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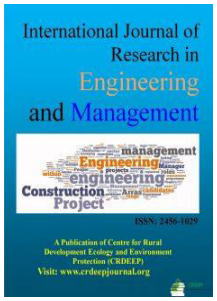

Full Length Research Paper

Business Analytic Systems and Organizational Decisions Making

John Idoko[1] and Sydney Akinsunmi[2]

[1]*Research Student, Department of Management Information System, Texas Southern University, USA.*
[2]*Research Student, Department of Information technology Management, California Baptist University: Riverside, California, USA.*
ORCID:[1]https://orcid.org/0000-0001-8026-4636&[2]https://orcid.org/0000-0001-8740-7433

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Corresponding Author:
John Idoko

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ABSTRACT

Business analytics is increasingly advocated as an important strategic information technology investment for many organizations. Its systems encompass the various analytics techniques that can be used to support evidence-based decision-making and action-taking. The study investigated the impact of business analytic systems on organization decision-making in Nigeria. To achieve this objective, primary data was collected from eight (8) large companies selected from Nigeria Stock Exchange (NSE). Survey research design was adopted for the collection of the primary data (questionnaires) from the manufacturing companies in Lagos State, Nigeria. Pearson Correlation and Multiple linear regression analysis were used for the analysis. The study found that analytical methods and interpretation tools showed a strong positive relationship, and analytic tools showed a weak positive correlation. The result of the multiple regression analysis found that analytical tools, analytical methods, and interpretation tools positively contributed to organizational decision-making. The study concluded that business analytic system has a significant impact on organizational decision-making.

Introduction

Business analytic is an important area for the great interest in deciding on an organization. Hota, (2011) reported that business analytic tools can be used in the analysis, product affinity, human resource management, campaign effectiveness, and financial intelligence applications. It creates a platform for better collaboration, collects and sort data, document business requirements, use case analysis, workflow management, and creation of the prototype. Business analytics aims to generate knowledge, understanding, and learning – collectively referred to as 'insight' – to support evidence-based decision-making and performance management. It has a paradigm shift in the way organizations execute their operational, tactical, and strategic objective (Hota, 2011).

Business analytics (BA) is increasingly advocated as an important strategic information technology (IT) investment for many organizations. BA systems encompass the various analytics techniques (e.g., descriptive analytics and predictive analytics) that can be used to support evidence-based decision-making and action-taking (Wang, Hajli, & Byrd, 2015; Watson, 2014). In business analytic, some common methods include optimization, mathematical modeling, statistical analysis, market segmentation, data mining, econometrics, and time series methods as described in the research of Hota, (2011). According to Smallman and Moore, (2010), six paradigms were used in organizational decision making. The six paradigms include the classical concept of prescriptive, analytical decision making (Edwards, 1954); bounded rationality (Cyert & March 1992); adaptive decision making (Payne, Bettman & Johnson, 1993); political decision-making (Pettigrew, 1973); conceptualize decision-making (Cohen, March, & Olsen, 1972), and naturalistic decision-making (Lipshitz, Klein, & Carroll, 2006). These paradigms explained the concept of business analytics deciding for an organization.

Decision-making in businesses today is moving to the point where the accepted practice is about first understanding the numbers and what they are revealing, and then using this insight to drive intelligent business decisions. This replaces the approach where people take the action that feels right and then examine the numbers afterward to see if it worked. Insight, therefore, should drive decision-making. But insight also has a broader role to play in the landscape of organizations. It is often presented as a rational process, in which individuals make decisions by collecting, integrating, and analyzing data in a coldly rational, mechanistic way. However, research has long shown that this is not how people make decisions. It is a dynamic, contextual and personal/group activity in which prior knowledge and experience are recalled and combined with information. Most organizations rely on individuals to make rational judgments that are based on data. Yet outcomes from psychological experiments exploring this area suggest that

people will frequently fail to do so. What is interesting is that they fail to do so in systematic, directional ways that are predictable (Ariely, 2008; Hodgkinson, 2008).

Different authors including Seddon, Constantinidis, and Dod, (2012); Sharma,Mithas, and Kankanhalli, (2014); Cao, Duan, and Li,(2015); Wang, Kung, Wang, Yu, and Cegielski, (2014) etc have reviewed and explored the linkage between the analytics uses, insights decisions, and organizational benefits using different variables to measure it. Despite this, the study has no strong empirical evidence on how business analytics systems impact organizational decision-making in a medium organization. To respond to the research gap, the study, therefore, investigates how the business analytics system in an organization is used in deciding on an organization.

Literature Review

Cao, Duan, and Li, (2015) researched business analytics and decision-making effectiveness. The study aimed at developing a model connecting business analytics to organizational dimension medium effectiveness using a structural equation model. About 740 responses were gathered from United Kingdom businesses. The result of the study found that business analytics, through the mediation of a data-driven environment, positively influences information processing capability, which in turn has a positive effect on decision-making effectiveness. The result of the analysis also discovered no significant differences in large and medium companies of business analytics to dimension-making effectiveness. Another result of the analysis also found a significant difference between the manufacturing and professional service industry. A similar study conducted by Cao and Duan, (2015) also used a structural equation model to investigate the relationship between business analytics and strategic decision making and their impact on organizational performance using 296 survey responses from UK businesses. The study found a positive effect on business and decision-making affordances. Using a similar method, Wang and Byrd (2017) found that business analytics capability is a multidimensional construct that is formed by capturing the functionalities of BA systems. The study also found that effective use of data analysis and interpretation tools in healthcare units indirectly influences decision-making effectiveness.

In the health sector, Ward, Marsolo, and Froehle (2014) applied business analytics in the healthcare system. The study explored the applications of analytics in healthcare, barriers and facilitators to the widespread adoption, and ways in which analytics can help us achieve the goals of the modern healthcare system. Wang, Hajli, and Byrd, (2015) furthered investigated the use of business analytics systems. The results discovered that healthcare units are likely to obtain valuable knowledge as they utilize the data interpretation tools effectively. The result also found that the use of data analysis and interpretation tools in healthcare units indirectly influences decision-making effectiveness, an impact that is mediated by absorptive capacity.

Chatterjee, Rana, and Dwivedi, (2021) discovered that the acquisition of business analytics capabilities has a significant influence on an organization's business process performance and business decision which significantly influences organizational performance. Also, organizational performance has a positive influence on business value. Aydiner, Tatoglu, Bayraktar, Zaim, and Delen, (2019) found a significant positive relationship between business process performance and firm performance.

The research of Ramanathan, Philpott, Duan and Cao (2017) used a qualitative method of data analysis to investigate the impact of business analytics and performance using the case study of nine retailers in the U.K. The study found that a significant relationship between TOE elements and adoption. Troilo, Bouchet, Urban, and Sutton (2016) conducted an empirical study on management's perception and the effect of business analytics and the actual change in financial performance ever since the adoption of analytics by organizations.

Materials and methods

Study area

Lagos state is an administrative division of Nigeria, located within Lat 6°31'27.77"N and Long. 3°22'45.14"E in southwestern geopolitical zone of Nigeria. It is the second most populous state in Nigeria, regarded as the nation's largest urban area. It is over 65 percent of Nigeria businesses with more than 2000 manufacturing companies, 200 financial institutions and the largest collection of small and medium enterprises in Africa.

Sampling methodology

This research employed a survey research design to gather information among the five selected large companies including Nestle, Neimeth International Pharmaceutical, Berger Paints, Chikki Foods Industries, and Rite Foods Ltd in Lagos State, Nigeria. The population of the study comprised of managers, human resource management, IT staff, and computer scientists or analysts amidst the staff of the large companies with the population of 267 staff in total. The data was randomly distributed by adopting a simple random sampling among the staffs of the five selected companies in Nigeria.

Sample size determination

To determine the sample size, Taro Yamani formular for sample size determination was applied. This is because the population of the study is finite and Babbie, (1986) proposed that sample sizes between 30 to 500 participants are mostly appropriate for most studies. Researchers have suggested that the minimum sample size should be at least 5% of the total population. This led to the formular of sample size suggested by Taro Yamane, (1976) given as:

$$n=N/(1+N(e^2))$$

where

n = sample size;
N = total population size = 267
e = margin of error (0.05), and
1 = constant.

$$n=N/(1+N(e^2))$$
$$n=267/ (1+267(0.05^2))$$
$$n=267/ (1.6675)$$
$$n=160.12.$$

Therefore, the total sample size (n) = 160.

Data analysis

The section focused on the data and analytical method adopted to analyze the questionnaires distributed among large companies. The study used descriptive and inferential methods of analysis. The descriptive statistics include mean, standard deviation, minimum, maximum, and number of observations while the inferential statistics include correlation analysis and regression analysis. The correlation analysis was used to

determine the relationship between business analytic systems (analytic tool, analytic method, and interpretation tool) and organizational decision making. A multiple regression analysis was conducted to check the impact of business analytic tools and organizational decision-making. Meanwhile, before the regression analysis was conducted, a multicollinearity test, analyzed using variance inflation factor, was used to determine whether there will be a problem of multicollinearity. However, the result of the regression analysis showed the model summary, F-statistics, p-value determined by the F-statistics, and beta, known as the coefficient value is tested using the statistical significance level, determined by having either positive or negative impact on organizational decision making.

In this paper, the model is built under the proxies of analytical tools, analytical methods, and interpretation tools of business analytic systems, indicating the explanatory or the independent variables while organizational decision making was used as a dependent variable. Figure 1 shows the presentation of the dependent and the independent variables.

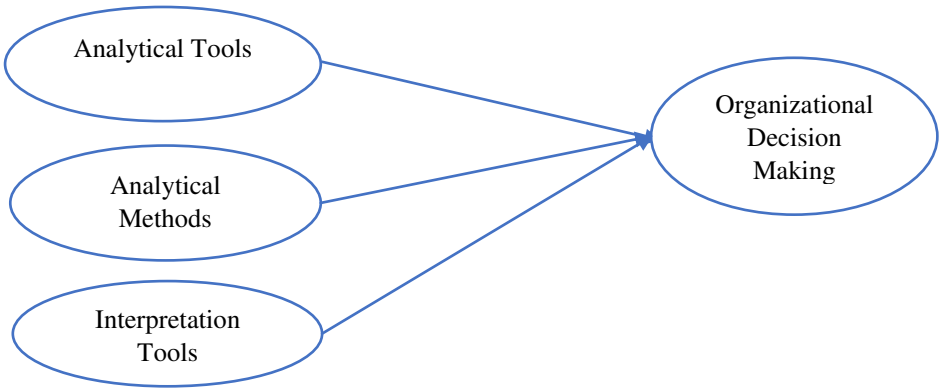

Fig 1: Researcher's Conceptual Model**.** *Source: Researcher's Compilation, 2021.*

Given the researcher's conceptual model, the model in Figure 1 below captures the interrelationship between business analytical systems and organizational decision-making in Nigeria given the equation of the model below.

$ODM_i = \beta_0 + \beta_1 ANT_i + \beta_2 ANM_i + \beta_3 IPT_i + \varepsilon_i$ ---------- Model

Where;

The proxies for business analytics systems include analytical tools, analytical methods, and interpretation tools;

ODM = organizational decision making;

ANM = Analytical Methods;

IPT = Interpretation tools, and

ε = error term.

A total sample size of 160 questionnaires was distributed among the listed staff but only 152 questionnaires were retrieved and used for the analysis. The validity and the reliability test of the instrument used for the analysis were analyzed. The result of the KMO, Bartlett test, and composite reliability revealed that the instrument is valid as shown in Table 1. The result also indicates that the instrument is reliable using Cronbach's Alpha test ranging from 0.858 to 0.928 as indicated in Table 2. Proving from the result obtained on validity and reliability test, it indicated that the analysis is consistent and there is a need to proceed with the analysis.

Table 1: Validity Test for the Variable

Sections	No. of Items	AVE	KMO	Bartlett Test	Composite Reliability
Dependent Variable					
Organization decision making	6	0.897	0.855	0.000	0.928
Independent Variable					
Analytical Tool	12	0.823	0.812	0.002	0.858
Analytical Methods	7	0.696	0.769	0.031	0.882
Interpretation Methods	3	0.743	0.795	0.000	0.887

Source: Researcher's Field Survey, 2021.

Table 2: Reliability Test for the Variables

Sections	Variables	No. of Items	Cronbach's Alpha
Dependent Variable			
	Organization Decision Making	5	0.745
Independent Variable			
	Analytical Tool	12	0.798
	Analytical Method	7	0.718
	Interpretation Tools	3	0.735

Source: Researcher's Field Survey, 2021.

Results and Discussion

To satisfy the research objective and hypothesis, multiple linear regression was used to analyze the dataset obtained from large companies in Lagos Nigeria. STATA version 17, the statistical package was used to analyze the dataset.

Descriptive Analysis

Table 3 presents the mean, standard deviations, minimum, maximum, and number of observations of each of the proxy for business analytics tools and organizational decision-making. From the result presented below, the interpretation tool has the highest mean value of 3.2408 with the standard deviation of 0.8439; followed by analytical methods having the mean of 3.1908 (0.7759std); analytical tools showing the mean of 3.0276 (0.7963std), and the least mean value was organizational decision making showing 2.7655 and the standard deviation of 0.4532.

Table 3: Descriptive Statistics of the Dependent and Independent Variables

Variable	Mean	Std. dev	Min.	Maximum	Number of Observation
Analytical Tools	3.0276	0.7963	1.000	4.132	152
Analytical Methods	3.1908	0.7759	1.000	4.800	152
Interpretation Tools	3.2408	0.8439	1.000	5.162	152
Organizational Decision Making	2.7655	0.4532	1.000	5.000	152

Where std. dev indicates standard deviation, and Min. indicates the minimum; Source: Researcher's Field Survey, 2021.

Inferential Analysis

The degree of relationship between organizational decision-making and business analytical systems. Organizational decision-making showed a strong positive relation with analytical method (r = 0.573) and interpretation tools (0.658) while organizational decision making showed a weak positive relationship with analytical tools at r = 0.456. The result is an indication that business analytic systems are an indicator of organizational performance, implying that as business analytic systems increase, organizational decision making also increases. Analytical tools increase organizational decision making a minimal way as a result of the analysis shown in the table below. Variance inflation factor (VIF) was used to explain whether the problem of multicollinearity among the explanatory variables. As indicated in Table 5 below, the value of the VIF for all the variables is less than 5, this indicates that no problem of multicollinearity. Also, the tolerance level, indicated by 1/VIF gave a value less than 1 confirming the result obtained on the analysis and indicating that no problem of multicollinearity occurs between the explanatory variables (business analytic systems). The fitness of the dataset of the model is determined using adjusted R^2 as revealed in Table 6. The value of the adjusted r^2 showed 0.537, indicating that 53.70% of the composition of business analytic systems on organizational decision making. The remaining 46.30% of the factors were either not considered or not capture in the study. In Table 7, the study investigated the impact of business analytic systems on organizational decision-making. The result found that business analytic systems (analytical tools, analytical methods, and interpretation tools) were significant with organizational decision-making. The parameter estimates are shown in Table 7 which indicates that business analytical tools had a great impact on organizational decision making. The study mediated the relationship between business analytic systems and organizational decision-making. The result shown in Table 7 revealed that analytical tools, analytical methods, and interpretation tools had a positive impact on organizational decision-making. This indicated that if the business analytic system increases, the organizational decision-making also increases. Also, a unit increase in the proxy of business analytic tools will lead to an increase in organizational decision-making.

Table 4: Bivariate Analysis of the Variables

Variable	Organization decision Making	Analytical Tools	Analytical Methods	Interpretation Tools
Organization decision Making	1.000			
Analytical Tools	0.456	1.000		
Analytical Methods	0.573	0.431	1.000	
Interpretation Tools	0.658	0.422	0.683	1.000

Source: Researcher's Field Survey, 2021.

Table 5: Multicollinearity Analysis

Variable	VIF	1/VIF
Analytical Tools	2.750	0.364
Analytical Methods	1.760	0.568
Interpretation Tools	2.570	0.389
Mean	2.360	0.440

Where VIF indicates Variance Inflation Factor. ; Source: Researcher's Field Survey, 2021.

Table 6: Model Summary

Model Summary				
	SS	**Df**	**MS**	
Model	45.302	3	15.101	
Error	64.462	148	0.486	F(3, 148) = 16.30
Adj. R-square	0.537	R square	0.558	Prob > F = 0.000

*SS indicates Sum of Square, DF – Degree of Freedom, and MS – Mean Square. **;** Source: Researcher's Field Survey, 2021.*

Table 7: Organisation Decision Making and Business Analytical Tools

ES	Coeff	Std. Error	t-value	P-value
Constant	1.845	0.250	3.28	0.000***
Analytical Tools	0.167	0.0829	2.17	0.024**
Analytical Methods	0.183	0.086	3.02	0.045**
Interpretation Tools	0.163	0.084	1.75	0.004***

**** and ** indicates P-value ≺ 0.05 (5% significance level), Std. Error – Standard Error, and P-value indicates Probability Value. ; Source: Researcher's Field Survey, 2021.*

The proxies of the business analytic system include analytic tools, analytic methods, and interpretation tools. These proxies served as explanatory variables or independent variables. These variables determine the level of contribution to the dependent variable, known as organizational decision-making. Some research studies have been consistent with our findings indicating a significant relationship between business analytic and organizational decision making. Studies like Aydiner et. al., (2019); Chatterjee et. al., (2021), and Cao and Duan, (2015) revealed a significant positive relationship between business analytic and organizational decisions making. The studies are consistent with our findings since the result obtained showed a significant impact on organizational decision-making. Our study found that an increase in the business analytic system will increase organizational decision-making. The analysis has also confirmed that the business analytic system determines or it is an indicator of organizational performance.

Conclusion

The study examined the linear relationship between business analytic systems and organizational decision-making. In doing this, the study first reviewed some studies relating to business analytic and organizational decision-making, where variables used in the study were identified based on past empirical studies. The study, however, used correlation and multiple linear regression analysis to analyze the impact of analytical tools, analytical methods, and interpretation tools on organizational decision making. The study provides evidence that a business analytic system has a significant impact on organizational decision-making. Thereby provide useful guidance for practitioners about the management and configuration of business analytic systems.

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