

Restructuring Kenyan Micro and Small Enterprises for Manufacturing Advantageous Food Products in a Globally Competitive Landscape

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Abstract

Restructuring food manufacturing industry is one of the key strategies prioritized by Kenya to deliver the country's ambitious economic growth and feeding the soaring population, past 40 million people. The purpose of this paper is to investigate if restructuring Micro and Small Enterprises (MSEs) in food manufacturing along competitiveness and innovativeness would enable the MSEs make advantageous products at the global market. A survey was done on 132 (MSEs) in Busia and Nairobi using semi structured questionnaires. The Cronbach's alpha found reliability of questionnaires to be at 0.97, an excellent internal consistency of the items. Due to weak information management system of agro-food processors in Busia County, snowballing sampling techniques was used. Fisher sampling techniques was applied on Nairobi County Government given its numerous food manufacturing enterprises. Data was analyzed using Structural Equation Modeling (SEM) by Amos version 21. It showed that the three of forces of Porter's competitive model causal path was more meaningful than Davis predictors. However, a hybrid of Porter's and Davis forces gave a better model. According to the model, buyers bargaining power, rivalry from incumbent competitors, perceived ease of use and usefulness formed the best model for MSEs in agro-food manufacturing. The study recommended that stakeholders in agro-food industry should restructure the MSE's manufacturing processes to address the modern customers' sophisticated demands and competitors' complexities. Secondly, technology fabricators should design food manufacturing systems that are ease and useful to the MSEs. Finally the study recommended that a food and beverage administration authority be established to assist food manufacturers, borrowing from Singaporean models.

Key terms: Competitive Industry Model, Technology Adoption Predictors, advantageous Product and Micro and Small Food Manufacturing Enterprises

BACKGROUND

Food manufacturing is the practice of transforming raw agriculturally-based inputs into finished food products for human consumption. Beyond increasing variety in food supply, food manufacturing has the ability to enhance shelf-life and reduce safety risks in food products (Monteiro & Levy, 2010). This sector connects the producer and end-user, thus having countervailing effect on both the farmer and the consumer. Its critical roles in feeding the world's surging population, generating jobs and higher incomes from exports has anchored food manufacturing on world platform as a popular topic and focus for agriculturally-dependant economies (Mukherjee et al., 2013). The extent to which the foods

are innovated and processed, according to Monteiro & Levy (2010), gives the food both comparative and competitive advantage on the global market in terms of convenience, nutritional fortification and pricing. Enterprises like countries with highly innovative and advanced food manufacturing systems are likely to create more jobs, increase income and improve customers' health. Empirical evidences have proved that United States, Netherlands, Germany, France, and Brazil have become leaders in food export incomes and built their economies out agriculture by heavily investing in technology (Velthuijsen & Janszen, 2014; Germany Trade & Invest, 2015).

Table1: Top Food Exporters: Competitiveness and Innovativeness relative to Kenya

Country	Export in Billions US\$	Competitiveness (score: 1-7)	Innovativeness (score 0-100)
United States	118.3	5.61	60.10
Netherlands	79	5.50	61.58
Germany	70.8	5.53	57.05
France	68	5.13	53.59
Brazil	55.4	4.08	34.95
Kenya	4.82944	3.85	30.19

Source: Author (2016)

Compiled from Global Reports (Velthuijsen & Janszen, 2014; World Economic Forum, 2016; Cornell University, INSEAD & WIPO, 2015)

The results in Table1 demonstrate that the greater a country was innovative and competitive the bigger the food export output. Brazil is an exception. However reports have that it has highest concentration of innovation in food processing and marketing strategies (Fraser, 2015). The agro-food processors in Brazil have upped in making products that stay longer than 6 months on the shelves, attractive packaging, differentiated, continuous improvement and supermarkets being the main retail distribution channels (Fonseca, 2012). According to the GAIN report, these innovations in agricultural value chain have made Brazil grow its agribusiness sector for the last nine years despite the global economic downturn.

Singaporean economy, a Kenyan comparator with a common history and friendlier relationship; is a net importer of food products due to its limited land resource. Singapore is one of the freest, most innovative and competitive food market in the world recording over US\$ 12.1 billion worth of agri-food imports in 2011 alone (Switzerland Global Enterprise, 2013). This gives Kenya a good global market opportunity. However, Kenyan agro-food processors seem to lose this opportunity because of deficiency in “mechanisms of endogenous growth based on technological learning and innovation” (Annunziata & Martucci, 2008). The Agri-Food & Veterinary Authority (AVA), a safety and standard food agency, cannot let food penetrate the Singaporean market without hazard analysis all the way from the food production and critical control points. It also promotes agro-technology and food supply resilience among food enterprises. According to the Switzerland Global Enterprise (2013), AVA would allow foods from Kenya if they fulfilled the Hazard Analysis and Critical Control Point (HACCP) requirements. The stringent science-based analysis adopted by AVA calls for hi-tech innovations among Kenyan entrepreneurs to manufacture healthier foods, and aesthetically packed and labeled with nutritional information. It is technological innovation, as observed by Otengo et al., (2015), that would enable Kenyan MSEs develop such attractive products, services, marketing methods and production processes that would meet HACCP standards.

Statement of the problem

Agriculture being a powerhouse of the Kenyan economy, advancement in competitiveness and innovativeness of agri-food manufacturing sector would make Kenya realize improved quality of life of its people and become a middle-income economy. Currently, the country's agro-food processing enterprises are portraying dismal performance; producing goods with very little innovations and quality that make them inferior for export. Though Kenya is the most industrially developed country in the region (UNIDO, 2013), it ranks very low globally in competitiveness, innovativeness and productivity. Out of over 140 countries, it is number 99 in terms of competitiveness (World Economic Forum, 2016) and number 92 in innovativeness (Cornell University, INSEAD & WIPO, 2015). Ipso facto, 91% of the agricultural exports are in raw, crude or semi-processed state causing low employment rate, declining commodity prices and stiff competition from cheap imports (Republic of Kenya, 2012). According to the National Agribusiness strategy, the dismal performance is a function of low uptake of science, technology and innovation among other factors. In this paper, the study investigates if restructuring MSEs along competitiveness and innovativeness could make them produce advantageous food products that increased income, met sophisticated market demand and differentiated products.

Objectives of the study

The principal objective in this study is to unearth if modeling Kenyan MSEs along technology and competition would make them come up with advantageous foods.

Hypothesis

In an evidence-based research, hypothesis should follow the primary objective to define specific aims of the study (Farrugia et al., 2010). In light of the advice, the study hypotheses are:

H₀1 Porter's three competitive forces (Bargaining powers of buyer, supplier and threat of competitors) has no effect on manufacturing advantageous food products

H₀2 Technology adoption model predictors (PEU, PU and BI) have no significant effect on making advantageous food products

LITERATURE REVIEW

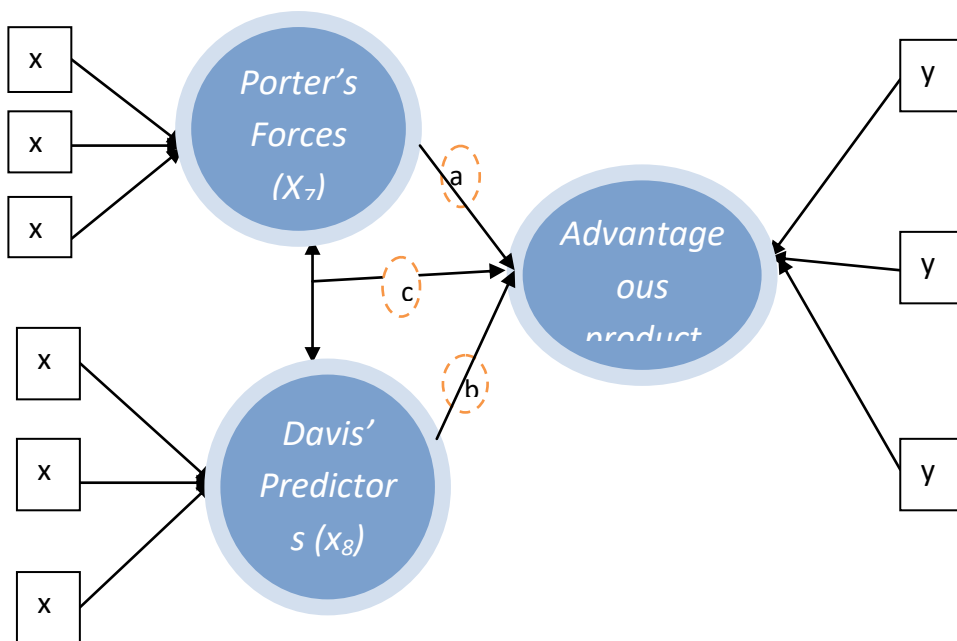
Innovation has been found to cause high productivity, quality management and service excellence among Micro and Small Enterprises (MSEs) (Otengo *et al.*, 2015). Consequently several theories and studies have been mounted to explain technology adoption among companies to leverage such gains in a competitive global business environment. In this study technology adoption model and Porters' three forces of competitive model formed the theoretical framework on which the study was grounded.

Technology adoption predictors are factors that influence acquisition of innovation that enabled entrepreneurs execute food business functions effectively and efficiently. This study adopts Perceived Ease of Use (PEU), Perceived Usefulness (PU) and Behavioral Intention (BI) as conceived by Davis (1989) to be the three predictors that explained the potential agro-food adoption of innovations in food manufacturing. In Technology Adoption Model (TAM), BI is influenced by user's motivation which is purely perceptions of ease or difficulty of performing the technology (Krueger *et al.*, 2000). It is a process where perceived ease of use and perceived usefulness that determined technology acceptance. Many innovation studies have found TAM a solid theoretical model that could be applied in

various contexts. However TAM has been observed to be saturated and deficient of critical considerations. First the model is a subjective measure and generated self-reported data that exposed it to unreliability (Chuttar, 2009). Secondly, TAM failed to explain reasons for perceiving technology systems useful which were significantly influenced by external factors (Fung, 2013; Gaig & Song, 2008; Uaiene, 2011; Cui et al., 2008; Smith et al., 2009). Thirdly, Bagozzi (2007), observed poor relationships between Davis constructs, considering behavior of technology use as terminal goal and excluding pertinent factors like voluntary environment, attitude, knowledge, evaluation and reflection which formed weak theoretical foundation. Given the skepticism by various researchers, TAM model was discovered to be inadequate (Lapointe, 2006) and unreliable (Gururaj, 2013) especially when not corroborated with other specific exogenous factors. It is on this basis that the study improved the deficiency by combining it with Michael Porter's competitive model.

Porter's competitive model is a five-driver framework that shape strategy in a competitive landscape (Porter, 2008). The drivers of the cyclical wave in the global market, according to Porter et al., (2004), are threat of entry, intensity of rivalry among existing competitors, pressure from substitute products, bargaining power of buyers, suppliers and complementary factors. The forces have been used as techniques for analyzing attractiveness, competition and profitability in every industry and every market. The threat of new entries depended on the extent to which the barriers to entry existed. Access to raw materials was controlled by existing players. Distribution channels were controlled by existing players who had close customer relations and high switching costs for customers. In such situations, new entrants could change major determinants of the market environment as well as the technology to address competition in internal and external market (Porter, 2004). Studies by Galbraith (1963) discovered that competitors, customers and suppliers were the three most "*countervailing factors*" affecting the market equilibrium from both sides. In other words rivalry among competitors, bargaining power of suppliers and bargaining power of buyers stand out to be the most relevant in studying competition out of the Porter's five forces; hence the study making them the variables of choice.

However, Porter's model has some major limitations in today's market environment. First in the early eighties, when the model was designed, development was fairly stable and predictable, compared with today's dynamics and complexity in competition. Contemporary business world is characterized by digitalization, globalization and deregulation. These issues are never addressed by the framework (Dalken, 2014). Thirdly the model did not consider strategies like strategic alliances, electronic linking of information systems of all companies along a value chain, virtual enterprise-networks among others. It was also observed by Senker (1990) that Porter's competitive strategy framework failed to appreciate the necessity for cumulative in-house technological competence and how each technological competence contributed to its value chain activities. It further ignored technology related risks and uncertainties that rose due to undertaking innovation. This study, therefore, filled the gaps in the Porter's model by combining it with technology acceptance model which influence technology usage, a modern engine for fast growing enterprises and economy today. The combination of the 2 models is as shown in fig. 1.



Exogenous/independent variables

x_1 - buyers' bargaining power; -rivalry of competitors	x_2 - suppliers bargaining power;	x_3
x_4 – perceived ease of use; – intention to use technology	x_5 – perceived usefulness;	x_6
$x_7 = f(x_1, x_2, x_3)$ – $f(x_1, x_2, x_3, x_4, x_5, x_6)$	$x_8 = f(x_4, x_5, x_6)$	x_9

Figure 1: Conceptual Framework

Source: Adapted from Porter (1985) and Davis (1989) and Suarez (2009)

Hybrid of Porters Three Competitive Forces and Davis Technology Predictors

In the figure, the advantageous product is a function of three of Porter's competitive forces and Davis' TAM predictors. On one hand, the Buyers' bargaining power(x_1), Suppliers' bargaining power(x_2) and Rivalry from incumbent competitors(x_3), in this study, are the attributes of competitiveness. On the other hand PEU(x_4), PU(x_5) and BI(x_6) to use technology formed the attributes of innovativeness of the food manufacturing enterprise. The apriori is that if MSEs were structured along this hybrid model, a performing food product (advantageous Product) is likely. The anticipated advantageous product is

characterized by increase in income (Y_1), meeting market demand (Y_2) and differentiated product (Y_3).

RESEARCH DESIGN AND METHODOLOGY

Research design describes a framework of data sampling, collection, measurement and analysis but research methodology detailed how research problem was solved systematically using scientific approaches. Research design is an advance plan of data collection and analysis methods and techniques in view of the economy of staff, time and money (Kothari, 2004). The plan also details procedures of choosing a sample and instrument administration besides analyzing the data collected (Jepchirchir & Achoka, 2015). This study used both quantitative and qualitative approaches to solve the research problem. According to Kothari (2004), the approach subjected generated data to rigorous mathematical analysis in a formal rigid fashion. The approach transformed the micro and small scale agro-food processors' motives on innovativeness and Competitiveness of their enterprises into numerical representation. This approach assumed a constructivist-positivist worldview. The food entrepreneurs' constructs were changed into reality that could be measured scientifically using fixed laws of cause and effect.

Survey design was used targeting micro and small agro-food processors in Busia and Nairobi, Kenya. Survey was preferred because of its power to gather information describing a phenomenon at a given point in time and equally identifying standards for comparison and relationships between events (Cohen et al., 2007). The population was 2096 micro and small enterprises involved in food value addition for commercial reasons. The sample size was determined using fisher method in Nairobi County. Due to weak information management system of agro-food processors in Busia County, snowballing sampling techniques was used. Overall sample was 188 respondents. The study collected 132 usable responses. This response rate of approximately 70% is perfect (Mugenda & Mugenda, 2009). Primary data was collected using semi-structured questionnaires designed on 7 point likert scale. In-depth interviews and participant observations were incorporated to gather more information on the agro-food processors perceptions. Secondary data was realized using relevant document analysis.

Data was analyzed using Structural Equation Modeling (SEM) by Amos version 21 computer software. Model building brought out covariance structures and crucial variables that were to be guarded against to attain competitiveness and innovativeness in Kenyan agro-food enterprises. SEM established causal paths among the variables using statistical significance and standardized path coefficient (between -1 and +1) at α of 0.05 whose Amos output should be $> \pm 1.96$ to reject null hypothesis meaning that the structural coefficient is not zero (Bentler, 2002). The technique further examined the strength of variable relationships. At least 0.20 and ideally above 0.30 are recommended bars for standardized paths and to be held meaningful for discussion respectively (Chin, 1998).

To validate the research model fitness, this study adopted Confirmatory Factor Analysis (CFA) because of its ability to execute a number of tests using Amos statistical software package. Most SEM scholars advised that more than one indicator must be observed in determining goodness-of-fit (Bentler & Wu, 2002; Progress et al., 2013; Hooper et al., 2008). Chi-Square, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI) and Parsimonious Normed Fit Index (PNFI) were the most recommended (Kline, 2005). The Chi-Square (χ^2) test evaluates overall model fit and the magnitude of

discrepancy between the sample and fitted covariance matrices. A good model fit is measured at an insignificant threshold of 0.05 (Barrett, 2007). On the other hand, Root Mean Square Error of Approximation (RMSEA) is one of the most informative fit indices (Byrne, 1998) that demonstrated how well the model, with unknown but optimally chosen parameter estimates would fit the populations covariance matrix (Diamantopoulos & Sigauw, 2000). According to Steiger (2007), this fit statistic favors parsimony or models with the lesser number of parameters with lower limit close to 0 while the upper limit lesser than 0.08. The RMSEA's ability for a confidence interval to be calculated around its value and testing null hypothesis (poor fit) more precisely counts to be its greatest advantage over others (McQuitty, 2004). The Comparative Fit Index (CFI) is least affected by sample size (Tabachnick & Fidell, 2007). It assumes that all latent variables are uncorrelated and compares the sample covariance matrix with this null model. The values of CFI range between 0 and 1 with values closer to 1 indicating good fit.

After evaluating the model fit, the study tested unidimensionality (existence of one construct underlying a set of items) using principle components (Germain et al., 1994). Each variable was separately subjected to principle component analysis to find out the eigenvalue. The eigenvalue >1 shall demonstrate unidimensionality or existence of a variable underlying a set of items.

RESULTS AND DISCUSSIONS

This section makes use of the data gotten from the survey. After feeding in Amos software, the study interprets the finding using structures and loadings generated to determine the effective combination of the predictor variables.

Competitiveness and Advantageous Food Products in Kenyan MSEs

Competitiveness is determined by Porter's three competitive forces i.e. bargaining powers of buyer, supplier and threat of competitors. The study, by use of path analysis estimated the magnitude and significance of the hypothesized causal connection between Porter's competitive forces and advantageous products. The path coefficients are the standardized reregression coefficients (beta weights) as shown in fig. 2.

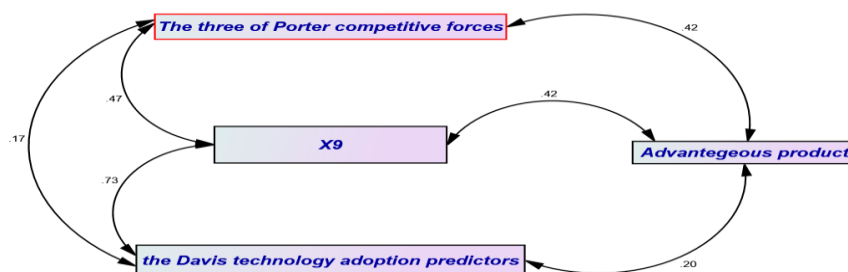


Figure 2: Output Path Diagram of Causal Relationships in the Food Manufacturing MSEs

As shown in fig. 2, Porters three forces(x₇) have significant influence on advantageous products (.42). Ideally above 0.30 are recommended bar for standardized paths and to be held meaningful. In this respect Paths a is meaningful. This means that, in agro-food processing sector, buyers and suppliers bargaining power combined with rivalry of incumbent competitors had a more meaningful and stronger causal relationship to manufacturing of advantageous food products. The findings contradicted results of a study by Progress et al (2013) of 211 SMEs in Buffalo City where a negative insignificant influence of the adoption and deployment of new marketing technologies on Porter's Five Competitive Forces was found. However, Copeland and Shapiro (2010) found out that competition was a key driver of the rate at which enterprises designed advantageous products. In Pakistan, competitors' rivalry and buyers' bargaining power were found to be of most significant influencers among mobile and telecommunication firms (Munir et al., 2011). In South Africa, a study on fruit and vegetable sellers at Natalspruit market found out that bargaining power of buyers and rivalry among street traders had a significantly high impact. When suppliers were studied at Johannesburg Fresh Produce Market, the impact was high but when studied as a range of suppliers the impact was low (Ngiba et al., 2009).

Innovativeness and Advantageous Food Products in Kenyan MSEs

Equally the hypothesis seeking to determine relationship between innovativeness and advantageous products were determined. The Davis technology adoption predictors that are PEOU, PU and BI represented innovativeness of a food manufacturing enterprise. Using path analysis standardized path coefficients of 0.20 was generated. At least 0.20 and above are recommend standard coefficient. It therefore follows that innovativeness significantly had a positive influence on advantageous products, too. In Jordan, BI and PU were the most important motivators (Al-Adwan et al, 2013). In Korea, 628 students' BI to use e-learning were studied and the students' greatest motivators were self efficacy and subjective norm (Park, 2009). Almost the same study was done among 72 Australian students and PEOU had the strongest significant influence on BI. The study also found out that individual's characteristics significantly influenced the Australian teachers' propensity to include e-portfolio in the curriculum (Shroff et al., 2011).

Hybrid of Competitiveness and Innovativeness on Advantageous Food Products in MSEs

Path analysis in fig.2 demonstrated a standardized path coefficient of 0.42 demonstrating a much better, ideal and meaningful causal relationship. Comparatively, competitiveness (0.42) had a more significant strength than innovativeness (0.20). Eigen values were used to determine if a variable underlie a set of items. The findings showed an eigenvalue of 0.823 demonstrating that there were no variables underlying the set of items. The study further employed confirmatory factor analysis to single out meaningful elements in competitiveness and innovativeness. Using modification indices it was decided that suppliers bargaining power and BI be removed from the Porter forces and Davis' technology adoption predictors.

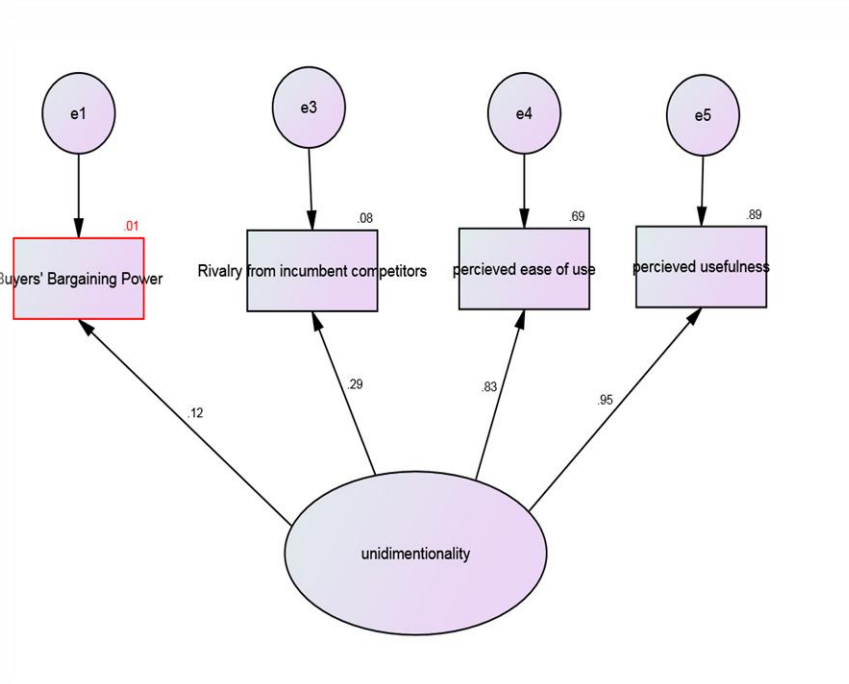


Figure 3: The Best Evaluated Model for MSEs to Produce Advantageous Product

Now with four items estimation done, the model showed a very good fit with sample data. The buyers' bargaining power, rivalry from incumbent competitors, perceived ease of use and perceived usefulness stood out to be the best combination and model constituents for MSEs in agro-food processing. The fit indices presented in table 2 below confirmed the same. Unlike many studies (Park, 2009; Al-Adwan et al, 2013; Shroff et al., 2011), this study found BI not critical to be gurdred. The reseasion being that BI is a function of both PEU and PU.

Table 2: Model Evaluation Overall Fit

Fit index	Value	Recommended value
Chi-square (X^2)	3.658	N/A
Df	2	N/A
P	0.161	>0.05
The Comparative Fit Index (CFI)	0.966	> 0.95
Parsimonious Normed Index (PNFI)	0.311	>0.00
Root Mean Square Error of Approximation(RMSEA)	0.08	≤ 0.08

The results showed that the model had a high predictive power in determining advantageous products among MSEs manufacturing foods in Kenya. The chi-square(X^2) is a product of the difference between the observed covariance and those implied in the model. X^2 – test revealed that the model was adequate ($X^2(2) = 3.658, p=0.161 > 0.05$). The Root Mean Square Error of Approximation (RMSEA) demonstrated that the model with optimal chosen

parameter estimates fitted well the population covariance matrix at 0.08 value index. Finally, CFI (0.966) and PNFI (0.311) supported the findings that the model fitted the data adequately. The estimations of the model found out that all parameters were significant apart from suppliers bargaining power and the behavioral intention to use technology.

CONCLUSIONS AND RECOMMENDATIONS

The conclusion is guided by the hypotheses. Strong association was found between the Porter's three forces (buyers' bargaining power, suppliers' bargaining power and rivalry from incumbent competitors) and the manufacturing of advantageous food products. According to SEM, buyers bargaining power, rivalry from incumbent competitors, perceived ease of use and usefulness formed the best model for MSEs in agro-food manufacturing. The study recommended:

- i) That stakeholders in agro-food industry should restructure the MSE's manufacturing processes to address the modern customers' sophisticated demands and competitors' complexities.
- ii) That technology fabricators should design food manufacturing systems that are easy to use and useful to the MSEs.
- iii) That a food and beverage administration authority be established to assist food manufacturers borrowing from Singaporean models. The Authority would ensure (HACCP) food safety standards and promotes agro-technology and food supply resilience among food enterprises for Kenyan and export markets.

Further studies, according to this study could be done on the following topics:

- i) The association of new entrants, substitutes, complementary forces and developments of highly performing food products among MSEs.
- ii) The role of other technology adoption determinants such as self-efficacy and subjective norms in enhancing innovativeness in food manufacturing MSEs.

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