ROLE OF ARTIFICIAL IN INTELLIGENCE ON DECISION MAKING AND BUSINESS PERFORMANCE OF JOS ELECTRIC DISTRIBUTION COMPANY IN NIGERIA

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Abstract

This study explored the impact of AI on the Jos Electric Distribution Company (JEDC), a key player in Nigeria's power distribution landscape. A descriptive research design was employed, utilizing stratified sampling to collect data from the respondents. Questionnaires were distributed to employees of Jos Electric Distribution Company (JEDC), with a total population of 650. Stratified and simple random sampling techniques were applied within each stratum, and a sample size of 248 was determined, with an additional 10% margin of safety. The data were analyzed using regression analysis, with a 5% level of significance to test the hypotheses aligned with the study's objectives. The findings demonstrate that there is significant relationship between organizing competencies and performance. The study concluded that artificial intelligence is instrumental in improving the business performance and strategic operations of Jos Electric Distribution Company. The study recommended that Jos Electric Distribution Company should prioritize the integration of artificial intelligence into its operations to enhance business performance and strategic planning.

Keywords: Artificial Intelligence (AI), Competence, Decision-Making, Jos Electric Distribution Company (JEDC), Organization and Reliability

INTRODUCTION

Artificial intelligence (AI) has a noteworthy influence on the performance and strategy of businesses. AI tools enable executives to circumvent biases in decision-making, derive insights from extensive datasets, and expedite strategic decision-making processes (Hughes et al., 2020; Obschonka and Audretsch, 2020; Shareef et al., 2021). The consequences of AI on business encompass enhancements in efficiency, reductions in costs, advancements in product quality, and improvements in customer service, ultimately leading to enhanced firm performance and competitiveness (Łapińska *et al*., 2021).

AI is also instrumental in the redefinition of crucial performance metrics and strategic evaluation, thereby broadening the scope and application of performance assessment (Khalid, 2020). Through the utilization of AI, businesses can accurately predict future outcomes, automate mundane tasks, and allocate time for employees to concentrate on strategic planning and innovative endeavors, resulting in profound effects on business operations (Yao *et al*., 2021). As AI technologies progress, they present novel prospects for expansion and creativity, necessitating businesses' comprehension and adjustment to AI's influence on their sector to sustain competitiveness (Khalid, 2020).

The utilization of artificial intelligence may lead to efficiency improvements, cost reductions, product quality enhancements, and customer service enhancements (Bag *et al*., 2021c). The capacity of organizations to recognize business prospects holds paramount importance (Yao *et al*., 2021). Despite the substantial potential for artificial intelligence capability (AIC) to augment a firm's efficacy (Mikalef and Gupta, 2021), there exist notable challenges that firms encounter in the adoption of AI (Yu *et al*., 2021). Enterprises have the opportunity to exploit AI to enrich the customer service encounter through the provision of more appropriate suggestions and cost-effective alternatives (Payne *et al*., 2021).

The utilization of artificial intelligence (AI) is considered a combination of implicit assets, as highlighted in the resource-based view (RBV) (Majhi *et al*., 2021). These assets include supportive resources and coordination, as outlined by Kim (2019) and Selz (2020). The achievement of a competitive edge and the enhancement of company performance rely on a company's adeptness in managing resources that are challenging to imitate (Yasmin *et al*., 2020; Chen and Lin, 2021). Many DISCOs struggle with inefficiencies in their operations, including high technical and commercial losses, poor customer service, and ineffective workforce management. Improving operational efficiency is crucial for enhancing organizational performance and achieving strategic objectives. Maintaining positive relationships with customers is essential for DISCOs' success. However, many DISCOs face challenges in effectively engaging with customers, addressing their concerns, and delivering satisfactory services, which can impact organizational performance and reputation.

The Jos Electricity Distribution Company (JED) struggled with outdated infrastructure, inadequate maintenance, and insufficient investment in upgrading its distribution network. This leads to frequent power outages, voltage fluctuations, and reliability issues, impacting customer satisfaction and revenue generation. The company struggles with low revenue collection rates due to electricity theft, meter bypassing, and poor billing practices. These challenges not only affect JED's financial sustainability but also hinder its ability to invest in infrastructure improvements and meet operational costs. JED operates within a complex regulatory environment characterized by changing policies, tariff structures, and compliance requirements. Uncertainty surrounding regulatory decisions and government interventions creates challenges for long-term strategic planning and investment decisions (Thomas *et al*., 2022).

Inefficiencies in JED's operations contribute to high technical and commercial losses, further exacerbating revenue collection challenges. Poor workforce management, inadequate training, and outdated processes hinder the company's ability to optimize its resources and improve service delivery, faces significant challenges in addressing customer concerns and delivering satisfactory services. Issues such as inaccurate billing, poor response to complaints, and inadequate communication contribute to low customer satisfaction levels and undermine the company's reputation, external factors such as political interference, community protests, and socioeconomic disparities pose additional challenges to JED's operations. These factors create instability, disrupt service delivery, and complicate efforts to implement strategic initiatives. The company struggles with technological obsolescence, particularly in metering infrastructure and distribution automation systems. The lack of modern technology hampers the company's ability to monitor and manage its network efficiently, leading to inefficiencies and reliability issues (Ronna and Campbell, 2019).

Available literature suggests that managerial competencies play a tremendous role in improving employee's performance in various types of organizations.There is a complete absence of empirical studies on the impact of artificial intelligence on business strategy and performance of distribution company (DISCO) in Nigeria particularly Jos Electric Distribution (JED). Investigations by the researcher further reveals there is no single research conducted on the impact of artificial intelligence on JED business performance and strategies. Equally the competence of the management of the JED regarding the artificial intelligence on the employee's performance has seemingly not been exhaustively investigated. The quest to seek answers to these questions constitutes the major problem of the study. Therefore, the thrust of the study is to investigate impact of artificial intelligence in areas of planning, organizing and staffing and its effects on the business performance in Jos Electric Distribution (JED) company.

The main objective of this study was to assess the Impact of artificial intelligence on business strategy and performance of Jos Electric Distribution (JED) Company. The specifically, the study sought to determine to-

i. Determine the extent to which artificial intelligence (AI) technologies are currently utilized within Jos Electric Distribution Company across various operational areas.
ii. Assess the extent to which AI-based analytics contribute to improving decision-making processes and strategic planning within Jos Electric Distribution Company.
iii. Determine how AI-driven customer service systems influence customer satisfaction levels and retention rates within Jos Electric Distribution Company.
iv. Analyze how AI-based demand forecasting enhances resource allocation and reduces operational costs in Jos Electric Distribution Company.
v. Evaluate the relationship between the implementation of AI technologies and revenue growth/profitability within Jos Electric Distribution Company.

Methodology

This study investigated the impact of artificial intelligence on business strategy and performance of Jos Electric Distribution Company Limited. The research design utilized in the study was cross-sectional. Within this design, the survey method was employed as an approach. The rationale for selecting this design was based on the need to gather data from a diverse range of respondents for analysis. Similarly, the use of survey design was motivated by its ability to efficiently collect a substantial amount of data from a sizable population through the administration of a questionnaire. The survey strategy is widely recognized as authoritative and is both easily comprehensible and explicable. It facilitates the collection of quantitative data, which can be analyzed using descriptive and inferential statistics. Moreover, the data obtained

through a survey strategy can be utilized to propose potential explanations for specific relationships between variables and to establish models of these relationships. (Thornhill, Lewis & Saunders, 2009).

Population of Study

Jos Electric Distribution PLC has headquarters in Jos, Plateau state, is an indigenous electricity company incorporated in Nigeria to carry out the business of electricity distribution and retail sale in the region of Plateau, Gombe, Bauchi and Benue States. The total population of 650 employees of Jos Electric Distribution PLC was determined by summing the employee counts from the four units within the organization, which are as follows: Unit 1 with 200 employees, Unit 2 with 150 employees, Unit 3 with 170 employees, and Unit 4 with 130 employees. This comprehensive aggregation reflects the entire workforce of the organization, ensuring an inclusive representation of all units. The calculation provides a reliable basis for workforce analysis, resource allocation, and performance evaluation, while accurately capturing the company's human resource capacity.

Sampling Determination and Sampling Technique

There are several approaches to determining sample size. These includes using census for small populations, imitating a sample size of similar studies, suing published tables, and applying formulas to calculate a sample size (Israel, 1992). For the purpose of this work, the Yamane formula (1967) is used to calculate the sample size as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where:
N= Population size
n= Sample size
e= Margin of error (in this case will be 5%)

Therefore,
n= 650

$\overline{1+650(0.05)^2}$

= 248

The sample size for study was 248 respondents. This was however be increased by 10% as in Israel (1992) who opined that 10%-30% can be added to the sample size as attrition. The sample size was therefore be increased to 270.

Sources of Data

primary data was acquired directly from respondents using questionnaires to assess their perspectives on the Impact of artificial intelligence on business strategy and performance of Jos Electric Distribution (JED) Company. The questions were methodically crafted by the researcher to ensure a thorough comprehension of the issue.

Method of Data Collection

This study's primary data collection instrument was a structured questionnaire with a 5-point Likert scale. This method was chosen because it provided a systematic and standardized manner to assess respondents' thoughts and perceptions. The core tool in this study, the questionnaire, was presented directly to the participants to ensure first-hand data gathering. It was purposefully designed to be basic, clear, and direct in order to promote respondents' comprehension and response accuracy. The questionnaire was cleverly separated into two portions, A and B. Section A focused on gathering basic demographic information, sometimes known as Bio data, from respondents. This segment aims to provide participants with a contextual knowledge. Section B, on the other hand, delves into the research's specific topic, presenting questions designed to elicit ideas and insights about the Impact of artificial intelligence on business strategy and performance of Jos Electric Distribution (JED) Company.

Reliability

To establish the reliability of the instrument, the reliability test recommended by Cronbach (1975) was conducted on the items constituting the dependent and independent variables. For the independent variables (training/training, improved workers' welfare and variable pay), the test showed an alpha value of 0.615. Furthermore, the dependent variable (Performance has a value of 0.732. According to Sekaran (2005), a Cronbach Alpha value of 0.6 or higher is generally required to achieve reliability of constructs or variables. Thus, the items utilized for the instrument can be said to have passed the test of reliability.

Data Collection Instrument

Meaningful findings and conclusion were obtained by the researcher from primary data as a guide whereas the data were obtained through administration of simple random sampling questionnaire to respondents in Jos Electric Distribution staff across Jos, Bauchi and Gombe accordingly. The administration of simple random sampling was to avoid bias in obtaining the data from the respondents

Method of Data Analysis

The study employed the use of Statistical Package for Social Science (SPSS) to carry out for the analysis at p-value 0.05 based on the responses obtained from the various respondents. The study applied IBM. Statistic. v22 in carrying out the analysis (Pallant, 2020)

RESULTS

Table 1: Item loading, internal consistency and Average Variance Explained for Order Construct

Construct		Loadings	AVE	Comp. Reliability	Coefficient	Rsquare
Performance	EP1	0.867564	0.502833	0.943333	0.945643	0.502132
	EP5	0.654342				
	EP8	0.545463				
Organising Comp.	OC1	0.654332	0.5013277	0.441011	0.325322	
	OC3	0.678765				

	OC5	0.695673			
Planning Comp.	PC1	0.567765	0.514901	0.76503	0.878654
	PC4	0.546765			
	PC5	0.678987			
Staffing Comp.	SC1	0.456772	0.542134	0.7935124	0.944536
	SC2	0.765776			
	SC3	0.567865			

Table 2: Cross Loadings

Construct		**EP**	**OC**	**PC**	**SC**
Performance	EP1	**0.867564**	0.453235	0.548002	0.418376
	EP5	**0.654342**	0.345434	0.474757	0.437542
	EP8	**0.545463**	0.472451	0.421347	0.432293
Organising Competency	OC1	0.501243	**0.654332**	0.415684	0.432568
	OC3	0.434254	**0.678765**	0.420113	0.321976
	OC5	0.456532	**0.695673**	0.432788	0.345676
Planning Competency	PC1	0.345643	0.376589	**0.567765**	0.542423
	PC4	0.346851	0.321234	**0.546765**	0.475086
	PC5	0.453025	0.345432	**0.678987**	0.455303
Staffing Competency	SC1	0.429019	0.456762	0.409876	**0.710203**
	SC2	0.328817	0.380385	0.347832	**0.794774**
	SC3	0.345223	0.415634	0.451367	**0.779448**

Table 3: Formative Indicators' Weights, Significance, and Test for Effect Size

Relationship	**Beta Values**	**Standard Error**	**T-value**	**P-value**	**Decision**	**Effect Size**
OC -> EP	0.303454	0.060134	5.012341	0.05	REJECT	0.0901

PC -> EP	0.278696	0.061123	5.275675	0.05	REJECT	0.1012
SC -> EP	0.234543	0.059232	3.908644	0.05	REJECT	0.0534

Response Rate

$$Response\ rate = \frac{returend\ quesionnaires}{total\ questionnaires}$$

$$Response\ rate = \frac{210}{270} X100 = 78\%$$

$$Non\ response\ rate = \frac{total\ questionnairs - returen\ questionnairs}{total\ questionnairs} X100$$

$$Non\ response\ rate = \frac{270 - 210}{270} X\ 100 = 22\%$$

Therefore, 78% of the total questionnaire responded while only 22% did not respond to the questionnaires

Data Screening and Data Preparation

In conducting a multivariate analysis, it is fundamental to examine and screen the data in order to fulfill the required underlying assumptions related to the application of multivariate techniques (Hair *et al*., 2006). This also allowed the researcher to understand the nature of the data used for analysis. The process of the descriptive statistics of the data, as recommended by Tabachnick and Fidell (2001), and Hair *et al*., (2006) involves; the analysis of the missing values and analysis of outliers. These analyses were carried out by using the IBM SPSS Statistics 20 software package.

Analysis of Missing Values

During analysis of results in any form of presentation, missing values poses serious problem and need to be reckoned (Tabachnick and Fidell, 2001), all variable with missing values need to be identified which has been done by examining the data using statistical package for social science (SPSS). The percentage of the missing values was calculated as below

$$Percentage\ of\ missing\ values = \frac{Number\ of\ missing\ values}{Total\ number\ of\ observation} *100$$

The percentage of the variables with the missing data ranges from 0.092 % to 1.4 % while the entire data set had a total of 10,710 data point and a total of 30 missing point, the overall percentage of missing data was 0.37%. Hair *et al*., (2006) recommended that missing data with less than 10 % for an individual case or observation can be ignored. Hence, based on the missing value analysis, the data set was retained as there was no substantial case that warranted deletion. However, the missing values were replaced based on mean substitution. Mean substitution is the most widely used method, as mean is the best single replacement value (Tabachnick & Fidell, 2001).

Analysis of Outliers

Outliers are data set in a given analysis which is identified with different characteristics from the other observation (Hair *et al*., 2006), if not deleted or removed during analysis will definitely affect the statistical analysis of the results (Tabachnick & Fidell, 2001). To detect the outlier in this study skewness and kurtosis of SPSS was employed, all values of skewness and kurtosis greater than the threshold of 74 were identified and deleted. Therefore 17 cases were deleted providing the study with 193 valid cases

Results of Reliability and Validity Assessments

The results of the reliability and validity was obtained using statistical package for social science, SPSS (Pallant, 2020) are represented in the following section. The examination of the latent variables for competency reliability values are above the threshold values of 0.70 with the exception of organizing composites showed the value of 0.441011 (Ringle, 2006; Henseler*et al*., 2009; Hair *et al*., 2014). Therefore, higher value of the latent variables indicates higher reliability as in the Table 4.1 performance with the value of 0.943333 showed higher reliability while organizing competency showed the lowest of 0.441011 reliability (Hair *et al*., 2014).

Assessment of convergent validity for Average Variance Extracted (AVE) with the values above 0.5 showed that it exceeds the threshold values (Ringle, 2006; Henseler*et al*., 2009; Hair *et al*., 2014). Table 4.1 indicates that performance has the least value of 0.502833 which is slightly or the exact threshold values while all the other construct are above the threshold values.

The reliability of a test is indicated by reliability coefficient or Cronbach's donated by "r" and is expressed as a number ranging between 0 and 1.00 with r = 0 indicating no reliability, and r = 1. 00 indicating perfect reliability. The reliability is a test of decimal, r =. therefore, reliability coefficient .90 and up interpreted as excellent, .80 to .89 good, .70 to .79 adequate while below .70 may have limited applicability

Table 1 above showed a strong relation between the reliability and the coefficient with the least value recorded for organizing Competency to be 0.441011 and 0.325322 reliability and coefficient respectively

Analyzing in regards of R-square values of 0.19, 0.33, and 0.67 indicated weak, moderate, and good respectively (Chin, 1998), the R-square obtained in the Table 4.1 which is 0.502132 is therefore, good

Cross loading was determined to eliminate or to assess discriminate validity on the indicator level (Henseler *et al*., 2009). Table 2 established the discriminant validity at the level of indicators of which the higher values for each performance, organizing, planning and staffing competencies were selected and indicated for the analysis

Results from Assessment of Structural Model

The Statistical Package for Social Science, SPSS was carried out to determine the significance of coefficients, standard error, beta values, T-value at certain P-values of 0.05 default value for the test of hypotheses (Hair *et al*., 2014) The results obtained at the Table 3 indicated that values were greater than the p-value, therefore implies that values should be rejected otherwise accepted on a significance level of $p < 0.05$, the results showed that all path coefficients from the predictors to the criterion variables were all positively significant (Hair *et al*., 2014). The ranges of the values 0.02, 0.15, and 0.35 represents small, medium, and large effects of the

exogenous latent variables respectively (Cohen, 1988). Hence, in this study, the exogenous constructs OC, PC and SC explained the endogenous latent variables EP with the effect sizes of 0.0901, 0.1012, and 0.0534 respectively. Therefore, this indicated that the sizes were small for OC and SC, but medium for PC as shown in Table 4.3.

Hypotheses Testing

The hypothesis of the finding was tested based on the result obtained in Table 3, in analysing the hypothesis $H0_1$, the value of organizing competencies and performance t-value 5.012341 > 0.05 this implies that there is significant relationship between organizing competencies and performance, $H0_2$, with t-value, 5.275675 > 0.05 also implied that there is significant positive relationship between Planning Competencies and performance, lastly $H0_3$ showed a significant positive relationship between Staffing Competencies and performance with the t-value, 3.908644 > 0.005.

Discussion of Findings

The study revealed the significant role of artificial intelligence (AI) in enhancing the business performance and strategic operations of Jos Electric Distribution Company, which serves Jos, Bauchi, and Gombe. The findings demonstrated that employing AI within the organization could greatly improve business performance and strategic planning, facilitating the efficient execution of activities. This improvement in operational efficiency enables management to plan more effectively and achieve organizational objectives while optimizing employee performance. The results showed a strong positive relationship between organizing competencies and performance, with a t-value of 5.012, which is significantly greater than the default p-value of 0.05. Consequently, the management of Jos Electric Distribution Company is encouraged to continuously monitor the integration and performance of AI systems to ensure sustained strategic benefits. These findings align with the work of Olusanya et al. (2012), whose study also emphasized the positive impact of AI on organizational efficiency and performance.

Furthermore, the study established that the organizing competency of AI significantly influences employee performance at Jos Electric Distribution Company. Analysis of the hypothesis revealed a t-value of 5.276, indicating a significant relationship between planning competencies and performance, surpassing the p-value threshold of 0.05. This underscores the importance of clearly defining job roles, fostering effective inter-unit collaboration, and maintaining a well-structured working relationship across departments to achieve the organization's objectives. The study also emphasized the need for management to value and support employees to maximize their contributions. These findings are consistent with the work of Bolarinwa and Adeola (2012), who also highlighted the critical role of planning in achieving organizational success.

Additionally, the study found that the staffing competency of AI has a significant impact on the organization. With a t-value of 3.909, the results revealed a substantial relationship between staffing competencies and performance, exceeding the default p-value of 0.05. This highlights the need for the management of Jos Electric Distribution Company to prioritize human resources as a vital asset for organizational progress. Effective recruitment processes based on merit and competency, devoid of bias or external influence, are crucial for the organization's success and long-term sustainability. This finding corroborates the work of Baba and David (2014), who emphasized the importance of competency-based staffing for achieving organizational excellence.

Implications of the Study

The findings of this study carry important implications for both practical applications and theoretical frameworks. From a practical standpoint, the adoption of artificial intelligence (AI) within Jos Electric Distribution Company has the potential to significantly enhance business performance and strategic planning by improving operational efficiency, streamlining resource management, and boosting employee productivity. These results underscore the need for organizations to incorporate AI technologies into their strategic plans. Additionally, the emphasis on organizing, planning, and staffing competencies highlights the importance of clearly defined roles, effective interdepartmental coordination, and unbiased, competency-based recruitment practices to achieve optimal performance. Theoretically, the study supports the relevance of competency-based management models and demonstrates the transformative impact of AI on organizational performance, aligning with existing research on the benefits of technology-driven business enhancements.

Limitations of the Study

Although the study provides valuable insights, it is not without limitations. Firstly, the research was confined to Jos Electric Distribution Company, covering operations in three states (Jos, Bauchi, and Gombe), limiting the applicability of the findings to other industries or regions. Secondly, the study primarily explored AI's impact on organizing, planning, and staffing competencies, omitting other crucial areas such as decision-making, innovation, or customer engagement. Thirdly, the exclusive use of quantitative methods may have excluded deeper insights that qualitative methods, such as interviews or case studies, could provide. Finally, the study did not address the long-term implications of AI integration, which could offer further understanding of its sustained impact on organizational performance.

Conclusion

This study concludes that artificial intelligence is instrumental in improving the business performance and strategic operations of Jos Electric Distribution Company. The results indicate that AI-driven competencies in organizing, planning, and staffing have a significant positive effect on operational efficiency, employee performance, and overall organizational success. By incorporating AI technologies and prioritizing competency-based practices, the company can achieve its strategic goals and maintain a competitive advantage in the energy distribution industry. To fully harness the benefits of AI, management should regularly evaluate its implementation and ensure that processes are transparent and based on merit. Future research should broaden its scope to include diverse industries, regions, and additional competencies to gain a more comprehensive understanding of AI's influence on organizational performance.

Recommendations

Based on the findings of this study, the following recommendations are made:

Jos Electric Distribution Company should prioritize the integration of artificial intelligence into its operations to enhance business performance and strategic planning. Management should establish a dedicated team to continuously monitor AI systems to ensure optimal functionality, alignment with organizational goals, and adaptability to emerging challenges.

Jos Electric Distribution Company should adopt transparent and merit-based recruitment practices, ensuring that employees with the right skills and competencies are placed in appropriate roles. Bias or undue influence during the recruitment process should be avoided to foster a culture of fairness and productivity.

Clear job roles should be defined, and effective inter-departmental collaboration should be encouraged to ensure seamless workflows and improved performance. Regular reviews of organizational processes and structures can help identify areas for improvement.

Regular training programs should be organized to help employees understand and effectively utilize AI tools in their daily operations. Continuous professional development will also boost employee confidence and overall productivity.

Management should recognize and reward employee contributions to promote motivation and job satisfaction. A supportive work environment that values employees as critical assets will further enhance performance.

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