Management information system and firms' performance in a developing economy: Evidence from the manufacturing sector in Nigeria

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Abstract

The employment of information system for conceptualisation of information analysis and control as well as decision-making, which depicts management information system (MIS), has aroused the interest of researchers and practitioners. This study examined the effect of MIS on manufacturing firms' performance in Nigeria, by using two elements of MIS, namely the decision support system (DSS) and the executive information system (EIS). The study employed a survey research design, by administering questionnaires to some selected employees of manufacturing firms at Agbara Industrial Estate, Ogun State, Nigeria. The findings revealed that the two elements of MIS employed for this study (DSS and EIS) have an individual significant positive effect on manufacturing firms' performance. It concluded that MIS elements (DSS and EIS) are important determinants of manufacturing firms' performance. It is, therefore, recommended that manufacturing firms should employ MIS elements, particularly DSS and EIS, for the enhancement of their performance.

Keywords: Decision support system, executive information system, management information system, manufacturing firms, performance.

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1. Introduction

The manufacturing sector in Nigeria accounts for millions of employment opportunities and contributes significantly to Nigerian economic growth and development. As of 2018, the sector accounted for 9.2% of the nation's GDP (NBS, 2018). The manufacturing sector is confronted by various challenges that affect their competitiveness. Business entities are now adopting information-based management style. Consequently, more firms are concentrating on implementing an information system that aids decision-making, by processing data towards the production of useful information. Furthermore, most organisations have recognised the significance of management information system (MIS), which is a process that offers vital information in order to manage a firm in an effective manner. MIS enhances communication among workers, allocates intricate material all through the companies and lessens the high cost connected to manual labour-intensive actions; it equally supports the organisation's strategic goals and directions (Azeez & Yaakub, 2019; Shion, 2000; Mwangi, Kiarie & Kiai, 2018).

The MIS concentrates on providing support for the firm's decision-making process; it helps in generating business information required for decision-making through the computerisation of a firm's processing system towards the attainment of organisational goals (Kumar, 2006). Antwi and Gideon (2019) found that MIS had improved learning and teaching and it had also enhanced or modified the learning process in educational institutions. A study by Tahon-Ballestero, Gonzalez-Serrano, Soguero-Ruiz, Munoz-Romero and Rojo-Alvarez (2018) found that the data from customer relationship MIS aided in the determination of client profiles in the hospitality industry. Furthermore, Abu-Amuna, Shobaki and Abu-Naser (2017) found that it is important to use knowledge-based computerised information systems in the decision-making process.

It has been observed that the extant literature neglected the evaluation of MIS elements, particularly the decision support system (DSS) and the executive information system (EIS), with regard to the manufacturing sector in Nigeria. More specifically, this review poses the following research questions:

RQ1: To what extent does DSS affect the performance of manufacturing firms in Nigeria?

RQ2: To what degree does the EIS affect the performance of manufacturing firms in Nigeria?

RQ3: What is the combined effect of MIS elements on the performance of manufacturing firms in Nigeria?

The study's objective is to investigate the effect of MIS on manufacturing firms' performance in Nigeria, by using two elements of MIS, namely DSS and EIS.

In line with the research objectives, the following hypotheses were tested:

H1: DSS significantly affects the performance of manufacturing firms in Nigeria.

H2: EIS significantly affects the performance of manufacturing firms in Nigeria.

H3: MIS elements significantly affect the performance of manufacturing firms in Nigeria.

This study is noteworthy in the following ways: first, it extends previous studies on the MIS, particularly DSS and EIS. Second, the results of this study will be relevant to the manufacturing sector. Finally, the study opens a new research vista on the MIS.

This paper is divided into four sections: the first section introduces the subject matter as well as provides the statement of the problem and the research hypotheses. It equally provides the conceptual and theoretical review of literature on the broad concept of MIS and its elements (DSS and EIS) as well as the concept of performance. The second section presents the research methods adopted for this study. The third section presents the findings and discussions. Finally, the fourth section provides the conclusion and recommendations, as well as suggestions for further study.

2. Literature review

Businesses and other organisations' internal reports used to be produced manually and only periodically as a derivative of the accounting gadget and with a few extra information, and these gave confined and behind the schedule records on management performance. Data were prepared manually in line with the requirement and necessity of the employer. As computational generation developed, information began to be distinguished from data and the devices were developed to produce and arrange abstractions, summaries, relationships and generalisations based totally on the data (Al-Emram, Mezhuyev, Kamaludin & Shaalan, 2018).

Laudon and Laudon (2007) posit that in 1939, John Atanasoff and his assistant Clifford Berry constructed the primary digital computer. Their device, the Atanasoff–Berry computer, furnished the inspiration for the advances in electronic digital computers. These computers processed binary bits of information and achieved mathematical computation for technological know-how projects. The invention of the first mainframe computer led to a career area known as laptop technology. The category of computer utilisation and the processing of scientific records became strictly associated with the domain of science. In 1952, the evolving Punchcard system created by International Business Machine changed the way the government, enterprises and academic institutions perceived data processing (Laudon & Laudon, 2007).

Business applications were challenging for computer scientists due to the fact many did not have a historical past in business. The programmers often had to call in business people and write down notes on how business managers and executives wanted the computers to process information. The computer programmer usually writes the programme without knowing the business concept in any respect. There was a language barrier among programmers and business owners who desired to have programmes developed for their businesses or operations (Laudon & Laudon, 2007). The arrival of computer applications for businesses has brought about the creation of the management information domain.

Huang and Chang (2003) posit that the development of facts and communique techniques (ICT) has a restrained scope of convenient gadget deployment, implementation and finer input processing to get the preferred output. Although high-performance computing and knowledge management tools prevail, enterprise computing and intelligence competencies have been improvised; there may be an awesome want to promote the long-term viability of management informatics as well as artificial intelligence techniques (Patil, 2018).

Gabriel (2012) opines that in defining management data systems, it would be right to first split the challenge into three components, namely control, information and systems, respectively. Management can be described as the manner through which planning, organising, staffing, coordinating, reporting, controlling and directing of operations within a company is carried out in order to attain the goal of the organisation. Furthermore, information refers to the circulation of information which has been processed to the form in that the users understand. In a nutshell, information is systematised data that is meaningful (Patil, 2018). However, the system refers to an assemblage of numerous but inter-related and interdependent components that features as a whole towards the attainment of a shared objective (Gabriel, 2012) or a set of components joined together for a mutual goal (Kumar, 2006).

Based on the above, MIS may be described as a mixed system of offering information to guide the management's operations and decision-making capabilities in an enterprise (Ajayi & Omirin, 2007). Laudon and Laudon (2007) define MIS as the process of amassing, processing, storing and transmitting applicable statistics to assist choice making in any organisation. In line with Bee and Bee (1999), MIS is a system that converts information from internal and external resources into records; in addition to passing on the information in the correct form to the managers at all levels, to help the administrator

make effective decisions, organise, plan, control and direct the activities for which they are accountable.

According to Davies (2009), MIS is a man or machine that provides information to support the management decision-making process. Firms use the MIS to gather and report various bits of business or financial information to the management. Managers use the information to review employees' productivity and compare company performance to an industry standard; MIS can be an expensive management tool for small business to implement. Davies (2009) further posits that the MIS is a unified user-machine system made to provide information to support operational control, management control and decision-making function in an establishment.

Various elements of MIS have been identified in the literature and they are EIS, DSS, human resource management systems, marketing information systems, enterprise resource planning (ERP), accounting information systems, school information management systems (SIMS) and office automation systems (OAS), among others. However, this study only employs two elements of MIS, namely DSS, which refers to computer packages utilised by top management and middle level to collect data or information to support decision-making and problem-solving from broad sources. DSS is used typically for unstructured and semi-structured decision problems (Al-Shobaki & Abu-Naser, 2016). EIS, which is the second element, is a reporting instrument that summarises reports coming from all firms' cadres and units or departments, such as human resource management, accounts and operations, among others (Faraji & Najafzadeh, 2016).

2.1. Firms' performance

Firms' performance is determined by an enterprise's ability to use its resources to predict its future (Kaplan & Norton, 2005). Ruey-Gwo and Chieh-Ling (2007) posit that performance can be in a simple method as the outcome of the operations carried out by members of the company. The financial measures entail the traditional financial measures such as revenue, profitability, return on investment and return on asset, among others (Mehralian, Nazari, Nooriparto & Hamid, 2017).

Increase return on assets and increase return on investment measure the productivity; while increasing profit margins measure the revenue growth to reduce operating costs and increase the use of materials/assets as a measure of the cost structure (Azeez & Yaakub, 2019; Hoque & James, 2000). Apart from the financial performance indicators, non-financial measures have been attracting research interest in recent time. This non-financial measure includes competitiveness, organisational learning, employees' satisfaction, customers' satisfaction, efficiency and effectiveness, among others. This study employs financial performance measures, namely return on investment, an increase in profit, an increase in sales and an increase in market share.

2.2. Theoretical framework

The theory underpinning this study is the innovation diffusion theory (IDT). The IDT presents the foundation for technological innovation diffusion research. It symbolises the adoption of innovativeness, which aids in the evaluation of the technology (Rogers, 1995). Rogers (1995) identified four major elements of IDT, namely innovation, time, social system and communication channels. Rogers (1995) posits that innovation is affected by five factors, namely observability, complexity, relative advantage, compatibility and trial-ability. Innovation ought to be perceived by the user as novel. These factors affect the adoption of the innovative system. However, the introduction of the perceived ease of information management system has led to the expansion of some of the factors (Vogel & Cheung, 2013). It is also important to state that the theory entails communication, which plays diverse roles at the different stages in the innovation-decision process.
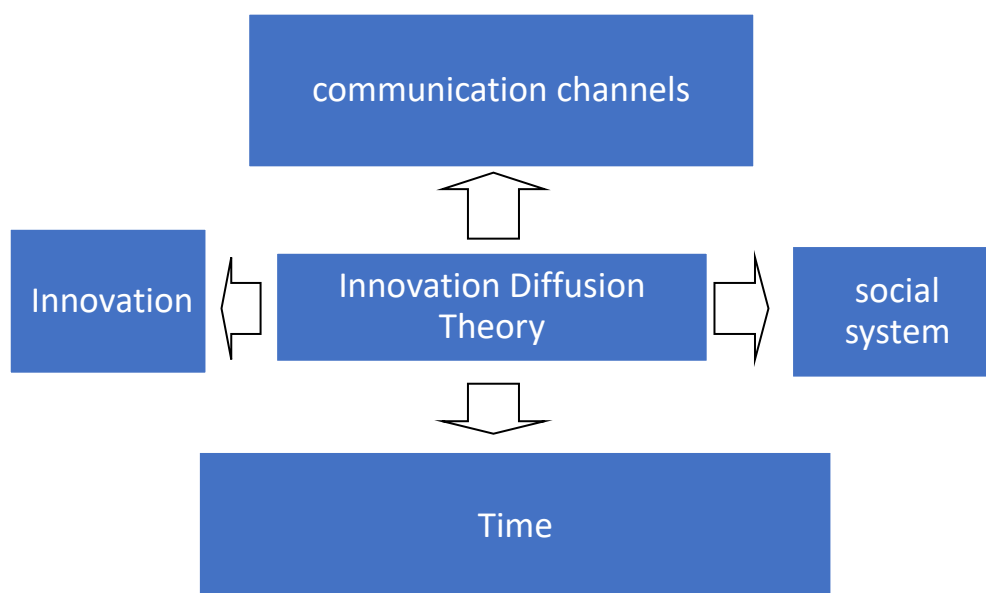
Figure 1. Theoretical framework. Source: Authors' compilation

The theoretical framework shows the various elements of IDT, which include innovation, time, social system and communication channel. This shows the relevance of IDT to MIS in general and DSS as well as EIS in particular.

3. Method and materials

The survey research design was employed in this study. According to Daily Trust (2018), the manufacturing sector in Nigeria provides about 350,000 formal employments. Therefore, the entire 350,000 employees of manufacturing firms in Nigeria constituted the population of the study, using Taro Yamane's sample size determination formula at 95% confidence level and margin of error of 5, a sample size of approximately 400 employees was obtained, and a non-response rate of 20% was assumed, which gave a modified sample size of 480. A well-structured questionnaire on a 7-point Likert scale ranging from 1 (minimum) to 7 (maximum) was administered on 480 purposively selected employees of manufacturing firms at Agbara industrial estate, Ogun State, Nigeria.

The research instrument was validated using content validity index (CVI), through the evaluation of six independent evaluators (four academic staff of Mountain Top University and two academic staff of Hallmark University). They evaluated the instrument on a 2-point scale (relevant and not relevant).

Using the CVI formula, we obtained the following: n/N

where

n = number of questions rated as relevant;

N = total number of the questions.

A CVI of 0.9013 was attained; this shows that the research instrument is valid.

The consistency/reliability of the research instrument was examined using Cronbach's alpha. The consistency of each variable was evaluated by considering the external load of the items in the research instruments. The rule for retaining an item or variable is a Cronbach's alpha value that is equal or greater than 0.7 (Hair, Sarstedt, Pieper & Ringle, 2012). The data were analysed using

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multiple regression analysis with Statistical Package for the Social Sciences (SPSS) version 23 at a 5% level of significance.

Table 1. Items for DSS and EIS as well as financial performance

Indicators	Items	References
EIS	− The organisation has invested in a MIS which has enabled the minimisation of administrative costs. − The EIS of the firm has been crucial in delivering innovative customer services. − The EIS of the firm has been crucial in assisting employees to enhance their performance and productivity. − The EIS is flexible enough to support the growth of the firm. − The organisation has invested in an EIS which is easy to use. − The organisation's MIS is compatible with other systems.	
DSS	1. The use of Internet communication facilities has enhanced information flow between administrators and employees in our firm. 2. The use of DSS facilities, such as emails and SMS, for communication has resulted in quick decision-making in our firm due to easy information flow. 3. DSS has improved collaboration between top managers, administrators and other employees, customers and suppliers in our firm. 4. The use of DSS for correspondence in our firm has increased participation of all stakeholders in the firm's activities and operations. 5. The use of DSS facilities has helped in improving the monitoring and evaluation of different departments activities. 6. The use of DSS has increased transparency and accountability in factories activities and programmes.	
Financial performance	− Return on investment − Increase in profit − Increase in sales − Increase in market share	Neubaum et al. (2012) Neubaum et al. (2012) Neubaum et al. (2012) Neubaum et al. (2012)

3.1. Model specification

PERF = f (DSS & EIS)

PERF = $\beta_0 + \beta_1$ (DSS) + β_2 (EIS) + μ_i

where

PERF = Performance;

DSS = Decision support system;

EIS = Executive information system;

β_0 is the constant term;

β_1 and β_2 are the coefficient estimators;

$\beta_1, \beta_2 > 0$;

μ is the error term.

The *a priori* expectation is that DSS and EIS will impact positively on manufacturing firms' performance; hence, the parameters of DSS and EIS will have a positive sign.

4. Findings and discussions

This section aggregates the elements of MIS employed for this study (DSS and EIS); it estimates the combined effect of these variables on manufacturing firms' performance, using *F*-stat. The individual effect of the two independent variables (DSS and EIS) on the dependent variable (performance) is also ascertained using *t*-statistics.

Table 2. Construct reliability and validity

	Cronbach's alpha average variance extracted (AVE)	rho_A	Composite reliability	Average variance extracted (AVE)
DSS	0.980	0.980	0.980	0.664
EIS	0.911	0.911	0.911	0.672
Financial performance	0.898	0.898	0.898	0.638

Table 2 shows Cronbach's alpha, composite reliability and average variance extracted results. All the components are within the desirable levels.

4.1. Hypotheses testing

Table 3. Result summary (dependent variable – performance)

Variable(s)	Coefficient	T	p-value
DSS	0.741[a]	4.912	0.000
EIS	0.802[a]	6.053	0.000
F-Statistics = 26.153 (0.0000)		*R*-Square =0.433 Adj *R*-Square= 0.419	

[a]Significant at 5% level.

Author's computation from SPSS 23.

Source: Field survey (2019).

The findings revealed that the two elements of MIS employed for this study (DSS and EIS) have an individual significant positive effect on manufacturing firms' performance with coefficients and probability values of DSS (0.741, *p*-value < 0.05) and EIS (0.802, *p*-value < 0.05). *F*-stat (26.153, *p*-value < 0.05) shows the fitness and overall significance of the regression model. It implies that the two elements of MIS adopted for this study have a positive significant combined effect on manufacturing firms' financial performance. The adjusted R^2 of 0.419 implied that 41.9% of the variation in manufacturing firms' performance is explained by the combined MIS elements. Furthermore, the findings also revealed that for every 1 unit change in DSS, manufacturing firms' performance will

change by 0.741. Additionally, for every 1 unit change in EIS, manufacturing firms' performance will change by 0.802.

5. Conclusion and recommendations

The study evaluated the effect of MIS elements (measured by the DSS and EIS) on manufacturing firms' performance. A survey research design was employed for the study. The findings showed that DSS and EIS have individual and combined positive significant effects on manufacturing firms' performance. It is concluded that MIS elements (DSS and EIS) are important determinants of manufacturing firms' performance. It is, therefore, recommended that manufacturing firms should employ MIS elements, particularly DSS and EIS. This is because DSS is highly useful for semi-structured and unstructured decision problems and EIS is a reporting tool that summarises reports coming from all firms' cadres and units or departments, such as human resource management, accounts and operations, among others. Considering the nature of the manufacturing sector in Nigeria, these two elements tend to enhance the overall performance of manufacturing firms in Nigeria.

6. Recommendation for further studies

The study only employed two elements of the MIS and from the literature about nine elements of MIS were identified, namely DSS, EIS, marketing information systems, accounting information systems, human resource management systems, supply chain information system, OAS, SIMS and ERP. The other seven elements of MIS that were not considered for this study can be employed for further studies.

Furthermore, other sectors, other than the manufacturing sector, can equally be considered for further studies. The use of interview as the means of obtaining survey data, especially key participants' interview, can be employed for further studies.

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