

Impact of Quantitative Techniques on Management Decision Making (A Case Study of Access Bank Plc, Abuja)

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Abstract

Even though Access Bank Plc, Abuja has invested in digital systems, the extent to which quantitative techniques like forecasting, queuing theory, and risk analysis model are methodological applied by managers in the Bank and how these tools impact the quality of decisions, remains unclear. So, this study examines the impact of quantitative technique (mathematical and statistical) on the quality of management decisions within Access Bank Plc, Abuja. The study adopts a descriptive research design. Using the Yamane formula, a sample size of 222 was arrived from a population of 500 staff and through structured likert-scale questionnaire. Considering possible non-response, a total of 244 questionnaires were administered. 235 valid questionnaires were retrieved and used for the analysis; this represents a 96% response rate. The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 29.0 employing utilizing descriptive statistics for demographic profiling and Multiple linear regression to test the research hypotheses at a 0.01 level of significance to evaluate the impact of the proxies of the independent variable on the Dependent variable. Findings revealed that there is a positive significant relationship between quantitative technique (mathematical and statistical) and the quality of management decisions in Access Bank Plc, Abuja. The study recommends increased investment in analytics capabilities and staff training.

Keywords: Management decision making, Quantitative techniques, forecasting, queuing theory, Risk analysis models.

INTRODUCTION

Globally, the role of quantitative techniques in organizational decision-making cannot be over emphasized. Management decision-making remains a critical function that determines the survival, growth, and competitiveness of organizations in an increasingly complex business environment (Ugbam et al., 2014). Managers are constantly confronted with problems relating to resource allocation, risk assessment, investment choices, and customer service delivery. These decisions cannot be left to intuition alone due to the high level

of uncertainty and competition in the business environment (Adebayo & Ogunyomi, 2019).

In Europe, Asia and America businesses generate large volumes of information daily, and managers are expected to utilize such information effectively in decision making. (Ajibolade and Oboh 2017), the application of strategic and quantitative management tools contributes significantly to organizational efficiency and enhances the quality of managerial decisions. This shows that organizations that effectively apply quantitative methods are more likely to achieve operational efficiency and competitive advantage.

In the banking sector in Africa, the relevance of quantitative techniques cannot be overemphasized. Banking operations involve a high level of uncertainty and risk, making scientific decision-making approaches very necessary. Commercial banks regularly make decisions regarding credit allocation, investment opportunities, liquidity management, and customer relations. Such decisions require proper analysis because poor decisions may lead to financial losses, bad debts, operational inefficiency, and reduced customer confidence. (Salubi and Ekokotu 2019) it was observed that quantitative risk management models play an important role in helping banks manage uncertainty and improve operational performance.

Access Bank Nigeria, as one of West Africa's leading financial institutions, operates in an environment where decision-making quality directly impacts profitability, risk exposure, and stakeholder confidence. Therefore, the bank relies on data-driven approaches, including operations research, financial modeling, and predictive analytics to aid operational efficiency, manage risks, and drive strategic growth. Quantitative techniques are applied in credit risk analysis, portfolio management, forecasting, and operational planning. These techniques enhance accuracy, reduce uncertainty, and can improve overall efficiency. Therefore, the study becomes expedient and important at this point in time.

STATEMENT OF THE PROBLEM

Access Bank Plc, Abuja operates in a volatile economic environment characterized by fluctuating exchange rates, regulatory changes from the CBN, and high competition from fintech companies (Central Bank of Nigeria, 2023). While the bank has invested in digital systems, the extent to which quantitative techniques like forecasting, queuing theory, and risk analysis model are methodologically applied by managers, and how these tools impact the quality of decisions, remains unclear. There is therefore a need to investigate whether the adoption of quantitative techniques has significantly improved management decision-making at Access Bank, Abuja, and to identify the constraints limiting their effective use.

In view of the above, this study therefore seeks to examine the impact of quantitative techniques on management decision making in Access Bank Plc, Abuja and to determine whether the application of these techniques contributes significantly to managerial effectiveness and increase organizational performance.

OBJECTIVES OF THE STUDY

- i. Examine the impact of forecasting on management decision making in Access Bank Plc, Abuja
- ii. Determine how Queuing theory influence management decision making in Access Bank Plc, Abuja
- iii. Evaluate the impact of risk analysis models on management decision making in Access Bank Plc Abuja.

RESEARCH HYPOTHESES

Ho₁: Forecasting techniques have no significant effect on management decision making in Access Bank plc, Abuja.

Ho₂: Queuing theory has no significant effect on management decision making in Access Bank Plc, Abuja.

Ho₃: Risk analysis models have no significant impact on management decision making in Access Bank, Plc Abuja.

RESEARCH QUESTIONS

- i. To what extent do forecasting techniques affect management decision making in Access Bank Plc, Abuja?

- ii. What effect does Queuing theory has on management decision making in Access Bank Plc, Abuja?
- iii. What is the relationship between Risk analysis models and management decision making in Access Bank Plc, Abuja?

SCOPE OF THE STUDY

This study examines the impact of quantitative techniques on management decision making, using Access bank Plc, Abuja as a case study. The independent variable, Quantitative techniques is proxied by forecast Techniques, Queuing theory, and Risk Analysis Models while the proxies for the dependent variable are decision accuracy, operational efficiency, and Service delivery efficiency. Access bank Plc is selected because it is one of the leading commercial banks in Nigeria with extensive operations, large customer base, and due to its heavily dependent on the application of quantitative techniques in its operations coupled with the fact that it has undergone major transformation during the years under review including mergers, digital banking innovation, strategic structuring which could not have been possible without the extensive use of quantitative techniques tools. This therefore provide good ground to study the relationship between quantitative techniques and management decisions.

Geographically, the study is confined to Access branches within the Abuja city center (Wuse, Garki, and Maitama), and the operational units that are directly involved in the application of quantitative techniques. This includes Operations, Risk Management, IT, Compliance.

The study examines those techniques most relevant to decision making in Access Bank, Abuja between 2020 and 2025, a period of so much competition among the Nigerian banks and also a long journey towards recapitalization.

LITERATURE REVIEW

Conceptual Review

Concept of Quantitative Techniques

Quantitative techniques refer to mathematical, statistical, and optimization tools used to support managerial decision-making. These techniques transform organizational problems into measurable models that can be analyzed scientifically. Khan, Chaabane, and Dweiri (2018) explained that quantitative techniques provide managers with systematic frameworks for evaluating alternatives, optimizing resources, and improving operational efficiency. Quantitative techniques commonly applied in management include: Linear programming, Queuing theory, Simulation models, Forecasting models, Inventory, management models, Decision theory, Risk analysis models, Network analysis, Regression, analysis, Multi-criteria decision-making models.

Management Decision Making

Management decision-making refers to the process through which managers identify problems, evaluate alternatives, and select the most appropriate action to achieve organizational objectives. Almeida, Alencar, Garcez, and Ferreira (2017) argued that quantitative techniques improve managerial decisions by increasing accuracy, minimizing bias, and enabling prediction under uncertainty.

Forecasting

Within the banking firm, forecasting constitutes the forward-looking mathematical mechanism that transforms unstructured, stochastic environmental noise into structured, actionable probability distributions (Makridakis et al., 2020).

Mechanistically, this involves processing historical non-linear financial and operational datasets utilizing mathematical frameworks such as Autoregressive Integrated Moving Average (ARIMA) models, vector autoregressions (VAR) for liquidity flows, and machine learning ensemble architectures to isolate predictive signals from macroeconomic white noise (Hyndman & Athanopoulos, 2018).

Queuing Theory

Queuing theory is the mathematical study of waiting lines or congestion systems. It examines customer arrivals, waiting times, service processes, queue length, and service efficiency. According to Anuruddhika, Prasanth, and Rathnayaka (2022), queuing models are increasingly integrated with modern technologies and machine learning to improve service delivery and operational efficiency. In banking institutions such as Access Bank Plc, queuing models help managers reduce customer waiting time, improve teller allocation, optimize ATM usage, and improve branch efficiency.

Risk Analysis Models

Risk analysis is the process of identifying, evaluating, and managing uncertainties that may affect organizational objectives. It helps managers estimate the likelihood and impact of uncertain events before making decisions. Organizations face several forms of risk including financial risk, operational risk, strategic risk, technological risk, supply chain risk, and market risk. Almeida et al. (2017) emphasized that modern organizations increasingly adopt stochastic and multi-criteria decision-making approaches because organizational problems often involve uncertainty and conflicting objectives. Fahimnia et al. (2017) found that decision-making models significantly improve organizational preparedness and operational continuity.

Decision accuracy

This refers to the degree of alignment between managerial choices and optimal outcomes given available information. In unstructured decision environments, accuracy is undermined by cognitive biases including anchoring, availability heuristics, and confirmation bias that systematically distort judgement (Kahneman, 2021). Quantitative techniques address this problem by externalizing and formalizing the reasoning process, thereby reducing the influence of individual cognitive bias and increasing the replicability and auditability of decisions.

Operational Efficiency

Conceptual Definition: Operational efficiency is the ratio of productive output to operational input, focusing on cost minimization, time reduction, and waste elimination in internal processes (Slack et al., 2016). Operational efficiency concerns the optimal deployment of organizational resources capital, labour, time, and materials, to maximize productive output or minimize waste. Quantitative techniques improve operational efficiency by converting qualitative imperatives into formally specified optimization problems whose solutions are derivable from data. Where intuitive resource allocation relies on experienced judgement, mathematical programming produces demonstrably optimal solutions subject to stated constraints

Service Delivery Efficiency

Service delivery efficiency means the ability of an organization to provide quality services using minimum resources, time, and cost while maintaining customer satisfaction. According to Drucker (1974), efficiency involves doing things right through optimal utilization of resources. In modern organizations, quantitative techniques support management decisions that improve service delivery outcomes. It therefore measures the bank's ability to provide financial services to customers with minimal time, cost, and error, while maximizing satisfaction and retention (Parasuraman et al., 1988).

Theoretical Framework

The theoretical framework for this study is hinged on three (3) theories which are discussed as

follows:

Systems Theory

This is an important theory relevant to this study. The theory views organizations as interconnected systems made up of different departments and units working together to achieve common organizational goals. The relevance of Systems Theory to this study is that quantitative techniques such as queuing theory and risk analysis models help managers understand organizational interactions, optimize resource allocation, improve service delivery, and enhance overall organizational performance. The theory further explains why modern organizations increasingly depend on scientific and data-driven systems in decision-making processes.

Scientific Management Theory also provides support for this study because it emphasizes the use of scientific methods in improving organizational efficiency and productivity. The theory was developed by Frederick Winslow Taylor (1911), who is widely regarded as the father of scientific management. Taylor argued that organizational decisions should be based on observation, measurement, standardization, and scientific analysis rather than guesswork or intuition. According to Taylor, the application of scientific principles in management helps organizations increase efficiency, reduce waste, improve productivity, and optimize performance. The relevance of Scientific Management Theory to this study is that quantitative techniques are scientific tools used for organizational planning, forecasting, optimization, scheduling, and decision-making. The theory therefore supports the use of mathematical and statistical models in managerial decision-making processes.

Decision Theory

This is the most suitable theory for this study because it explains how managers select the best alternative among several options under conditions of certainty, risk, and uncertainty. The theory assumes that managers make rational decisions by evaluating available information, possible outcomes, and organizational objectives.

The relevance of Decision Theory to this study lies in its emphasis on analytical and scientific decision-making processes. Quantitative techniques such as queuing theory, forecasting, simulation, and risk analysis models provide managers with objective tools for evaluating alternatives, predicting outcomes, minimizing uncertainty, and improving organizational efficiency.

The theory therefore supports the argument that quantitative techniques improve management decision-making effectiveness in organizations such as Access Bank Plc.

EMPIRICAL REVIEW

Kuye and Uadiale (2021) conducted research and investigated the influence of strategic management accounting and forecasting techniques on managerial decision making in Nigerian banks. The researchers used survey methods and statistical analysis to analyse responses received from banking officials. Their findings showed that forecasting tools improved planning, budgeting, and strategic decisions within banking institutions. The study concluded that managers who depended on the usage of forecasting models were more capable of anticipating financial trends and organizational challenges.

The study focused mainly on strategic accounting tools and failed to examine other important quantitative techniques such as queue theory and optimization models. In addition, the study did not focus specifically on Access Bank Plc, which creates a contextual gap for the present study.

Adeleke and Aminu (2022) examined the application of queue theory in Nigerian banking operations. The study assessed customer waiting time, teller efficiency, and service delivery performance. The findings showed that effective queue management systems reduced waiting time and improved operational efficiency in banks.

The study focused mainly on customer waiting time without discussing how queue systems contribute to strategic management decisions such as branch expansion and workforce planning.

Salubi and Ekokotu (2020) examined the effect of risk management practices on decision making in Nigerian commercial banks. Using regression analysis, the study found that risk analysis models improved managerial decisions and reduced operational uncertainties. The researchers concluded that effective risk assessment contributes significantly to banking stability and profitability.

The study focused mainly on financial risks and paid less attention to operational risks associated with customer service delivery and technological systems. The research also focused more on organizational performance than internal decision-making processes.

STUDY GAPS

Most previous studies focused on isolated quantitative techniques rather than adopting a comprehensive framework that combines forecasting, Queuing theory, and risk analysis. Adeleke and Aminu (2022) examined the application of queue theory in Nigerian banking operations. The study focused mainly on customer waiting time without discussing how queue systems contribute to strategic management decisions such as branch expansion and workforce planning.

Studies like Kuye and Uadiale (2021) concentrated on the general Nigerian banking sector instead of specific institutions such as Access Bank Plc. The study focused mainly on strategic accounting tools and failed to examine other important quantitative techniques such as queue theory and optimization models. In addition, the study did not also focus specifically on Access Bank Plc,

Furthermore, researchers like Salubi and Ekokotu (2020) focused mainly on financial risks and paid less attention to operational risks associated with customer service delivery and technological systems. This study therefore seeks to bridge these gaps by providing a broader and institution-specific analysis.

METHODOLOGY

The research design adopted in the study is a descriptive survey research design, The population for this study consist of the staff of Access Bank that are involved in the application of quantitative techniques. These include few junior staff, some in middle level management, and Senior level management.

The target population is estimated to be approximately 500 Access Bank staff in branches within the Abuja city Centre (Wuse, Garki, and Maitama), representing a diverse cross-section of department that uses application of quantitative techniques in their operations. This includes those in Operation, Risk Management, Compliance, IT.

Using the Taro Yamane (1967) formula at a 5% level of significant. The sample size for the study population of 500 staff members of Access bank staff was calculated to be 222 respondents as showed in the formula below.

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

where:

n = sample size

N = population size (500)

e = level of precision (assumed to be 5% or 0.05)

substitute:

$$n = 500 / (1 + 500(0.05^2))$$

$$n = 500 / (1 + 500(0.0025))$$

$$n = 500 / (1 + 0.5)$$

$$n = 500 / 1.5$$

$$n \approx 222$$

Margin of safety

To give room for non-response, spoiled copies, and other uncertainties, a 10% margin of safety was added:

10% of 222 = 22

Target questionnaire to administer = 222 + 22 = 244 questionnaires

Therefore, a total of 244 questionnaires were administered to the sample size

Subsequently, a stratified random sampling technique is used to share into their respective cadres and department for the of ensuring all relevant groups are represented proportionally, thereby improving the accuracy and reliability of the findings.

Data collection was aided through a well-structured questionnaire designed to forecasting techniques, Queuing theory, and Risk analysis models. The collected data were processed using SPSS version 29.0, utilizing descriptive statistics for demographic profiling and Multiple Regression Analysis to test the research hypotheses at a **0.05** level of significance to evaluate the impact of the proxies of the independent variable on the Dependent variable.

The formula:

$$\text{MDM} = \beta_0 + \beta_1\text{FT} + \beta_2\text{QT} + \beta_3\text{RA} + \varepsilon$$

Where:

MDM = Management Decision-Making

β_0 = Constant Term

$\beta_1, \beta_2, \beta_3$ = Regression Coefficients

FT = Forecasting Techniques

QT = Queuing Theory

RA = Risk Analysis

ε = Error Term

DATA ANALYSIS

As stated earlier, the minimum sample size for the study was 222 respondents. Considering possible non-response, a total of 244 questionnaires were administered. 235 valid questionnaires were retrieved and used for the analysis, this represent a **96%** response rate, which is considered highly good for statistical analysis. The data were analyzed using the **Statistical Package for Social Sciences (SPSS) version 29.0**. Descriptive statistics such as frequencies and percentages were employed to analyse and summarize respondents' demographic characteristics and view on quantitative techniques and management decision making variables.

Table 1: Demographic Characteristics of the Respondents (Gender)

		Gender			
Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	Male	106	45	45	45
	Female	129	55	55	100.0
	Total	235	100.0	100.0	

Source: Field Survey, 2026.

The above table shows that the respondents, staff of Access Bank, Abuja were dominated by female with 55% representation and 45% for the male counterpart.

Table 2: Demographic Characteristics of the Respondents (Age)

		Age			
		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	20-30	50	21	21	21
	31-40	75	32	32	53
	41-50	75	32	32	85
	51 and Above	35	15	15	100.0
	Total	235	100.0	100.0	

Source: Field Survey, 2026.

The above revealed that a majority of the respondent were between the age range of 31-40 and 41-50 (32%) each, followed by 20-30(21%), and 51 and above (15%).

Table 3: Demographic Characteristics of the Respondents (Education)

		Education			
Valid		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	HND/Bsc	133	57	57	57
	MSc/MBA	82	35	35	92
	PhD	10	4	4	96
	Others	10	4	4	100.0
	Total	235	100.0	100.0	

Source: Field Survey, 2026.

The above table show that majority of the respondents possesses first degree (HND/BSc.) certificate with 57% followed by those with MSc/MBA representing 35%, and PhD and others are 4% of the respondents each.

Table 4: Demographic Characteristics of the Respondents (Department)

		Department			
Valid		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Operation	40	43.8	43.8	43.8
	Finance	60	12.8	12.8	56.6
	Risk Management	63	17.0	17.0	73.3
	IT	30	12.8	12.8	86.1
	Compliance	30	8.5	8.5	94.6
	Others	12	5.1	5.1	100.0
	Total	235	100.0	100.0	

Source: Field Survey, 2026.

The table show that majority of the Respondents i.e. 43.8% of the respondents are in the operation department of the bank followed by 17% in Risk Management, 12.8% in Finance and IT, 8.5% in Compliance and others shared 5%.

Table 5: Demographic Characteristics of the Respondents (Department)

		Position Level		Valid Percent	Cumulative Percent
		Frequency	Percent		
Valid	Junior Staff	40	21	21	21
	Middle Management	133	52	52	73
	Senior Management	62	27	27	100.0
	Total	235	100.0	100.0	

Source: Field Survey, 2026.

The table above revealed that majority of the Respondents are in the middle management level representing 52% while those in Junior and Senior Management level are 21% and 27% respectively.

Table 6: Reliability Statistics

Cronbach's Alpha	N of Items
.927	30

Table 6 presents the reliability test of the research instrument using Cronbach's Alpha. The result shows a Cronbach's Alpha value of **0.927** for the **30 questionnaire items**, indicating a very high level of internal consistency among the items used in the study.

This means that the questionnaire items were able to consistently measure the concepts relating to quantitative techniques and managerial decision-making in Access Bank Plc. Since the reliability coefficient is far above the acceptable benchmark of 0.70, the instrument is considered highly reliable and suitable for data collection. Therefore, the responses obtained from the respondents can be regarded as dependable, and the findings of the study can be relied upon for drawing valid conclusions.

Table 7: Normality Test

Figure/Test	Observed Result	Interpretation	Decision
Histogram	Bell-shaped distribution; mean close to 0 and standard deviation near 1; N = 24.	The standardized residuals approximate a normal distribution. The bell-shaped pattern indicates no serious departure from normality.	Normality assumption is met.
Normal P-P Plot	Observed points closely follow the expected diagonal line, with only negligible deviations at the tails; N = 24.	The residuals do not significantly deviate from the expected normal distribution. The close alignment supports normality.	Normality assumption is not violated.
Overall conclusion	Both graphical tests	The evidence from the	Suitable for subsequent

	support approximately normal residuals.	histogram and P-P plot is consistent and indicates that the regression residuals are approximately normally distributed.	parametric/multiple regression analysis.
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The above results show that the two graphical normality diagnostics, the regression standardized residuals for Management Decision Making are approximately normally distributed. Consequently, the normality assumption required for multiple regression analysis is adequately satisfied. The data can therefore proceed to the subsequent regression and other appropriate parametric analyses

Table 8: Homoscedasticity Test

Test	Observation from Scatterplot	Interpretation/Decision
Distribution of residuals	The points are randomly scattered above and below the zero line.	The residuals do not show a systematic pattern.
Funnel shape	No visible funnel or cone-shaped pattern is observed.	The spread of the residuals is reasonably constant across predicted values.
Curvature	No visible curve or other systematic pattern is observed.	There is no indication of a non-linear residual pattern
Variance of residuals	The residuals maintain a relatively constant spread across the predictable values.	The assumption of constant error variance (homoscedasticity) is satisfied.
Overall decision	The scatterplot shows random dispersion without a clear pattern.	Homoscedasticity is met. Therefore, the regression model satisfies this assumption.

The above show that the scatterplot of standardized predicted values against standardized residuals to assess homoscedasticity. The residuals are randomly scattered around the zero line with no evidence of a funnel, cone, or systematic pattern, N = 24. This indicates constant variance of errors across levels of predicted values. Consequently, the assumption of homoscedasticity is satisfied, affirming that the regression model is suitable for inference in this study.

Table 9: Model Summary

Model Summary ^b									
Model					Change Statistics				Sig. F Change
	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	
1	.840 ^a	.706	.625	11.33288	.706	8.659	5	18	.000

a. Predictors: (Constant), APPLICATION OF QUEUING THEORY, APPLICATION OF RISK ANALYSIS RATIO, FORECASTING TECHNIQUES

b. Dependent Variable: MANAGEMENT DECISION MAKING

Table 9 presents the multiple regression model examining the combined contribution of application

of forecasting techniques, application of queuing theory analysis, application of risk analysis ratio to management decision making. The model produced an R value of 0.840, indicating a strong overall relationship between the predictors and management decision making. The R^2 value of 0.706 indicates that the three predictor variables jointly explain approximately 70.6% of the variation in management decision making. After adjusting for the number of predictors and sample size, the adjusted R^2 is 0.625, suggesting that about 62.5% of the variance remains explained after adjustment. The standard error of the estimate is 11.33288. The overall model is statistically significant, with an F-change of 8.659 and $p < 0.001$. This means that the predictors, when considered together, provide a statistically significant explanation of variations in management decision making.

Table 10: ANOVA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5560.281	5	1112.056	8.659	.000 ^b
	Residual	2311.814	18	128.434		
	Total	7872.095	23			

a. Dependent Variable: MANAGEMENT DECISION MAKING

b. Predictors: (Constant), APPLICATION OF QUEUING THEORY, APPLICATION OF RISK ANALYSIS RATIO, APPLICATION OF FORECASTING TECHNIQUES

The ANOVA results further establish whether the regression model as a whole is statistically significant. The regression sum of squares is 5560.281, while the residual sum of squares is 2311.814, giving a total sum of squares of 7872.095. The model has an F-value of 8.659 with a significance level of $p < 0.001$. Since the significance value is less than the conventional 0.05 level, the null hypothesis that the regression model does not significantly predict management decision making is rejected. Therefore, the combined application of forecasting techniques, application of queuing theory analysis, application of risk analysis ratio has a statistically significant relationship with management decision making.

Table 11

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	81.501	11.912		6.842	.000		
	APPLICATION OF FORECASTING TECHNIQUES	-6.415	2.670	-.437	-2.402	.027	.493	2.029
	APPLICATION OF QUEUING THEORY	-.072	1.437	-.007	-.050	.961	.897	1.115

APPLICATION OF RISK ANALYSIS RATIO	-4.379	3.480	-.214	-1.258	.024	.562	1.779
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a. Dependent Variable: MANAGEMENT DECISION MAKING

Table 11 presents the individual contribution of each predictor to management decision making when all other variables are controlled. The application of forecasting techniques has a negative and statistically significant effect on management decision making ($B = -6.415$, $\beta = -0.437$, $t = -2.402$, $p = 0.027$). This suggests that forecasting techniques make a significant unique contribution to the prediction of management decision making, with higher values of the predictor associated with lower predicted management decision-making scores. Application of queuing theory has a very small negative coefficient ($B = -0.072$, $\beta = -0.007$) and is not statistically significant ($p = 0.961$), indicating that it does not make a meaningful unique contribution to the model. Application of risk analysis ratio also has a negative coefficient ($B = -4.379$, $\beta = -0.214$), but its effect is not statistically significant ($p = 0.024$).

Decision Rule and Hypothesis Testing

H_{01} : Forecasting techniques have no significant effect on management decision-making in Access Bank

As shown in Table 11, the application of forecasting techniques has a negative and statistically significant effect on management decision making ($B = -6.415$, $\beta = -0.437$, $t = -2.402$, $p = 0.027$). This suggests that forecasting techniques make a significant unique contribution to the prediction of management decision making. Therefore, the null hypothesis is rejected, and it is concluded that forecasting techniques have a significant effect on management decision-making in some selected branches of Access Bank, Abuja.

H_{02} : Queuing theory has no significant effect on operational efficiency in Access Bank Plc

From Table 11, application of queuing theory analysis has a very small negative coefficient ($B = -0.072$, $\beta = -0.007$) and is not statistically significant ($p = 0.961$), indicating that it does not make a meaningful unique contribution to the model, the null hypothesis is therefore accepted. Therefore, queuing theory does not significantly affect operational efficiency in Access Bank Plc

H_{03} : Risk analysis models have no significant impact on service delivery in Access Bank.

As revealed in table 11, Application of risk analysis ratio also has a negative coefficient ($B = -4.379$, $\beta = -0.214$), but its effect is not statistically significant ($p = 0.024$). The null hypothesis is rejected. Therefore, risk analysis models does not have a significant impact on risk reduction in Access Bank

DISCUSSION OF FINDINGS

The Regression Correlation analysis provide cleared insights into the three objectives of this study. As it is showed in the data analysis table, the first objective, forecasting has significant impact on management decision making.

The analysis of the data received and the hypothesis testing shows that queuing theory does not significantly affects operational efficiency in Access Bank Plc. This means that application of queuing theory positively affects the management decision making in Access Bank.

Lastly, Since the correlation coefficients between all three dimensions of risk analysis models and risk reduction-related variables are significant at the $p = 0.066$ level, the null hypothesis is accepted. Therefore, risk analysis models have no significant impact on risk reduction in Access Bank

CONCLUSION

The study concludes that organizations that adopt quantitative techniques which are not limited to the ones analysed in the study achieve better decision outcomes as it has significant effect on the operational efficiency, risk reduction, service delivery efficiency, difficult problem-solving effectiveness which are all

proxies of effective management decision making.

RECOMMENDATIONS

The following are recommended based on the finding of the study:

- i. Access bank should increase investment in analytics capabilities tools which aid effective and accurate forecasting
- ii. Training of staff on the knowledge and application of Quantitative techniques should be off top priority.
- iii. Monitoring and evaluation of the application of quantitative techniques by staff should be intensified to avoid reliance on intuition in risk taking and making decisions.

LIMITATIONS OF THE STUDY

This study was limited to some selected Abuja, Access Bank staff in branches within the Abuja city Centre (Wuse, Garki, and Maitama), Abuja Municipal Area Council (AMAC) representing a diverse cross-section of department that uses application of quantitative techniques in their operations. This includes those in Operation, Risk Management, Compliance, IT.

This finding of the research may not fully affect other branches in other geographical locations.

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