

EFFECTS OF PRODUCT DIVERSITY ON ACTIVITY- BASED COSTING SYSTEM IMPLEMENTATION IN NIGERIA

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ABSTRACT

Product diversity facilitates a higher possibility for cost distortion and applies when products consume activity-resources in different proportions. Greater product diversity requires more complex costing systems to capture the variation in resource utilization by different products (Ahmadzadeh, Etemadi, & Pifeh, 2011). Activity-based costing system represents one of the complex costing system innovations. Using a survey research design, this study examines the effects of product diversity on activity-based costing implementation in the Nigerian manufacturing sector. Data were obtained using structured questionnaire administered to 500 Accountants, Cost Accountants, Management Accountants and Financial Managers who are in full-time employment of 24 randomly selected manufacturing firms listed in the Nigerian Stock Exchange. The result of regression analysis revealed that there is a significant relationship between the extent of activity-based costing implementation and product diversity in the Nigerian manufacturing sector. It is recommended that future studies should seek to investigate the influence of other contextual variables such as top management support and competition.

Key words: Activity-based Costing, Costing System, Manufacturing, Product Diversity.

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INTRODUCTION

Product diversity facilitates a higher possibility for cost distortion and applies when products consume activity-resources in different proportions. Greater product diversity requires more complex costing systems to capture the variation in resource utilization by different products (Ahmadzadeh, Etemadi, & Pifeh, 2011). Activity-based costing system represents one of the complex costing system innovations. To measure the resource consumption of different products in a complex setting, complex costing systems such as the activity-based costing are required (Al-Omiri and Drury, 2007).

STATEMENT OF PROBLEM

Product diversity refers to conditions in which cost objects place different demands on activities or activities place different demands on resources. This situation arises, for instance, when there is a difference in mix or volume of products that causes an uneven assignment of costs. Different types of diversity include: batch size, customer, market, product mix, distribution channels, and volume (Ashor, 2008). This factor seems to be important because disproportionate use of activities by products is generally considered to be the major cause of distortions in the true cost situation in traditional cost systems. However, results of previous studies on the influence of product diversity on costing systems' implementation have been inconclusive and controversial. Bjornenak (1997), Krumweide (1998) and Malmi (1999) have earlier studied the influence of product diversity on activity-based costing implementation. The results of Bjornenak are contrary to expectations. The implementers of activity-based costing are found to have a significantly lower degree of customized production (used as a proxy for product diversity) than the non-implementers, whereas both groups do not significantly differ with respect to the number of product variants. The results of Malmi, on the other hand, confirm expectations, as implementers of activity-based costing are found to produce a large number of different products than the non-implementers. In his multivariate analysis of implementers versus non-implementers, Krumweide (1998) also found a positive association between product diversity and activity-based costing implementation. In Nigeria, manufacturing companies' products are in various volumes; while some companies produce few numbers of product lines, others produce several and dissimilar products that come in various sizes, packages and forms (Uba, 2011). The question as to how the diversity in firms' product lines influences the implementation of activity-based costing system in Nigerian manufacturing sector remains unresolved and thus calls for investigation.

OBJECTIVE OF THE STUDY

Sequel to the problem identified above, the main objective of this study is to ascertain the influence of product diversity on ABC system implementation in Nigerian Manufacturing Sector.

RESEARCH QUESTION AND HYPOTHESIS

In order to achieve the objective of this study, the following research question has been posed. What is the influence of product diversity on ABC implementation in Nigerian Manufacturing Sector?

Similarly, in a bid to realize the set objective for this study, the following hypothesis has been formulated:

Ho: There is no significant relationship between the extent of ABC implementation and product diversity in the Nigerian Manufacturing Sector.

H1: There is significant relationship between the extent of ABC implementation and product diversity in the Nigerian Manufacturing Sector.

MATERIAL AND METHOD

The survey research design is employed in this study. The population comprises the 86 manufacturing companies that are quoted in the Nigerian Stock Exchange, meanwhile, the sample comprise of 24 randomly selected manufacturing companies. Primary data were obtained through the administration of structured questionnaire to 500 accountants, cost accountants, management accountants, senior accountants and financial managers on full-time employment in the Nigerian manufacturing sector. Data analysis is conducted using logistic regression analysis with the model below:

$$Y_1 = b_0 + b_1 X_1 + \varepsilon \dots\dots\dots(1)$$

LITERATURE REVIEW

Nguyen and Brooks (1997) conducted a survey on activity-based costing system implementation in the State of Victoria in Australia. The result of the study showed that product diversity does not significantly influence the implementation of activity-based costing system. According to Nguyen and Brooks (1997) the companies that have implemented activity-based costing system are not necessarily those with several product lines, many of them only produce limited number of products.

Chongruksut (2002) conducted an investigation among firms listed on the Stock Exchange of Thailand (SET) that operate in the Bangkok region. One of the aims of the study was to examine the implementation of activity-based costing by firms based in Thailand. The result revealed that only 11.9% of the selected firms had already implemented the activity-based costing. One reason that was reported as a factor responsible for the low level of implementation was the fact that most of the selected firms produce less complexity in products. In other words, since the selected firms produce similar and few number of product lines, there was less risk of cost distortion, therefore, implementing activity-based costing system was not seen as very necessary.

Cagwin and Bouwman (2002) in their survey of 210 internal auditors found that the firms with diverse product portfolio are those that have implemented activity-based costing along with other strategic initiatives. Cagwin and Bouwman (2002) asserted that diversity of firm products facilitates the implementation of activity-based costing system. Organizations that produce multiple products need to ascertain the exact cost of each of the products, so as to enhance products' profitability analysis and decision making.

Brown et al. (2004) examined one set of potential reasons for the paradox as to why so few firms have implemented activity-based costing system in Australia despite the demonstrated benefits of this costing system. A cross-sectional survey of Australian firms was used to examine the influence of product diversity amongst other factors. The result revealed that the fact that the firms manufacture similar and few products-line was a major reason why only few organizations have implemented activity-based costing system in Australia. In other words, a significant relationship was established between activity-based costing implementation and product

diversity in Australia. Organizations that actually implemented activity-based costing system are those that produce diverse products that come in various packaging, sizes and forms.

Isa and Thye (2006) examined the usage of management accounting practices in manufacturing firms in Malaysia. They also studied the relationship between product variety and usage of advanced management accounting practices. The result of Spearman correlation indicated significant positive relationships between product diversity and advanced management accounting techniques, particularly, activity-based costing implementation.

Al-Omiri and Drury (2007) reported on the findings of a postal questionnaire that examines the extent to which potential contextual factors influence the characteristics of product costing systems. Results indicated that higher levels of cost system sophistication are positively associated with the importance of cost information, extent of use of other innovative management accounting techniques, intensity of the competitive environment, size, extent of the use of just in time/lean production techniques and the type of business sector. No association was found between the level of cost system sophistication and cost structure, product diversity and quality of information technology.

Brierley (2008) used logistic ordinal regression analysis to examine the impact of the level of competition, product customization, manufacturing overhead costs and operating unit size on the level of consideration for activity-based costing when measured on a three-point ordinal scale ranging from not considered, considering and considered activity-based costing. The results indicate that operating unit size is related positively to the level of consideration for activity-based costing. However, competition, product diversity and indirect cost as a proportion of product costs were found to have no significant relationship with activity-based costing implementation.

Nasser, Morris, Thomas and Sangster (2009) examined critical success factors and barriers to activity-based costing implementation in Jordan. Primary data used for the study were obtained through the administration of questionnaire to eighty-eight (88) Jordanian industrial companies that are listed on the Amman Stock Exchange. Regression was used in the data analysis. The study reported that activity-based costing implementation among the Jordanian industrial companies was quite satisfactory. The rate of activity-based costing implementation was about 55.7%. The most cited factors that facilitated the decision to implement activity-based costing were that adequate training was provided for designing activity-based costing and operating data in the information system were updated in real time: followed by the fact that adequate training was provided for using activity-based costing. The most influential factors that motivated the process of activity-based costing implementation were among others the increasing proportion of overhead costs, growing costs, including product costs and administrative costs, and currently the increasing number of product variants.

Schoute (2011) examined the associations between product diversity, usage of advanced manufacturing technologies and activity-based costing adoption. Theory strongly suggests that product diversity is a major determinant of the demand for activity-based costing systems. The results of empirical research on the relationship between product diversity and activity-based costing adoption have generally been inconclusive, however, suggesting that there either may be no strong relationship, or that methodological issues may have prevented researchers from

consistently finding it. Using a dataset of survey responses from 191 Dutch, medium-sized manufacturing firms, the paper re-examined the relationship between product diversity and activity-based costing adoption. Improving upon the measurement of product diversity and distinguishing between activity-based costing adoption and use, it examined whether the relationship is curvilinear and/or moderated by usage of advanced manufacturing techniques. The paper contributed to the literature by showing that, consistent with the underlying theory, product diversity, on average, is positively related to both activity-based costing adoption and activity-based costing use, but also that these relationships are indeed inverted U-shaped and that the relationship with activity-based costing use is negatively moderated by usage of advanced manufacturing techniques.

Ahmadzadeh, et al. (2011) conducted an exploratory study on the organizational factors influencing the choice of activity-based costing system in 170 Iranian organizations. Postal questionnaires were administered to Financial Managers of the selected companies in Tehran Stock Exchange. The findings revealed a negative relationship between industry type and activity-based costing implementation. While most of the manufacturing companies still use the traditional costing method, most of the service companies have implemented activity-based costing system. Furthermore, while a negative relationship was reported between firm size and activity-based costing implementation, a positive relationship between cost structure and activity-based costing implementation on one hand and product diversity and activity-based costing implementation on the other hand was reported.

Salawu and Ayoola (2012) investigated activity-based costing adoption among manufacturing companies in Nigeria. The primary data were sourced through questionnaires administered to the Management Accountants of 40 selected manufacturing companies in South Western part of Nigeria. Descriptive statistics was employed to analyze the data. The study reveals that inability of the traditional cost systems to provide relevant cost was the most highly ranked reason in their decision to adopt activity-based costing. Traditional methods of allocating overhead were therefore believed to be deficient in terms of improving global competitiveness. Also, 60% of the respondents have adopted activity-based costing due to increased ranges of products, competition and increased overhead.

Rbaba'h (2013) investigated the influence of company characteristics factors on activity-based costing implementation in Jordanian manufacturing companies. The study investigated company characteristics factors which includes (i) Industry type (ii) company size (Number of Employees) (iv) Products diversity (Number of Product) (v) level of overhead costs; and how each of these factors influence activity-based costing implementation. Questionnaire survey was used in the study, 92 surveys were distributed within the Jordanian manufacturing companies. Logistic regression (logit) analysis was carried out on the data collected. The findings in the study reveals that company sectors, size - number of employees, diversity -number of product and level of overhead cost do not have significant influence on the implementation of ABC among manufacturing shareholding firms in Jordan.

ANALYSIS AND DISCUSSIONS

This section presents the analysis of the data obtained for the purpose of this study.

Table 1: Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.
Step 1	94.095	1	.000
Block	94.095	1	.000
Model	94.095	1	.000

Source: Field Survey, 2013

Table 1 above reports the “Omnibus Tests of Model Coefficients.” Omnibus means overall, and so this output is simply telling us whether the model with 1 predictor (Product diversity) predicts the dependent variable better than chance alone. What the above table is telling us is that the model with 1 predictor does better than chance at predicting the dependent variable, and is statistically significant at $p < .000$.

Table 2: Model Summary

Step	-2 Log likelihood	Log Cox & Snell R Square	Nagelkerke R Square
1	370.649 ^a	.206	.303

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Source: Field Survey, 2013

Table 2 above is the “model summary” which is a summary statistics for the model at “Step 1,” which recall the model with 1 predictor. The first statistic is the -2 Log likelihood value, and is equal to 370.649.

Furthermore, table 2 above reports the Cox & Snell R Square value of .206. This statistic is referred to as a “pseudo-R²” statistic; in that it is designed to tell us something similar to what R-squared tells us in ordinary least squares regression, that of the proportion of variance accounted for in the dependent variable based on the predictive power of the independent variable (predictor) in the model. Overall, high values are better than low values here, with higher values suggesting that your model fits increasingly well.

Next is the “Nagelkerke R Square” statistic, it is a “pseudo” R-square value, purporting to tell us something along the lines of an OLS R-square, but not directly comparable to it.

Table 3: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	2.176	2	.337

Source: Field Survey, 2013

Table 3 above presents the Hosmer and Lemeshow Test, a measure of fit which evaluates the goodness of fit between predicted and observed probabilities in classifying on the DV. We see that the test is not statistically significant ($p < .337$), suggesting that the probabilities of predicted vs. observed do match up as nicely as we would like.

Table 4: Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 ^a Product diversity	1.105	.132	69.680	1	.000	3.020	2.330	3.915
Constant	-4.140	.617	44.970	1	.000	.016		

a. Variable(s) entered on step 1: Product diversity.

Source: Field Survey, 2013

Table 4 above presents the variables in the Equation. The above table is a major part of the logistic regression output. First, we see that SPSS is reporting the Step number, which is "1," and noting that the variable in this step include Product diversity. Let us look at the coefficient "B" under "Product diversity." It is equal to 1.105. It means that given an increase of Product diversity by one unit, we can expect the log odds (or "logit") of implementing ABC system to increase by 1.105.

Next, we see "S.E." which stands for "standard error. Essentially, the standard error is a measure of how stable our estimate is. A large standard error means the estimated coefficient is not that well estimated, and a low standard error means we have a fairly precise estimate. For "product diversity," the standard error is equal to .132. The Wald statistic, as noted earlier, is very much like a t-statistic conceptually, and is a test of the null hypothesis that the "B" population coefficient is equal to 0. Do we have good reason to reject the null hypothesis? Based on the p-value of .001, we have evidence to suggest that the "B" coefficient is not equal to 0 in the population from which these data were presumably drawn. That is, we have evidence to suggest that Product diversity, predicts the response variable better than chance alone.

Next, we see "Exp(B)," and for Product diversity, the value is equal to 3.012. The number 3.012 has a very special meaning. It is called an "odds" and is interpreted as follows: an increase of 1 unit on product diversity increases the odds of implementing ABC system by 3.012. The 95% confidence interval is also provided for the value of Exp(B).

From the analysis in tables above, particularly with the result of the Hosmer and Lemeshow test and other tests conducted above suggests that significant relationship exists between the extent of ABC implementation and product diversity in the Nigerian Manufacturing Sector as the p value (0.001 is less than the beta value 0.05). Thus the null hypothesis that "there is no significant relationship between the extent of ABC implementation and product diversity in the Nigerian Manufacturing Sector," is rejected. It can be concluded therefore that "there is a significant relationship between the extent of ABC implementation and product diversity in the Nigerian Manufacturing Sector."

The section above presents the analysis as it relates to the objective, research question and the hypothesis of the current study. Overall, the result indicates that a significant relationship exists between activity-based costing system implementation and product diversity in the Nigerian manufacturing sector. The fact that most of the selected firms produce more complex and diverse products; they were favourably disposed to implementing activity-based costing. In other words, since the selected firms produce dissimilar and diverse number of product lines, there was more risk of cost distortion, therefore, implementing activity-based costing system was seen as very necessary. This result aligns with the result reported by Cagwin and Bouwman (2002),

Chongruksut (2002), Brown et al. (2004), Isa and Thye (2006), Nasser et al. (2009), Ahmadzadeh, et al. (2011), and Schoute (2011) who each observed that one of the most influential factors that facilitated the decision to implement activity-based costing was the increasing number of product variants.

On the other hand, the result of the current study is inconsistent with the result reported by Nguyen and Brooks (1997) and Rbaba'h (2013) who reported that diversity or number of products do not have significant influence on the implementation of activity-based costing among manufacturing shareholding firms.

Conclusion

This study examines the relationship between products diversity and activity-based costing system implementation in the Nigerian manufacturing sector. The result of the logistic regression analysis reveals that there is a significant relationship between the extent of activity-based costing system implementation and product diversity in the Nigerian manufacturing sector.

Recommendations

This study examines the effects of products diversity on activity-based costing system implementation in the Nigerian manufacturing sector. Products diversity represents only one of the contextual variables influencing costing system implementation. Future studies should seek to investigate the influence of other contextual variables such as top management support and competition, amongst others.

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