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Business Intelligence Efficacy and Management Accounting Practices of Listed Manufacturing Firms in Nigeria

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ABSTRACT

This study examined the effect of business intelligence efficacy on management accounting practices of listed manufacturing firms in Nigeria. The study used survey research design with a sample size of twenty-six (26) manufacturing firms selected through purposive sampling from thirty-three (33) firms listed on the Nigeria Exchange Group as at 31st December, 2021. While correlation and regression analyses were considered for the study. It was discovered that the relationship between data warehouse, online analytical process, data mining and management accounting practice is positive but data warehouse though positive is insignificant, while others were significant. The study concluded that online analytical process and data mining showed more significant effect on management accounting practice as these variables will contributes to the decision making and service quality of management accounting practice of manufacturing firms in Nigeria.

***Keywords*— Business intelligence efficacy, data mining, data warehouse, management accounting practice, online analytical process.**

I. INTRODUCTION

Information technology has advanced rapidly in recent years and has revolutionized several areas of corporate establishment (Achhaiba & Omari-Alaoui, 2022). This includes but not limited to management accounting practices of most corporate organisations. Given the influence of these evolutions, an increasing number of firms have invested in new technologies to improve the effectiveness and efficiency of their information generation processes (Ogundajo & Nyikyaa, 2021). This trend has ultimately benefited these firms in terms of more effective decision-making (Al-Zubi et al., 2014). As a result, firms have undergone major organisational changes, including at the level of the management accounting practice whose main role is to provide key information to both top and operational management. The changes observed triggered the development of new analytical tools known as business intelligence (BI) systems.

Business intelligence efficacy has in recent time has wide attention in the literature. Most of the studies especially in Nigeria have focused on business intelligence in relation to organisational performance (Bestman & Evan, 2022; Ogundajo & Nyikyaa, 2021; Emiaso & Egbunike, 2018). This aside, the estimated methods documented have be descriptive, percentages, content analysis among others. For instance, in a study conducted by Achhaiba and Omari-Alaoui (2022) in Morocco to assess the impacts of business intelligence systems on the management accounting employed content analysis. Bestman and Evan (2022) used Spearman's rank order correlation statistics, Nwohiri and Sonubi (2020), Babatunde et al. (2019), Appelbaum et al. (2017) used descriptive, percentages among others.

II. LITERATURE REVIEW

A. Conceptual Review: Business Intelligence Efficacy

Bestman and Elekwachi (2019) defined business intelligence as the processes, technology and tools needed to transform data into information, information into knowledge, and knowledge into plans of action to promote profitable business. Business intelligence systems combine data gathering, data storage, and knowledge management with analytical tools to present complex and competitive information to planners and decision makers. More so, the primary objective of business intelligence systems is to improve the timeliness and quality of the input to the decision making process.

B. Management Accounting Practice

According to Ogundajo and Nyikyaa (2021) management accounting is a field that deals with partnering in management decision making, budgeting, performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy. Similarly, Petera and Šoljaková (2020) defined management accounting as a joint part of management which deals with the identification, generation, presentation, interpretation and use of important information to communicate strategic decisions, formulate business strategy, and determine capital structure. However, management accounting practice helps an organization to survive in the competitive, ever-changing world, because it provides an important competitive advantage for an organization that guides managerial action, motivates behaviour, plan budgeting parameter like fixed costs, cash flow, profit, supports and creates the cultural values necessary to achieve an organization's strategic objectives (Nwohiri & Sonubi, 2020).

C. Data Warehouse and Management Accounting Practice

In a study conducted by Al-Zubi et al. (2014) when evaluating business intelligence as a means to improve the efficacy of modern management accounting discovered that the use of data warehouse significantly improved the modern management accounting practices in Jordan. In the same vein, Babatunde et al. (2019) concluded that data warehouse technique of business intelligence is useful in the prediction of customers order for a product-based manufacturing outfit with make-to-order strategy possible. Similarly, Alsqour and Owoc (2015) used decision making of an organization to proxy management accounting in a study conducted in Jordanian.

D. Online Analytical Process and Management Accounting Practice

Bestman and Elekwachi (2019) found a positive and significant relationship between online analytical processing and management techniques employed in the public hospitals in River State, Nigeria when accessing business intelligence system strategies and organisational success. As part of the variables employed in Al-Zubi et al. (2014), online analytical process showed significant and positive effect on management accounting practice. Issa (2002) also indicated that online analytical process is a tool often employed by the organization to learn more about the customers and their product preferences.

E. Data Mining and Management Accounting Practice

Nwohiri and Sonubi (2020) used data mining techniques such as statistical analysis, classification, visualization, summarization and report generation and found a significant positive relationship with the accounting practices of an organization. Using selected deposit money banks in River State, Nigeria, Bestman and Evan (2022) assessed the relationship between data mining and organisational performance, and they discovered that there is a significant relationship between the variables.

F. Theoretical Review

This study is rooted in technology accepted model. The theory was propounded by Fred Davis in 1986. The theory showed the relationship between the user's acceptance of new information system and their perception of the ease of use and the significance of using information system. Basically, the theory has two assumptions. These are the perceived utilities and the perceived ease of application, and these two assumptions determine the attitudes to adopt modern technology and have impacts on the overall goals of the organization. These include the user's behaviour and their perception about the use of business intelligence systems.

According to Bestman and Evan (2022), this theory is relevant and applicable when considering the extent or the degree to which organisations; especially manufacturing firms utilize business intelligence

techniques to provide answers to all the organization's complex queries within the context of management accounting.

G. Empirical Review

Achhaiba and Omari-Alaoui (2022) assessed the impacts of business intelligence systems on the management accounting of selected companies in Morocco. The study used content analysis based on past studies to draw out its findings. The study revealed that business intelligence systems as analysis-oriented solutions appear to support existing management accounting tasks such as reporting, analysis and budgeting. Additionally, BI systems appear to stimulate companies to adopt advanced management accounting techniques, such as key performance indicators, balanced scorecard, activity-based costing, benchmarking, customer satisfaction survey, target costing, and lifecycle costing among others. The role of management accountants also continues to evolve in parallel, moving from that of a technical expert to that of a business partner supporting decision making.

Bestman and Evan (2022) examined the relationship between data mining and organisational performance of deposit money banks in Rivers State, Nigeria. The study used a cross-sectional research survey design through structured questionnaire, and the hypotheses were tested using the Spearman's rank order correlation statistical technique. The findings revealed that there is a significant relationship between data mining and organisational performance of deposit money banks in Rivers State, Nigeria.

H. Conceptual Framework

The conceptual framework on business intelligence efficacy and management accounting practice of listed manufacturing firms in Nigeria is illustrated in Figure 1.

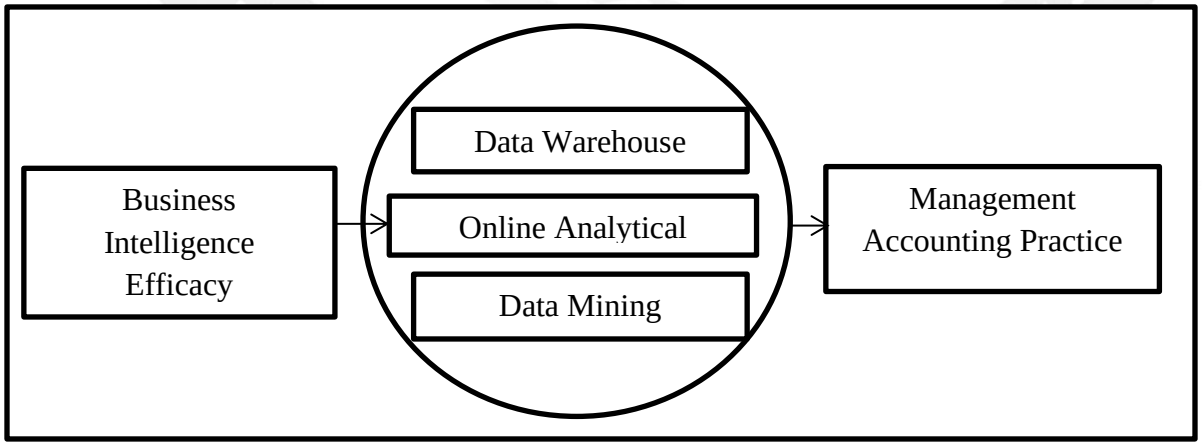

Figure 1: Conceptual framework on business intelligence efficacy and management accounting practice of listed manufacturing firms in Nigeria

III. METHODOLOGY

Survey research design was used because data was obtained directly from the respondents. The population of the study is 33 manufacturing firms listed on the Nigeria exchange group as at 31st December 2021 of which each of the firms operates under different sectors. The sample size of this study is 26 firms which were selected using purposive sampling technique. Data was collected from primary sources through the use of structured questionnaires. Data collected were analyzed using correlation analysis and regression analysis.

A. Model Specification

This study adapts the model of Al-Zubi et al. (2014) which studied the effect of business intelligence tools in raising the efficiency of modern management accounting. The study however uses efficiency of modern management accounting and extract transform and loading but this model however digresses by introducing data warehouse and data mining. The model is specified thus:

$$MAP = f(DW, OAP, DM) \quad (1)$$

Stating the model in econometric form as given in equation 3.1 as:

$$MAP=\beta_0 + \beta_1 DW + \beta_2 OAP + \beta_3 DM + \mu \quad (2)$$

Where:

MAP = Management Accounting Practice

DW = Data Warehouse

OAP = Online Analytical Process

DM = Data Mining

μ = Error term

The apriori expectations in line with theoretical evidence in the literature are stated as:

$$\frac{\delta MAP}{\delta DW} > 0 \quad \frac{\delta MAP}{\delta OAP} > 0 \quad \frac{\delta MAP}{\delta DM} > 0 \quad (3)$$

IV. RESULTS AND DISCUSSION

A. Reliability Test

Table 1 is the test conducted on reliability of business intelligence efficacy and management accounting practice of listed firms in Nigeria. The result showed that management accounting practice has a Cronbach

Alpha of 0.718 using 6 items. Cronbach Alpha for data warehouse is 0.721 using 7 items, online analytical process has a Cronbach Alpha of 0.761 using 7 items, while data mining has a Cronbach Alpha of 0.704 using 7 items. This explained that all the items in the variables explain the topic under consideration due to the Cronbach Alpha values that is greater than 0.7.

B. Descriptive Statistics

The result of descriptive statistics is reported in Table 2, and it explained the distribution characteristics of the variables used in the investigation of business intelligence efficacy and management accounting practice of listed manufacturing firms in Nigeria. The table revealed that the average value of management accounting practice is 4.120408 and has a minimum of 3.000000 to a maximum of 4.750000. The degree of variation reported by the standard deviation showed a higher variability from its mean with a value of 0.348139. Data for the variable is negatively skewed with a value of -0.272294 while it kurtosis of 2.756761 proofed that it is normally distributed.

Similarly, data warehouse recorded a mean value of 4.212245 varies from a minimum of 3.000000 to a maximum of 5.000000. Its deviation from the mean of 0.433496 showed that it has higher deviation rate. The Skeweness of -0.279195 implied that the variable is negatively skewed and showed a kurtosis value of 2.734509 that is Platykurtic distribution. Online analytical process has a mean value of 4.008163 varies from a minimum of 1.000000 to a maximum of 1.000000. Standard deviation of 0.914330 showed that data for the variable deviated very high from the recorded value of the mean. The variable is negatively skewed with a value of -1.079883 while its kurtosis value of 4.560226 is leptokurtic because it exceeded 3. In the same vein, data mining has a mean value of 4.032653 varies from a minimum of 1.000000 to a maximum of 5.000000. The degree of variation reported by the standard deviation showed a higher variability from its mean with a value of 0.788594. Data for the variable is negatively skewed with a value of -0.610244 and the kurtosis of 3.112925 is leptokurtic due to the value that is above 3.

Table 1 Reliability Test Results

S/N	Variable	No. of Items	Cronbach's Alpha
1	Management Accounting Practice (MAP)	6	0.718
2	Data Warehouse (DW)	7	0.721
3	Online Analytical Process (OAP)	7	0.761
4	Data Mining (DM)	7	0.704

Table 2 Descriptive Statistics

Variables	MAP	DW	OAP	DM
Obs	245	245	245	245
Mean	4.120408	4.212245	4.008163	4.032653
Std. Deviation	0.348139	0.433496	0.914330	0.788594
Minimum	3.000000	3.000000	1.000000	2.000000
Maximum	4.750000	5.000000	5.000000	5.000000
Skewness	-0.272294	-0.279195	-1.079883	-0.610244
Kurtosis	2.756761	2.734509	4.560226	3.112925

C. Test of Variables

(i) Normality Test

Figure 2 is the output of the normality test conducted on the model. It revealed that the Jarque-Bera statistics value is 68.10334 while its probability is 0.140271. This probability value of 15% exceeded 5% hence accept the null hypothesis that the residual are normally distributed while the alternative hypothesis of no normal distribution is rejected.

(ii) Linearity Test

The correlation analysis of business intelligence efficacy and management accounting practice of listed manufacturing firms in Nigeria is reported in Table 3. The result showed that the correlation between data warehouse and management accounting practice is negative with a value of -0.272. This implied that an increase in data warehouse will lead to 0.272 unit decrease in management accounting practice among listed firms in Nigeria. More so, online analytical process has a significant positive correlation of 0.402 with a p-value of 0.000, which shows that an increase in business intelligence caused by online analytical process will increase management accounting practice by 0.402.

Similarly, the correlation between data mining and management accounting practice is positive and significant with a value of 0.534 and p-value of 0.000 showed that as data mining increases by a unit will lead to 0.534 unit increase in management accounting practice of listed firms in Nigeria. The correlation between data warehouse and other two independent variables (online analytical process and data mining) is negative with a value of -0.239 and -0.424 respectively while the correlation between online analytical process and data mining is positive but insignificant with a value of 0.096. The coefficients of all the variables do not exceed 0.7, therefore concluded that multicollinearity problem which may affect the suitability of the model is absent.

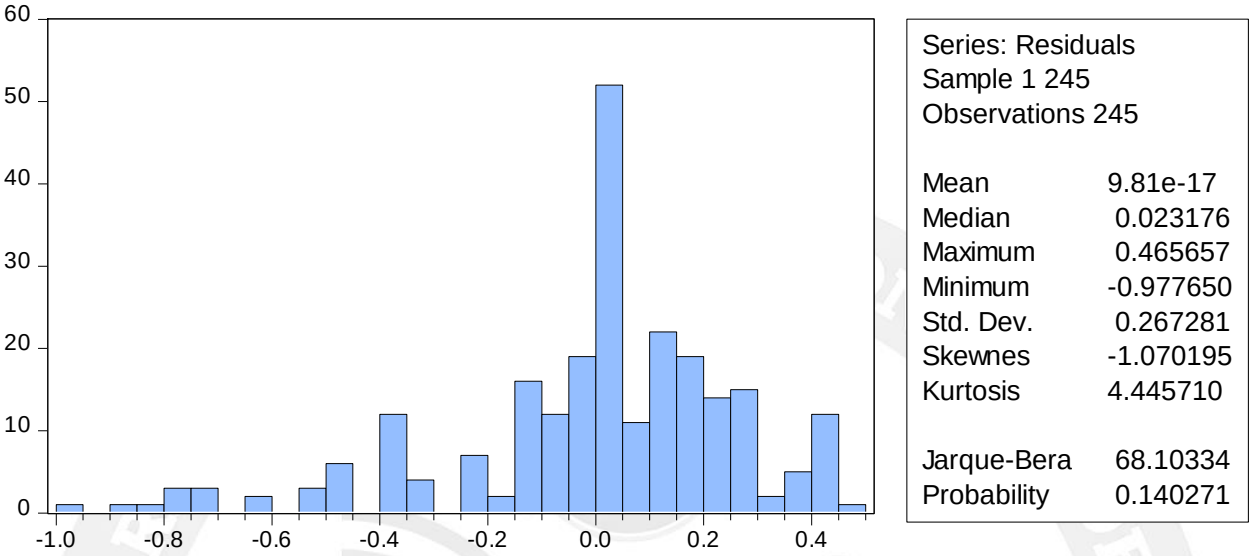

Figure 2: Normality Test

Table 3 Correlation Analysis of Study Variables

	MAP	DW	OAP	DM
MAP	1.000			
DW	-0.272**	1.000		
	(0.000)			
OAP	0.402**	-0.239**	1.000	
	(0.000)	(0.000)		
DM	0.534**	-0.424**	0.096	1.000
	(0.000)	(0.000)	(0.133)	

(iii) Multicollinearity Test

To further ascertain absence of multicollinearity problem in the model, Tolerance value and Variance Inflation Factor (VIF) were conducted (Table 4). The tolerance value of data warehouse is 0.781, for online analytical process is 0.943 while data mining has a tolerance value of 0.820. The tolerance values of all these variables are greater than 0.10 therefore, proofed the absence of multicollinearity problem. In the same way, Variance Inflation Factor (VIF) for data warehouse is 1.281, online analytical process has a variance inflation factor of 1.060 while the Variance Inflation Factor (VIF) for data mining is 1.219. These equally showed that multicollinearity problem is not in the model.

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Table 5 showed the regression analysis of ordinary least square conducted on the specified model. It revealed the R Square (R2) of 0.410571 and its adjusted (R2) value of 0.403234. This indicated that the independent variables (data warehouse, online analytical process and data mining) account for about 40% behaviour of management accounting practice while the remaining percentage is explained by the stochastic term. The statistical significant of the whole model revealed a value of 55.95676 and has a probability of 0.000000 which revealed that the model is nicely fitted.

The individual coefficient revealed that data warehouse has a positive coefficient of 0.025482 which implied that a unit increase in data warehouse will lead to 0.025482 unit increase in management accounting practice among listed firms in Nigeria. The t-statistics of 0.566884, and a p-value of 0.5713 is not significant in explaining management accounting practice among listed firms in Nigeria. On the other hand, online analytical process has a coefficient of 0.137328, t-statistics of 7.081875, and a p-value of 0.0000. This connotes that a unit increase in online analytical process will lead to 0.137328 unit increase in management accounting practice among firms in Nigeria. In addition, data mining has a coefficient of 0.226457 t-statistics of 9.393856 and a p-value of 0.0000 implied that a unit increase in data mining will lead to 0.226457 unit increase in management accounting practice in Nigeria.

The policy implications of the variables are provided thus: data warehouse has an insignificant positive relationship with management accounting practice of listed firms in Nigeria. Though positive but not significant implied that business intelligence efficacy of data warehouse has no major effect on management accounting practice in Nigeria. The positive relationship of these two variables supports the works of Achhaiba and Omari-Alaoui (2022), Bestman and Evan (2022), Ogundajo and Nyikyaa (2021), Babatunde et al. (2019).

Table 4 Multicollinearity Test

Tolerance	VIF	1/VIF
0.781	1.281	0.781
0.943	1.060	0.943
0.820	1.219	0.820
Mean VIF	1.187	

Table 5 Tax System Automation and Revenue Yield in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DW	0.025482	0.044951	0.566884	0.5713
OAP	0.137328	0.019391	7.081875	0.0000
DM	0.226457	0.024107	9.393856	0.0000
C	2.549419	0.271033	9.406307	0.0000
R-squared	0.410571			
Adjusted R-squared	0.403234			
F-statistic	55.95676			
Prob (F-statistic)	0.000000			

E. Findings

The study examined business intelligence efficacy and management accounting practice of listed manufacturing firms in Nigeria. Variables for business intelligence are data warehouse, online analytical process and data mining while the dependent variable is management accounting practice. The study revealed that the relationship between data warehouse and management accounting practice is positive but not significant. The insignificant relationship expresses the fact that business intelligence created through data warehouse is not enough to the level of having a meaningful impact on management accounting practice among firms in Nigeria. The other two variables revealed a significant positive relationship. This connotes that online analytical process and data mining contributes in no small measure to the management accounting practice of firms in Nigeria.

V. CONCLUSION

In a bid to examine business intelligence efficiency and management accounting practice among Nigerian firms, the study employed regression analysis of multiple regression coupled with correlation matrix. The outcome of the study showed that insignificant positive relationship subsist between data warehouse and management accounting practice while online analytical process and data mining revealed a significant positive relationship. From the results, the study concluded that business intelligence efficacy created through online analytical process and data mining propel the management accounting practice of listed firms in Nigeria for data-driven decision making and service quality.

The study recommends that corporate organization in Nigeria should make provision for an up-to-date and adequate data warehouse for storage of information that can facilitate better management accounting practices; Companies should ensure that records of all kinds are made and process via online as it will reduce cost of paperwork and ensure accuracy of information; It is vital for corporate organization to ensure

that data mining techniques such as statistical analysis, classification, visualization, summarization and report generation are use from time to time to aid management accounting practice in their establishment.

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