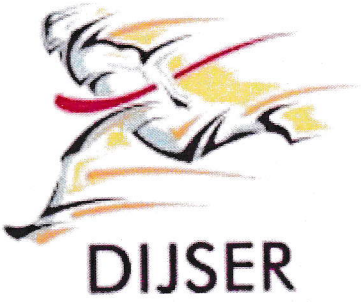
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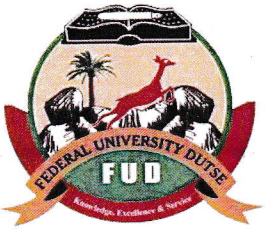
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KABODLIMITED

Implementation of Activity-Based Costing and Accurate Cost Information in Selected Nigerian Manufacturing Firms

Adigbole Ezekiel A.[1*], Dikki Anietie C.[2], Abogun, Segun,[3] Olaoye Clement O.[4] and Fakile, Oluwaseye G.[5]

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Abstract: *The continued use of traditional costing for processing cost information by manufacturing firms has resulted in the reportage and use of distorted cost information that may lead to wrong decisions. Activity based costing is required for generating complete and undistorted cost information. Hence, the objectives of this study were to: examine the effect of technology growth on the implementation of Activity- Based Costing (ABC); evaluate the influence of ABC on accurate cost information; and; and examine the impact of technology growth on accurate cost information. Survey research design was employed. The population of the study consisted of three hundred and eighty - five respondents in seventy - seven listed manufacturing firms in Lagos and Ogun States. The sample of the study consisted of three hundred and twenty- five respondents in sixty - five randomly selected manufacturing firms. Primary data used were collected through questionnaire administration. Data analysis was done using Partial Least Squares Structural Equation Modeling. The study found that: technology growth has positive significant effect on ABC implementation ($\beta = 0.538$, $p < 0.01$); ABC has positive significant influence on accurate cost information ($\beta = 0.634$, $p < 0.01$); and Technology growth has positive significant impact on accuracy of cost information ($\beta = 0.224$, $p < 0.01$). It was concluded that ABC is relevant for generating accurate cost information. The study recommended among others that Nigerian manufacturing firms should implement ABC to achieve accuracy of cost information.*

Keywords: Activity-based costing, Accurate cost information, Technology growth.

INTRODUCTION

The manufacturing environment has become so competitive that firms must employ contemporary costing systems to generate cost information that is relevant for making strategic decisions that can deliver competitive advantage. In the contemporary manufacturing business environment characterised with improvement in manufacturing and information technology, overheads cost now constitutes a large proportion of manufacturing cost (Abdel – Kader & Luther, 2008). Manufacturing companies now also produce multiple products as against the manufacture of single product previously. The problem then arises as to how to allocate overheads effectively over multiple products to generate accurate product cost information. The traditional costing systems such as absorption costing has not been helpful in effectively allocating overheads cost. This makes it imperative for firms to seek for better way of allocating cost to secure accurate product cost information. Activity – Based Costing (ABC) has come to provide solution to the problem of cost allocations. With ABC overheads cost

allocation can be made effectively and which could result in generation of accurate product cost information.

The study of the implementation of ABC in manufacturing firms in Nigeria is a continuous one as a lot of works are still required to be done to explore the potentials of this strategic management accounting technique in assisting manufacturing firms secure competitive advantage and enhanced performance. Some of the few works on ABC in Nigerian manufacturing firms which this present study built on are those of Imeoukparia (2013); Adigbole and Oludoyi, (2015). While the aforementioned studies focused mainly on ABC and performance, this present study explore the use of ABC in securing accurate cost information. The objectives of this study are to:

(i) examine the impact of Technology growth on the implementation of activity - based costing in selected manufacturing firms in Nigeria; and
(ii) evaluate the effect of activity - based costing on accurate cost information in selected manufacturing firms in Nigeria; and
(iii) assess the influence of technology growth on generation of accurate cost information.

The following null hypotheses were formulated based on the research objectives:

Ho1: Technology growth has no significant impact on the implementation of activity - based costing in selected manufacturing firms in Nigeria.
Ho2: Activity - based costing has no significant effect on accurate of cost information in selected manufacturing firms in Nigeria.
Ho3: Technology growth has no significant influence on the generation of accurate of cost information.

The rest of this paper is divided into literature review, methodology, data analysis and discussion of results, and conclusion and recommendation.

LITERATURE REVIEW

Activity - Based Costing

Activity - based costing emerged as a result of the following factors: the failure of the traditional absorption costing systems to produce accurate cost information; improvement in manufacturing technology resulting in high automation of manufacturing activities; the manufacture of multiple products; increase in manufacturing overhead cost compared to material and labour cost; intense global competition of 1980s which made decision errors possible and costly (Fei & Isa, 2010); decrease in cost of processing information; and the demand for accurate product cost information (Holzer, & Norvekht, 1991).

The traditional absorption costing failed to produce accurate cost information because of the following limitations: the use of a single cost driver that is also volume - based (e.g. direct labour hour rate or machine hour rate) in cost allocation process (Cooper & Kaplan, 1988); the assumption that products or service are the real consumers of resources instead of activities (Blocher, Chen & Lin,1999; Hansen & Mowen, 2000; and the inability of the system to cope with the contemporary manufacturing setting where firms now produce multiple products or services. Absorption costing was designed for manufacturing companies when there were few products and when the direct material and labour costs were dominant parts of factory costs

(Drury, 2012). Due to the inherent limitations of absorption costing it cannot generate high quality and undistorted product cost information (Fei & Isa, 2010). Hence, the need for activity – based costing to overcome the problems of the traditional absorption system (Turney, 1996; Hansen & Mowen, 2000).

Activity - Based Costing (ABC) can be described as a management accounting process that ensures the allocation of costs to products based on activities which determine the incurrence of such cost or, the consumption of such products or services (Krumwiede & Roth, 1997). Activity, which is the core concept is of ABC is described by Bebcos, Cauvin and Gosselin (2002: 232) as, "group of actions or tasks that add value to a product or service and which generate costs and resource consumption. A homogeneous set of activities is called 'process' '' . Kaplan (1992) described activity- based costing system as an allocation procedure by which overhead costs are assigned to products or services via activities. ABC ensures effective cost allocations. The paramount aim of ABC as noted by Turney (1996) and Cooper and Kaplan (1988) is to: provide accurate product cost information for: product costing, setting of selling price, determination of market channel, strategic cost management purposes, and formulating and implementing business strategies for attaining competitive advantage.

ABC has two main stages of cost allocation: the first stage allocation is a resource cost assignment process, which uses appropriate resource cost drivers to assign overhead costs to activity pools or group of activities called activity centres (Blocher *et al.,* 1999); while the second stage is an activity cost assignment process by which the costs of activities are assigned to cost objects using appropriate activity driver. The two stages of ABC cost allocation process as noted by Drury (2012) can further be divided into the following four stages of : identification of major activities – activities done in the firm; assigning costs to activity cost centres; selecting appropriate cost drivers for assigning the cost of activities to cost objects - determining what consumes activities, eg transaction drivers, duration drivers etc.; and finally, assigning the cost of the activities to products or services (cost object). With these elaborate cost allocation processes in ABC systems accurate cost can be generated.

Accurate Cost Information

The quality of information is paramount in any business enterprise. Without good cost information, a business operates in the dark as bad cost information can leads to faulty decisions which may not be reversible. The implementation of activity based costing in cost allocations can enable a firm generate accurate cost information (Noordin, Zainudin, Mail, Mail & Sariman, 2015*)*. ABC is able to produce accurate product cost information because it uses multiple cost drivers in cost allocations. Accurate cost information from ABC systems is broad, forward looking, outward looking and market focused.

ABC helps to improve cost information by showing the true product costs. With ABC the true cost of products or activities could be revealed and improve the overall cost information. Accurate cost information can enhance the quality of decision making in product pricing.

THEORETICAL REVIEW

Contingency theory

The contingency theory of management accounting refers to the premise that there is no universally appropriate accounting system equally applicable to all organizations in all circumstances; instead, accounting systems are shaped by environmental and organizational factors (Otley, 1980). The factors shaping the implementation of management accounting

systems in individual organisations are referred to as contingent factors. The contingent theorists argue is that management accounting systems are functions of certain contingent factors. Hence, management accountants can follow this mantra and then design a suitable management accounting system as there is no any best system that is applicable in the same way anywhere. (Wickramasinghe & Alawattage, 2007). Contingency theory suggests that there is need for efficient organizational structures, processes and competent management accounting system is contingent on organizational and environment characteristics. These factors influence changes in the structure and sophistication of cost management system or advanced cost accounting techniques (Drury & Tayles, 2005). Chenhall (2003) classified contingency factors that have a major effect on management accounting practices into five main elements as: environment, technology, organizational size, structure, strategy and national culture. This study selected technology growth as a contingent factor that can influence the implementation of activity -based costing systems to achieve accurate cost information in a firm.

Empirical Review

Tsai and Hsu (2004) conducted a case study of a traditional inn in Taiwan and focused on the application of activity - based costing (ABC) vis avis the traditional costing system. The data (costs) collected from the sampled firms were analyesd descriptively. The study made an analysis of unit cost per customer using the traditional costing and ABC. The results were compared to see what difference does the adoption of ABC makes. The outcome of the analysis shows that there are significant differences in unit cost per customer of each product (lodging, hot spring, and dining). The unit cost of dining was overestimated using traditional costing. On the other side, the unit cost of lodging and hot spring turns out to be significantly underestimated using traditional costing. This implies that ABC produces more accurate cost information.

Anand, Sahay and Saha (2005) studied activity-based cost management practices in companies operating in India. The aim was to understand whether corporate India practices cost management in a value-chain analytic framework. A nationwide survey was carried out to capture the design and applications of contemporary cost management tools. The study revealed that the firms that have adopted ABC were significantly more successful in capturing accurate cost information for value chain analysis and supply chain analysis as compared to those the firms that had not adopted ABC.

Vazakidis and Karagiannis (2011) carried out a case study on the implementation of ABC in hotels in Greece. The study also focused on the use of activity-based management (ABM) which is based on the cost information resulted from ABC. Data collected from the sampled firms were analysed descriptively. An analysis of costs of the hotels was carried out using both traditional costing and ABM. The study found that cost information became more accurate after the implementation of ABC.

Askarany, Brierley and Yazdifar (2012) carried out a study on the factors influencing the adoption of activity-based costing (ABC) by assessing the contribution of the characteristics of an innovation on its adoption. The study applied innovation diffusion theory to examine the impact of five characteristics of an innovation, and organisation size, industry and location on the decision to ABC. The finding of the study revealed that organisations are more likely to adopt ABC when they attach a high level of importance to the relative advantages offered by innovations, are large.

In Nigeria, Imeokparia (2013) examined the adoption of ABC and its impact on manufacturing company's profit in 262 manufacturing firms in the South West of Nigeria. Data were collected through the instrument of questionnaires administered to the sampled manufacturing companies. The regression analysis was used in testing the hypotheses formulated in the study. The results of the study indicated that manufacturing companies that have adopted activity - based costing had increase in their profitability measured by return on capital employed (ROCE) and other measures

Adigbole and Oludoyi (2015 studied the impact of the implementation of activity-based costing on performance of selected manufacturing firms in Kwara State. Twenty – eight (28) manufacturing firms were sampled for the study and questionnaire was used in collecting primary data from the sampled firms. The data collected were analyzed using both descriptive statistics and regression analysis. Specifically, the Ordinary Least Square (OLS) was used in testing the hypotheses formulated. The findings of this study show that ABC has a positive significant impact on accurate cost information and performance of the sampled firms.

This current study fills the observed gaps on the literature reviewed. Most of works reviewed were foreign studies but this study focused on quoted manufacturing firms in Nigeria. Few studies in Nigeria reviewed focused on ABC and performance but this study focused on ABC and accurate cost information. There is also a methodological gap that this study filled by using Partial Least Squares - Structural Equation Modeling (PLS - SEM) in the data analysis. The use of this methodology is not common.

METHODOLOGY

The study employed a cross - sectional survey research design since it allows for the examination of statistical associations at any particular point in time. This study covered quoted manufacturing firms located in Lagos and Ogun states of Nigeria as majority of manufacturing firms in Nigeria either have their head offices or factories located in these states (Adigbole, 2018). The population of the study consisted of 77 quoted manufacturing firms (385 respondents) having their head offices or factories located in the study area. The sample size of 65 quoted manufacturing companies (325 respondents) was determined statistically using Taro Yamane formula (Imeokparia, 2013).

Primary data were collected for the study using questionnaire administration. The questionnaire was structured to cover questions of personal information about the respondents; information on the respondent's company; assessment of activity - based costing, accurate cost information. Five (5) copies of the questionnaire were administered to each of the sampled sixty - five (65) companies (325). The questionnaire was targeted at the financial accountants, cost accountants, management accountants, chief accountants / finance directors and the chief internal auditors of the manufacturing companies under study. After several visits made to the sampled companies, two hundred and forty – four (244) copies of the administered questionnaire were retrieved out of which eleven (11) were unusable due to improper filling by the respondents. The valid copies of the questionnaire instruments used for analysis were two hundred and thirty - three (233) from 57 manufacturing firms, which represents 71.7% success rate of return.

Variable Measurement

Activity-Based Costing Application

Activity Based Costing Application (ABCA) was measured in the questionnaire using seven items developed from literature and the items were measured using seven–point Likert scale ranging from - strongly disagree (1) to strongly agree (7).

Accurate Cost Information

Accurate Cost Information (ACI) were described in the questionnaire using four items developed from the literature and the items measured using seven–point Likert scale ranging from - strongly disagree (1) to strongly agree (7).

Technology growth

Technology Growth (TG) was measured using four items adopted from Kaneko *et al*, 2013. The items were anchored on seven–point Likert scale ranging from - strongly disagree (1) to strongly agree (7).

Method of analysis

The analytical tool used in analyzing the data collected and testing of hypotheses formulated in the study was the Partial Least Squares - Structural Equation Modeling (PLS - SEM). SEM is a second generation regression analytical method. It is an alternative to Ordinary Least Squares (OLS) regression and canonical correlation. SEM was used because it makes it possible to determine several measures of reliability and validity tests (Baines & Langfield-Smith 2003); and particularly, the PLS version of SEM allows for smaller sample and does not require data normality for its use.

Structural Model Specification

In using Partial Least Square (PLS -SEM) to examine the hypothesized effect of ABC on accurate cost information, the structural equation of the relationships among the variables involved in the study must be specified in pictorial form. The use of PLS -SEM software (SmartPLS 3.0) only understands models stated pictorial form as depicted in Figure 1. From the figure, the independent variables known as the exogenous variables are: Technology Growth (TG) and Activity Based Costing Application (ABCA), while the dependent variable or endogenous variable are: Activity Based Costing Application (ABCA) and Accurate Cost Information (ACI). All the variables also referred to as latent variables are in blue oval shapes and are linked by arrows. The arrows show the relationships between the independent latent variables and the dependent latent variable.

The arrows move from the dependent variables to the independent variables.

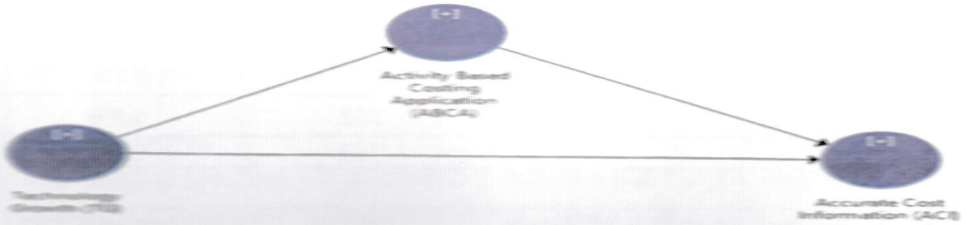


Figure 1: Structural equation model of the study

ANALYSIS AND DISCUSSION OF RESULTS

PLS - SEM Analysis and Testing of Hypotheses

The use of PLS – SEM for data analysis was carried out using two steps: the first step was the use of the PLS algorithm to produce some preliminary test results which were used in evaluating the measurement model. The second step was the use of the SmartPLS algorithm to obtain the β values and the R^2 and Smart PLS bootstrapping process to obtain the t – statistic and the p – values which indicate the significance value of the β.

Evaluation of Measurement Model (Preliminary Tests)

The PLS algorithm of SmartPLS 3 was used to produce results for the following tests: Indicators reliability test, Construct reliability and Validity tests, convergent validity test and discriminant validity tests. These tests are examined hereafter.

Indicators Reliability Test

The indicator reliability test was measured by indicators loading and indicators reliability. As can be seen in Table 1, all the indicators used in this model have loadings ranging from 0.801 to 0.902 and are above the required threshold of 0.70 (Ringle, 2006). Also from Table 1, the indicators reliability which is the square of the indicators ranges from 0.642 to 0.814, which are above the common threshold criterion of 0.50 (Hair *et al,* 2014). The common threshold criterion is that more than 50% of an indicator's variance should be explained by the latent construct. These results show that all the indicators are reliable and the measurement model is strong.

And the indicators reliability values are all above the common threshold criterion of 0.50 (Hair *et al,* 2014). These results show that all the indicators are reliable and the measurement model is strong.

Table 1: Indicator Reliability

Latent Variable	**Indicators**	**Loadings**	**Indicator Reliability**
Activity Based Costing Application (ABCA)	ABCA1	0.828	0.686
	ABCA2	0.837	0.701
	ABCA3	0.811	0.810
	ABCA4	0.849	0.658
	ABCA5	0.845	0.714
	ABCA6	0.801	0.642
	ABCA7	0.802	0.643
Accurate Cost Information (ACI)	ACI 1	0.860	0.740
	ACI 2	0.897	0.805
	ACI 3	0.902	0.814
	ACI 4	0.836	0.689
Technology Growth (TG)	TG 1	0.870	0.757
	TG2	0.899	0.808
	TG3	0.901	0.812
	TG4	0.885	0.783

Source: Researcher's SmartPLS 3.0 Results

Construct Internal Consistency Reliability

The construct consistency reliability indicates how well a set of manifest variables appraises a single latent construct and in this model it was evaluated by two measures – Cronbach's Alpha

and Composite Reliability (CR). From Table 2, the Cronbach Alpha and the composite reliability (CR) values of all the latent variables in the study were above the required value of 0.70. The results therefore show that internal consistency reliability has been demonstrated.

Convergent validity

Convergent validity which shows the amount of variance captured by the latent variable from its relative manifest (indicator) variables due to measurement errors (Memon & Rahman, 2014) and this was tested using Average Variance Extracted (AVE) test. From Table 2, the AVE values of all the constructs in this model were greater than 0.5 stipulated by Hair *et al.*, (2011). This result indicates that convergent validity was confirmed and the model is adequate.

Table 2: Construct Reliability and Validity

Latent Variable	Cronbach Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Accurate Cost Information (ACI)	0.897	0.928	0.764
Activity Based Costing Application (ABCA)	**0.922**	**0.937**	**0.680**
Technology Growth (TG)	**0.912**	**0.938**	**0.790**

Source: Researcher's SmartPLS 3.0 Results

Discriminant Validity

Discriminant validity test was carried out to confirm that the manifest variable in any construct is relevant to the designated latent variable. Discriminant validity test was measured using the modern method, Heterotrait – Monotrait (HTMT) ratio (Henseler, Ringle and Sarstedt (2015). From Table 4 the Heterotrait – Monotrait (HTMT) ratios results show that for each pair of latent variables, the values are below the criterion of $HTMT_{0.90}$ as a cutoff, hence, the results therefore indicates that discriminant validity was met in this study using HTMT ratio. Overall, all the latent variables or constructs have been appropriately measured and so could be used for further analysis.

Table 3: Heterotrait – Monotrait (HTMT)

Latent Variable	ACI	ABCA	TG
Accurate Cost Information (ACI)			
Activity Based Cost Application (ABCA)	0.824		
Technology Growth (TG)	0.624	0.582	

Source: Researcher's SmartPLS 3.0 Results

The above preliminary tests have all produced satisfactory results, implying that the measurement (manifest) variables are able to measure their constructs correctly and that the constructs were able to measure what they were intended to measure.

Structural Model Assessment

The structural (inner) which specifies the relationship between the exogenous (Activity based costing, and Technology growth) and endogenous latent variable (Accurate Cost Information and Activity based costing,) can be seen in Figure 2 showing the coefficient of determination (R^2) and the path coefficients (β values) in the model. SmartPLS algorithm was used to obtain the β values and the R^2, while Smart PLS bootstrapping process was used to obtain the t – statistic and the p – values.

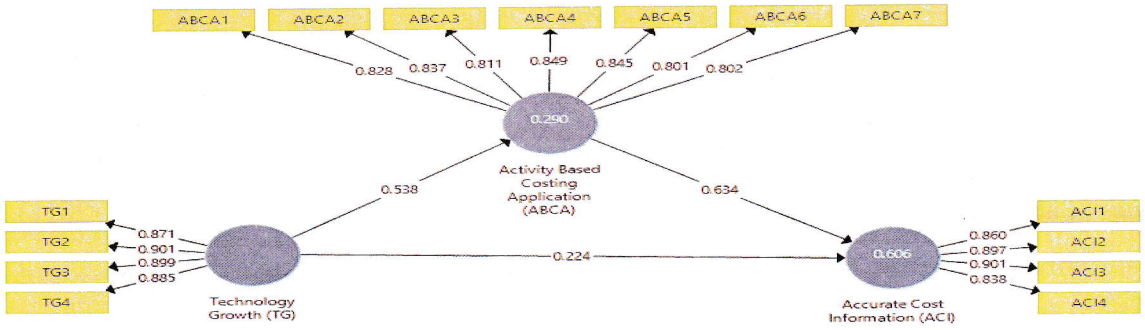


Figure 2: (SmartPLS 3.0 Algorithm results

Assessment of Path Coefficient of the Structural Model and Test of Hypotheses

The results of the bootstrapping process in PLS – SEM can be seen in Table 4 and the appendix. From the table, the path coefficients, and their p- values can be seen.

Test of Hypotheses

From table 4, the PLS – SEM results show that Technology Growth (TG) has a direct positive significant influence on Activity Based Costing Application (ABCA) ($\beta = 0.538$, $p < 0.01$). Thus, the hypothesis one is not accepted. This result indicates that as Technology improves, there is a probability that Activity Based Costing will improve.

The results of the PLS – SEM in Table 4 also show that Activity Based Costing Application (ABCA) has a direct significant positive influence on Accurate cost information (ACI) ($\beta = 0.634$, $p < 0.01$). Hence, hypothesis 2 is also not accepted. This indicates that as ABC is being applied in a manufacturing firm there is the probability that accurate cost information will be generated.

Lastly, Table 4 also show Technology Growth (TG) significantly influence Accurate Cost Information (ACI) ($\beta = 0.224$, $p < 0.01$). Thus, the hypothesis 3 is also not accepted. Hence, improvement in technology will lead to more generation of accurate cost information in a manufacturing firm.

Table 4: Path Coefficients with Significance Value1

Paths	Hypothesis	Coefficient (β)	Standard Deviation	T- Stats (β/St Dev.)	P - Values	Significant?
TG ->ABCA	1	0.538	0.067	8.074	0.000	Yes
ABCA-> ACI	2	0.634	0.055	11.461	0.000	Yes
TG ->ACI	3	0.224	0.069	3.259	0.001	Yes

Note: * p < 0.01

Source: Researcher's Smart PLS 3.0 Results

DISCUSSION OF RESULTS

Technology growth and Activity Based costing application

The result of testing hypothesis 1 is that Technology growth has a significant positive impact on the implementation of Activity based costing. This evidence indicates that technology improvement influences the implementation of activity-based costing in the sampled firms. This finding is consistent with the contingency theory which holds that internal environmental factor such as technology improvement in a firm can determine the extent of implementation of management accounting control systems. This finding is also in line with the studies of Kariuki and Kamau (2016); Ahmad and Zabri (2015); and Ajibolade (2013).

Activity based costing application and Accurate cost information

This study also found that activity - based costing application significantly influence accurate cost information positively. This finding is consistent with the studies of Noordin *et al.* (2015) and Adigbole (2018) who found that activity based costing system generate more broad, relevant, timely and accurate product cost information than the traditional costing systems.

Technology growth and Accurate cost information

Lastly, this study found that Technology has a significant positive impact on accurate cost information. This evidence indicates that technology improvement influences the generation of accurate cost information in the sampled firms. Hence, improvement in modern information processing technology will lead to effective generation of accurate cost information. This finding is consistent the contingency theory which holds that internal environmental factor such as technology improvement in a firm can determine the extent of implementation of management accounting systems. This finding is also in line with the studies of Kariuki and Kamau (2016).

CONCLUSION AND RECOMMENDATIONS

The study found that technology improvement can enhance the implementation of activity – based costing and that activity – based costing can improve the generation of accurate cost information in manufacturing firms. It was also found that technology growth can enhance the generation of accurate cost information in manufacturing firms. Hence, it can be concluded that the implementation of ABC is necessary for the generation of accurate cost information in manufacturing firms.

This study recommended that manufacturing firms that are yet to start using ABC should do so to enhance their generation of accurate cost information. Finally, manufacturing firms implementing ABC should invest in their technology to enhance ABC implementation for generating accurate cost information.

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APPENDIX

Appendix I: Demographic Data of the Respondents

Variables	Frequency	Percentage (%)
Position in the Firm		
Cost Accountant	55	23.6
Management Accountant	51	21.9
Financial Accountant	88	37.8
Chief Accountant / Finance Controller	29	12.4
Chief Internal Auditor	10	4.3
Total	**233**	**100**
Working Experience		
5 Years and Below	82	35.2
6 - 10 Years	92	39.5
11 - 15 Years	39	16.7
Above 15 Years	20	8.6
Total	**233**	**100**
Qualifications		
Diploma/ NCE	22	9.4
B.Sc./BA/HND	139	59.7
M.Sc./M.A.	32	13.7
Ph. D.	3	1.3
ACA/ACCA & B.Sc. HND/M.sc/MA/Ph.d.	32	13.7
ACA/ACCA/FCA	5	2.2
Total	**233**	**100**
Gender		
Male	190	81.5
Female	43	18.5
Total	**233**	**100**
Age	5	2.1
Under 25	80	34.3
25 – 30 Years	110	47.3
31 – 40 Years	30	12.9
41 – 50 Years	8	3.4
51 and Above	**233**	**100**
Total		

Source: Adigbole's Questionnaire Administration Results, 2018