and both human and environmental safety.

Key words: *Compatibility, Micro and Small Enterprises, Appropriate technology, Technology adoption*

1.0 INTRODUCTION

1.1. Small and Micro Enterprises in Kenya

Small and micro enterprises in Kenya represent a vital part of the economy, being the source of various economic contributions through; the generation of income via exporting and importing, providing new job opportunities, introducing innovations, stimulating competition, and engine

for employment. Intellectual capital appears as the most important and vital component of a knowledge-based economy. The role and importance of small and medium enterprises in a knowledge-based economy has been highly appreciated and acknowledged. Moreover, in the present economy, small and medium enterprises are facing tremendous challenges and threats to survive in a competitive environment. The impact of intellectual capital on the general performance of the Small and micro enterprises has become a very important issue now than ever, this is due to the level of globalization of whose outcomes are privatization and deregulation of markets, aggressive competition and the ever-rising expectations of customers. As a result of this, there is need for businesses to be at their best in order to be relevant in the environment (Karanja, Gakure, Were, Ngugi & Kibiru; 2012). The paper therefore examines the influence of compatibility of modern automobile technology and the rate of adoption to innovations among the mechanics operating in micro and small enterprises in Kenya.

1.2. Technology Adoption

Understanding the factors influencing technology adoption helps us predict and manage who adopts, when, and under what conditions. Armed with this information we can assess where people are in the adoption process and support them as they move from technology acceptance through to usage. The process of adopting new innovations has been studied for over 40 years, and one of the most popular adoption models is described by Rogers' foundational analysis and set of practices and categorizations that have informed innovation studies over the last several decades. Rogers (1995) described technology diffusion as 'the process through which an individual or other decision maker unit passes from first knowledge of an innovation, to a decision to adopt or reject, to implementation of the new idea'. He further asserted that diffusion involves two different actors: company or organization who will adopt the innovation or new technology and users or individual or organizations who will use the products or services regarded as new. Rogers (1995) conceived of the five attributes that influence technology adoption in the following ways: "Relative advantage; the degree to which an innovation is perceived as being better than the idea it supersedes. The degree of relative advantage is often expressed as: economic profitability, social prestige, or other benefits, compatibility; the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. An idea that is more compatible is less uncertain to the potential adopter, and fits more closely with the individual's life situation. Such compatibility helps the individual give meaning to the new idea so that it is regarded as familiar. Complexity; the degree to which an innovation is perceived as relatively difficult to understand and use. The more simplistic and less complex the innovation is, the easier it is for someone to adopt. Trialability; the degree; to which an innovation may be experimented with on a limited basis. A trial is a way for a potential user to alleviate any hesitancy or doubt that they might have. The fifth attribute that can help explain the rate of adoption is observability. Observability is the degree to which the results of an innovation are visible to others (Rogers, 1995). Given the complexity of modern automobile innovations, the Rogers model is the most suitable in attempting to explain various factors that influence adoption of technology within

the informal automobile mechanics. This paper sought to determine, specifically; the role of relative advantage in technology adoption.

Technology has been defined as "knowledge required to produce goods or services" and, alternatively, as "the application of practical or mechanical sciences to industry or commerce and the methods, theory and practices governing such applications." Whichever definition is applied, the advantages of technology are no longer a contentious issue, either in developed or in developing economies. What is at issue is the lack of policies that enhance access to it. (Russel, 1998). Technology is the means for adding value to goods, materials or resource in order to generate useful products or services. Thus industrial development is strongly related to the process of adding value to goods or materials and there from create a surplus (wealth creation). And technological capability is the key for doing this. A credible industrial development programme must be hinged on the availability of active indigenous technological capability. Technology has emerged in recent times as one of the key strategic variables in economic development. In Africa, technology as an instrument of change is now receiving special attention in national planning. However, there are still many issues requiring urgent attention before access to new technologies can diffuse and assimilate in Africa. Inventors, innovators, SMEs and R&D organizations constitute the pillars on which technological capability is constructed. And indeed it is through these bodies, often working in concert, that technology is nurtured, acquired, assimilated and fueled to power industrialization (Caryannis & Eric, 2006).

1.3 Statement of the Problem

New technologies come with various social and economic advantages. In the case of automobiles, Electronic Fuel Injection (EFI) systems have evolved significantly since the mid 1980s. These systems provide an accurate, reliable and cost-effective method of metering fuel and providing maximum engine efficiency with clean exhaust emissions, which is why EFI systems have replaced carburetors in the market place. EFI is becoming more reliable and less expensive through widespread usage. At the same time, carburetors are becoming less available, and more expensive. Virtually all internal combustion engines, including motorcycles, off-road vehicles, and outdoor power equipment, may eventually use some form of fuel injection (Wang, Jin, Wang, M. & Wei, 2010). Adoption of modern technology ensures accurate and reliable diagnoses, repair and or service of vehicles by use of on-board diagnostic scanners and thus lowering maintenance costs as in fuel consumption and less frequent repairs, maximum safety and a cleaner environment. Unfortunately, a significant proportion of motor vehicle mechanics in Kenya are yet to appreciate these relative advantages. It is critical for the informal mechanics to adopt and appreciate the advantages of modern automobile technology in order to alleviate the possible challenges.

1.4 Study Objectives

The general objective of this study was to assess the determinants of technology adoption among automobile mechanics in micro and small enterprises in Kenya. The specific objective was to determine the influence of compatibility on technology adoption within the informal automobile mechanics in Nakuru town.

1.5 Hypothesis

H_0: Compatibility has no influence on adoption of technology within the informal automobile mechanics in Nakuru town.

LITERATURE REVIEW

2.1 Theoretical Framework

This decision of whether an individual will adopt a particular technology and the time frame involved with that decision has been a long source of research across multiple disciplines, and it influences business, school, and everyday life. However, the concept of technology literacy is increasingly becoming integrated into mandated curricula (Barron, Kemker, Harmes, & Kalaydijian, 2003). Adoption theory examines the individual and the choices an individual makes to accept or reject a particular innovation. In some models, adoption is not only the choice to accept an innovation but also the extent to which that innovation is integrated into the appropriate context. Adoption theory, then, is a micro perspective on change, focusing not on the whole but rather the pieces that make up the whole while diffusion theory takes a macro perspective on the spread of an innovation across time. In contrast, diffusion theory describes how an innovation spreads through a population. Rogers (2003) argued that innovations offering more relative advantage, compatibility, simplicity, trialability, and observability will be adopted faster than other innovations. Rogers does caution, “getting a new idea adopted, even when is has obvious advantages, is difficult” (p. 1), so the availability of all of these variables of innovations speed up the innovation-diffusion process. Research showed that all these factors influenced one’s likelihood of adopting a new technology into his or her operations (Anderson et al., 1998).

2.2 Perceived Compatibility

This is the degree an innovation is perceived to be consistent with existing values or previous experience and need to the potential adopter. If the adopters require adjusting their existing routine and or the innovation or invention is in contrast to their attitudes, the more unlikely they are to adopt it (Zaltman & Lin, 1971). In addition the user’s previous experience of adoption of new tools, whether this was a positive or negative experience will also influence the adoption of technology. A negative previous experience can result in innovation negativism which is where a negative previous experience with one innovation can negatively impact the adoption of another. In the case of automobiles, the diagnosis, service or repair of electronic fuel injection and automatic transmission systems is quite different from the traditional

carburetor and manual gearbox systems. In the case of auto-body mechanics' tasks; the introduction and use of fibre glass, aluminium, and hard plastics as auto-body panels has necessitated the development of newer paints like spike hecker, metallics and sadocrylls. The repair of these panels may require complete replacement or advanced welding equipment like the tig and mig welders unlike the conventional arc and oxy-acetylene welders used in the traditional mils steel panels. It is inevitable for the auto-body mechanics to adopt to these innovations if they are to remain competitive in the industry (Growse, 2012).

Compatibility of the innovation needs to align with individual's current values and experiences. The more compatible new automobile technology will be to mechanics and users the less a change of behavior is required, therefore, allowing for faster adoption. If a technology requires mechanics and users to adjust their existing behavior or is in contrast to their attitudes, the more unlikely they are to adopt (Lippert & Forman 2012). In addition the user's previous experience of adoption of new tools in work place, whether this was a positive or negative experience will also influence the adoption of new automobile technology. A negative previous experience can result in innovation negativism which is where a negative previous experience with one innovation can negatively impact the adoption of another (Saxena & Kehar, 2011). This may be a contributing factor among informal mechanics where previous technology has an impact on the perception and future adoption. Compatibility attribute is related to benefit costs in the innovation for the adopters. Individuals or organizations would likely adopt the innovation if it does not drastically disturb the life style of the existing pattern studied e-commerce adoption among owners, presidents and chief executive officers of small and medium enterprises in Thailand. The study randomly sampled 800 participants and conducted an interview to establish factors that influence the rate of e-commerce adoption among the SMEs. Multinomial logistic regression was deployed to analyze the data. Findings of the study indicated that relative advantage, compatibility and observability were positively correlated to the rate of e-commerce adoption while complexity had a negative correlation. In this study, compatibility emerged as the most important factor.

METHODOLOGY

3.1 Research Design

This study was a descriptive research specifically deploying cross-sectional survey to gather information from informal automobile mechanics in Nakuru town in order to establish and assess the role of: relative advantage, compatibility, complexity and observability; in the adoption of modern auto technology. This type of design utilizes different groups of people who differ in the variable of interest, but share other characteristics such as socio-economic status, educational background among others (Saunders et al., 2003). This methodology is suitable for this study because informal mechanics tend to specialize in different areas like: auto-body, auto electrics, petrol and diesel powered engines though they have common socio-economic characteristics. The defining advantages of this design are that, it takes place at a single point in time, it does not involve manipulating variables, it allows researchers to look at

numerous variables at once (training, income, experience) and is often used to look at the prevalence of phenomenon in a given population (Gratton, 2004). Since there is no manipulation of any variable, this design is reliable and if carried out in similar environments, it will yield similar results. This design estimates prevalence of an outcome of interest because the sample is usually taken from the whole population. Since cross-sectional designs generally use survey techniques to gather data, they are relatively inexpensive and take up little time to conduct (Borg & Gall, 1993).

RESULTS AND DISCUSSION

4.1 Logistic Regression Analysis and Testing of the Hypotheses

A logistic regression analysis using the 'enter' method was conducted to generate relevant statistical information and produced the following tables. A test of the full model is presented in Table 4.1.

Table 4.1 Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	35.634	4	.000
	Block	35.634	4	.000
	Model	35.634	4	.000

All variables against a constant only model were statistically significant (Chi-square = 35.634, p < 0.000 with df = 11) indicating that the predictors as a set reliably distinguished between adopters and non-adopters and there is adequate fit of data to the model. This means that at least one or all of the predictors is significantly related to the response variable. Results in Table 4.1 shows that the -2 log likelihood chi-square distribution for the logistic regression has a p value of .000. Hence the study concludes that the four variables are statistically significant. According to Trammer and Elliot (2007), -2 log likelihood is a measure of how well the model explains the variations in the outcome of interest thus the significance of the variables imply they collectively explain variations in technology adoption among automobile mechanics operating in micro and small enterprises. The Hosmer and Lemeshow test of goodness fit was also generated as shown in Table 4. 2.

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Table 4.2: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.963	6	.682

A non-significance (p = 0.682) implies that the model adequately fits the data. Table 4.3 illustrates the summary of the model.

Table 4.3: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	105.527	.245	.765

Nagelkerke's R^2 of 0.765 indicates that there exist a moderately strong relationship between prediction and grouping. Overall the success of prediction was 82.7% (93.8% for non-adopters and 48.4% for adopters) as illustrated in Table 4.4.

Table 4.4: Classification Table

			Predicted		
			Adoption		
	Observed		0	1	Percentage Correct
Step 1	Adoption	0	90	6	93.8
		1	16	15	48.4
	Overall Percentage				82.7

To establish the effect of the hypothesized independent variables on the dependent, the odds ratio (OR), which estimates the change in the odds of membership in the target group for a one unit increase in the predictor was generated. It was calculated using the regression coefficients of the predictors as exponents or exp. SPSS calculated this value of the ln (odds ratio) and presents it as Exp (B) in the results printout in the 'Variables in the Equation' as shown in Table 4.5. In addition; to determine which particular independent variables had effects on the dependent variable, the wald statistics significant levels were also generated.

Table 4.5: Independent variables

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
Relative advantage	-1.191	.528	5.091	1	.024	.304
Compatibility	**2.555**	**.662**	**14.905**	**1**	**.000**	**12.868**
Complexity	-2.080	.662	9.879	1	.002	.125
Observability	1.535	.621	6.108	1	.013	4.642
Constant	-1.846	.503	13.461	1	.000	.158

Compatibility attribute is related to benefit costs in the innovation for the adopters. Individuals or organizations would likely adopt the innovation if it does not drastically disturb the life style of the existing pattern. The odds ratio for compatibility was 12.868 implying that a one unit increase in this variable will increase the chances of a technology to be adopted 12.87 times when all other variables are held constant. The wald statistics criterion demonstrated that compatibility made a significant contribution to technology adoption at 0.01 level of significance (p=0.000).The null hypothesis that compatibility has no influence on adoption of technology within the informal automobile mechanics in Nakuru town is therefore rejected and the alternative one accepted. Therefore, compatibility plays a significant role as far as adoption of a technology is concerned. Compatibility of the innovation needs to align with individual's current values and experiences. The more compatible a technology is, the less a change of working procedure and tools is required, therefore, allowing for faster adoption of automobile technology into the informal setting. If the innovation requires the mechanics to adjust their existing way of doing work, or is in contrast to their attitudes the more unlikely they are to adopt (Zaltman & Lin, 1971).

CONCLUSION

This study unveiled that compatibility plays a role in the adoption of technology. Results indicated that this variable made was significant contribution (p=0.000) at 0.01 level of significance. This is the degree an innovation is perceived to be consistent with existing values or previous experience and need to the potential adopter. If the mechanics require adjusting their existing routine and or the innovation or invention is in contrast to their attitudes, the more unlikely they are to adopt it. This study found that, the diagnosis, service or repair of electronic fuel injection and automatic transmission systems is quite different from the traditional carburetor and manual gearbox systems. In the case of auto-body mechanics' tasks; the introduction and use of fibre glass, aluminium, and hard plastics as auto-body panels has necessitated the development of newer paints like spike hecker, metallics and sadocrylls. The repair of these panels may require complete replacement or advanced welding equipment like

the tig and mig welders unlike the conventional arc and oxy-acetylene welders used in the traditional mild steel panels. It is inevitable for the mechanics to adopt to these innovations if they are to remain competitive in the industry.

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