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MODERATING EFFECT OF FINTECH ON BUDGETARY CONTROL AND ORGANISATIONAL EFFECTIVENESS OF PUBLIC INSTITUTIONS IN NORTH-CENTRAL NIGERIA

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Abstract
Public sector institutions in North-Central Nigeria often struggle with inefficiencies in budget implementation and weak financial oversight, which hinder effective service delivery. The paper investigates the direct effect of budgetary planning and budgetary participation (independent variables) on organizational effectiveness, proxied by service delivery (dependent variable), and the moderating role of financial technology (FinTech) in these relationships. A quantitative, cross-sectional survey approach was adopted, targeting 17,417 staff across ten revenue-generating institutions in Niger, Kwara, and Nasarawa States. A sample of 561 employees was selected using Krejcie and Morgan's table via simple random sampling. Data collected via a structured 5-point Likert scale questionnaire, were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings revealed that budgetary planning significantly and positively has an effect on organizational effectiveness (service delivery). Conversely, budget participation was found to have no significant effect on organizational effectiveness. Importantly, FinTech did not significantly moderate the relationships between either budget planning or budget participation and organizational effectiveness. The research work recommends that revenue-generating institutions prioritize enhancing budget planning through training and aligning allocations with institutional goals. While FinTech's moderating role was not supported, its direct utility in financial management should still be strategically adopted, alongside strengthened monitoring.

Keywords: Financial Technology, Budget planning, Budget participation, Organisational effectiveness

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1.1 Introduction

Enhancing organisational effectiveness remains a critical priority for public institutions, especially those tasked with revenue generation in Nigeria. These institutions play a vital role in financing developmental initiatives and ensuring the provision of essential public services. Organisational effectiveness is frequently assessed through service delivery outcomes, efficiency in revenue mobilisation, and the judicious use of public funds (Orobah, 2024; Roziq, *et al.*, 2025). However, persistent issues such as poor resource management, delays in budget implementation, and bureaucratic inefficiencies continue to undermine the performance of many revenue-generating institutions (Uwadiah, 2024), thereby limiting their ability to meet public expectations and impeding socio-economic progress.

To improve service delivery and overall effectiveness, public institutions must undertake structural reforms that promote transparency, accountability, and operational efficiency (Mwagona, 2023). In North-Central Nigeria, aligning institutional objectives with strict fiscal discipline and effective budgetary control systems is essential (Ariyo-Edu & Woli-Jimoh, 2024). Although various public financial management reforms have been introduced, institutional performance still falls short in many cases due to fundamental weaknesses in budgetary practices (Nuhu, *et al.*, 2023). Therefore, a critical examination of internal budgeting processes is warranted, particularly in relation to how emerging financial technologies (FinTech) may enhance these systems.

Budgetary control, examined in this study through the dimensions of budgetary planning and budgetary participation, is a core management tool that enables organisations to align financial activities with strategic objectives (Drury, 2018). In the public sector, this involves not only the technical formulation and implementation of budgets but also the engagement of key stakeholders and ongoing evaluation of outcomes (Jones & Smith, 2020). When properly implemented, budgetary control ensures efficient resource allocation, cost containment, and improved service delivery (Abor & Adjasi, 2020). However, deficiencies in the planning process and limited stakeholder involvement often result in poor execution and suboptimal performance.

Budgetary planning entails forecasting revenues and expenditures, setting priorities, and allocating resources in line with institutional goals (Horngren, Datar & Rajan, 2018). Effective planning fosters financial discipline, enhances predictability, and supports better decision-making elements that are vital to improving service delivery in public institutions. On the other hand, budgetary participation highlights the need for inclusive

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engagement of stakeholders such as department heads, financial officers, and administrative personnel throughout the budget cycle (Jones & Smith, 2023). This inclusive approach can improve decision quality, foster accountability, and enhance commitment to budgetary goals, ultimately strengthening organisational effectiveness through improved service delivery.

While the relationship between budgetary control and organisational effectiveness is well established, the role of FinTech introduces a new and important dimension. Innovations such as digital payment systems, automated budgeting tools, and real-time analytics can enhance the efficiency and transparency of budget processes (Ozili, 2020). In emerging economies like Nigeria, the adoption of FinTech in public financial management has shown considerable potential to streamline operations and reinforce accountability (Nuhu *et al.,* 2023). This study, therefore, investigates how budgetary control, through planning and participation, impacts the service delivery performance of public institutions in North-Central Nigeria, with a specific focus on the moderating influence of FinTech.

Organizational effectiveness remains a cornerstone of public sector performance, as it is critical to achieving sustainable development, institutional accountability, and citizen satisfaction. In Nigeria, however, public sector institutions, particularly revenue-generating agencies, continue to struggle with transforming allocated budgets into efficient service delivery. Evidence from recent audits suggests that over 60% of capital projects initiated by such institutions between 2018 and 2022 were either delayed, abandoned, or poorly executed, underscoring persistent inefficiencies in planning, participation, and execution (Isaac *et al.,* 2024). These failures have significantly impaired public trust and undermined service delivery, despite periodic financial reforms and increased budgetary allocations.

Empirical literature supports the view that effective budgetary control, particularly budget planning and participation, play a central role in shaping organizational performance (Kaithia et al., 2024; Ishimwe & Abuga, 2024). For instance, Kaithia et al. (2024) reported a strong positive correlation between budget planning and organizational effectiveness in Kenyan universities, while Ishimwe and Abuga (2024) demonstrated similar effects within the county government of Kajiado. Other studies, such as Simanjuntak et al. (2024) and Parihar (2024) confirm that budgetary controls significantly influence institutional effectiveness across various organizational types, including non-profits and enterprises.

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However, there is growing recognition that budgetary control mechanisms alone may be insufficient to overcome structural inefficiencies in public institutions. Emerging technologies, particularly Financial Technology (FinTech), are increasingly seen as tools that can enhance transparency, efficiency, and real-time responsiveness in public financial management. Yet, current empirical evidence on FinTech's application as a moderating variable within budgetary frameworks remains limited, especially in developing countries. Most existing studies focus either on the private sector or on financial inclusion, with little attention to the integration of FinTech in public budgeting processes (Dhiaf *et al.,* 2024; Hermuningsih *et al.,* 2023). Furthermore, studies that do explore this nexus often neglect the contextual realities of developing economies like Nigeria, where bureaucratic rigidity, limited ICT infrastructure, and resistance to innovation hinder digital transformation (Nuhu *et al.,* 2023; Theiri & Hadoussa, 2023).

Given these theoretical and empirical gaps, as well as the pressing practical challenge of underperformance in public service delivery, this study seeks to investigate how FinTech can strengthen the relationship between budgetary control and organizational effectiveness. Specifically, it examines the moderating role of FinTech in the relationship between budget planning and participation, and the organizational effectiveness of revenue-generating institutions in North-Central Nigeria. In this context, organizational effectiveness is measured by service delivery outcomes such as revenue collection efficiency, transparency, accessibility of services, and stakeholder satisfaction (Ahwera, 2021; Basward, *et al.,* 2021).

This investigation is essential not only for filling empirical gaps in public financial management literature but also for offering evidence-based insights that can inform policy formulation, promote digital accountability, and enhance performance outcomes in Nigeria's public sector.

1.2 Objectives of the Study

The specific objectives of the study are:

i. To analyse the effect of budget planning on organisational effectiveness of revenue-generating institutions in North-central States, Nigeria.

ii. To investigate the effect of budget participation on organisational effectiveness of revenue-generating institutions in North-central States, Nigeria.

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iii. To determine the impact of Fintech on the organisational effectiveness of revenue-generating institutions in North-central States, Nigeria.

iv. To evaluate the moderating effect of Fintech on the relationship between budget planning and organisational effectiveness in revenue-generating institutions in North-central States, Nigeria.

v. To assess the moderating role of Fintech on the relationship between budget participation and organisational effectiveness in revenue-generating institutions in North-central States, Nigeria.

2.0 Literature Review and Theory

2.1 Organisational effectiveness

Organizational effectiveness is a widely studied concept, defined as an organization's ability to achieve goals, adapt to external environments, and satisfy stakeholders (Roziq *et al.*, 2025). While this definition holds for both the private and public sectors, their specific measurement criteria differ. Business-oriented views often focus on productivity and internal processes while public sector effectiveness is tied to broader objectives like national development and efficient resource management. These differing perspectives highlight a key distinction: private sector effectiveness often prioritizes metrics of profit and output, whereas public institutions are primarily concerned with delivering value to citizens.

Given the unique mandate of public institutions, this study defines organizational effectiveness through the lens of service delivery. This approach aligns with research that emphasizes measurable outputs and outcomes for citizens (Roziq *et al.*, 2025; Uwadiah, 2024). Effective service delivery goes beyond internal efficiency by focusing on the tangible impact on the public ensuring that services are accessible and of high quality. The budgetary process, particularly planning and participation, is critical to this outcome, as it governs how resources are allocated to enhance service quality. Empirical studies in Africa have affirmed this connection, showing that practices like participatory budgeting and robust financial controls positively predict service performance (Ahwera, 2021; Basward, *et al.*, 2021). This study builds on this foundation to examine how budgetary control impacts service delivery in North-Central Nigerian institutions, while also exploring the moderating role of financial technology (FinTech) in this relationship.

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2.2 Financial Technology (FinTech)

Financial technology, or FinTech, has significantly transformed the financial services landscape. Its roots can be traced back to the late 19th century with the use of the telegraph and Morse code for financial communications (Michael, 2021; Akmal *et al.*, 2023). FinTech combines the concepts of finance and technology, referring to a broad range of digital tools, applications, and platforms that allow individuals and organizations to manage, analyse, and execute financial activities electronically (Trificana, 2023; Baker *et al.*, 2023).

Una *et al.,* (2023) define FinTech as the use of mobile apps and software to simplify financial transactions for consumers and businesses, leveraging advanced technologies to automate and improve traditional financial operations. Similarly, Feyen *et al.,* (2021) view FinTech as an umbrella term covering technologies across various financial sectors, including banking, capital markets, investment firms, hedge funds, and credit services.

According to Patadiya (2022), the FinTech industry spans multiple areas such as digital payment platforms, banking technologies, online lending, insurance marketplaces, and specialized financial software. The rapid expansion of FinTech presents opportunities for organizations to boost efficiency, lower costs, foster innovation, and improve risk management. In this fast-evolving environment, collaborating with FinTech development partners is increasingly seen as a strategic necessity for maintaining competitiveness.

2.3 Budgetary Control

Budgetary control is widely recognized in modern literature as a structured approach to managing organisational effectiveness through the formulation, tracking, and evaluation of budgets. Atrill and McLaney (2022) describe it as the process of setting financial targets, comparing actual outcomes against those targets, and implementing corrective actions when discrepancies arise. Similarly, Seal, *et al.,* (2021) present budgetary control as a management tool that ensures departmental activities align with organizational goals through periodic performance reviews. Bhimani *et al.,* (2019) define it as the application of budgets as quantified plans that are continuously assessed to promote financial discipline and operational efficiency. Hilton and Platt (2020) stress its role in performance management by promoting accountability and supporting decisions based on variance analysis. Likewise, Horngren *et al.,* (2021) view budgetary control as a mechanism for translating strategic goals into actionable financial targets while optimizing resource use.

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For this study, budgetary control is defined as a systematic process employed by revenue-generating institutions to formulate financial plans (budgets), assess actual performance against those plans, conduct variance analyses, and implement corrective actions, all aimed at improving organizational effectivenessand service delivery within a technology-driven framework.

2.3.1 Budgetary planning

Budgetary planning is broadly acknowledged as a core component of financial management in both public and private organizations. Atrill and McLaney (2022) describe it as the process of predicting future financial conditions and establishing financial targets to inform managerial decisions. Hilton and Platt (2020) define budgetary planning as the creation of detailed financial plans that outline anticipated revenues, expenditures, and resource allocations over a specific period. According to Horngren *et al.,* (2021), it serves as a strategic tool that translates long-term organizational goals into actionable financial initiatives. Bhimani *et al.,* (2019) frame it as a forward-looking process aimed at preparing for future opportunities and challenges while ensuring effective resource allocation. Likewise, Seal, *et al.,* (2021) emphasize its role in promoting departmental coordination and aligning operational activities with the organization's strategic objectives. It is defined as a structured and strategic process involving the projection of future revenues and expenditures, the establishment of financial targets, and the allocation of resources to meet organizational goals effectively.

2.3.2 Budgetary participation

Budgetary participation, as a dimension of budgetary control, is defined as the process in which individuals at various levels within an organization are involved in the setting of budget targets and the development of budget plans (Jones & Smith, 2020). This concept emphasizes the collaborative aspect of budgeting, moving away from a purely top-down approach. Budgetary participation involves every member of the organization in preparing the budget and influencing the creation of budget targets used for performance evaluation. This inclusive approach aims to leverage the knowledge and insights of employees across different levels to create more realistic and achievable financial plans.

2.4 Empirical Review

Kaithia, *et al.,* (2024) conducted a study to determine the impact of budget planning on the organisational effectiveness of public universities in the Mount Kenya region, Kenya. The research employed a descriptive design, targeting seven universities in the region.

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The respondents included 284 heads of departments from both academic and administrative divisions, selected through a census method. Data collection was carried out using structured questionnaires, which were distributed and collected after two weeks using the drop-and-pick method. The data were analysed using descriptive techniques such as frequencies, percentages, and means, as well as inferential statistics like correlations. A pre-test was conducted at Laikipia University, where 28 respondents were selected using a simple random method. The findings, presented in tables and explanations, revealed a significant and positive correlation between budget planning and the organisational effectiveness of public universities.

Ishimwe and Abuga, (2024) examined the effect of budgetary control measures on the organisational effectiveness of the county government of Kajiado. The study's objectives are to: assess the effect of budget planning, evaluate the effect of budget coordination and determine the effect of budget evaluation on organisational effectiveness of the county government of Kajiado. This study was anchored on the allocation of resource theory, expenditure theory, and progressive theory of public expenditures. The study used a descriptive research design. The target population of the study was the 4,017 employees in Kajiado County government in all the four departments. The study employed stratified random sampling, to categorize the population into strata. To get the number of employees per department, the study used the sample proportionate to population technique. Then, the study used simple random sampling to select the employees. Findings revealed that budget planning positively and significantly influences organisational effectiveness of the county government of Kajiado. It was noted that budget coordination and evaluation positively and significantly influence the financial performance of the county government of Kajiado.

Simanjuntak, *et al.*, (2024) explored the impact of organisational effectiveness on budget planning and control in non-profit organizations. The study employed a quantitative research approach, utilizing statistical methods to analyse the relationships among the variables. The researchers surveyed 16 non-profit organizations in Indonesia, selected through purposive sampling to gather primary data. Simple regression analysis was used to assess the influence of organisational effectiveness on budget planning and control, with the data being processed using SPSS version 22. The results indicated a positive correlation between the organisational effectiveness of non-profit entities and their budget planning and control practices.

Ngacha and McDonald (2023) examined the effect of Monitoring and evaluation of budgetary practices on project service delivery in Cameroon Baptist Convention Health

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Services. The study used mixed research designs (quantitative and qualitative). The study population was 140 respondents, with a sample size of 103 respondents using Fisher's exact formula and purposive sampling technique. The study used correlation and multiple regression to analyse the study data using SPSS. The study found a significant positive relationship between Monitoring and evaluation practice (project service delivery) and organisational effectiveness.

Parihar, (2024) conducted a study to assess the impact of budgetary control on organisational effectiveness at Vaishno Enterprise Satna. The research employed a descriptive survey design, utilizing structured questionnaires distributed to 25 respondents from the Accounts, Finance, and Administration Departments. Data collection was carried out using well-structured questionnaires, and respondents were selected through simple random sampling. The data were analysed using frequency percentages and chi-square tests. The study's findings indicated that budgets and budgetary controls significantly influence organizational effectiveness due to their strong interrelationship. Budgets and budgetary controls provide essential structural support that enables organizations to achieve their goals and objectives, thus enhancing performance through effective resource allocation and control.

2.5 Theoretical Framework

The Allocation of Resources Theory, proposed by Joseph Bower in 1970, supports the study's theoretical framework. The theory states that an organization's success depends on its ability to wisely distribute limited resources, a concept echoed by economists like Amartya Sen (Gizachaw, 2018, as cited in Osore, 2019). This principle is particularly relevant for public institutions, where budgetary control is used to allocate finite financial resources among various departments to achieve organizational goals. The theory thus provides a basis for evaluating how effectively ministries and other government bodies manage their resources to ensure financial discipline and success.

3.0 Methodology

The study used quantitative, survey, and explanatory research designs. The study's population comprises 17,417 staff members from ten revenue-generating institutions in Niger, Kwara, and Nasarawa States. The sample size was determined to be 561 employees, selected using Krejcie and Morgan's sample size determination table. A simple random sampling technique was used to ensure representative sampling. Data was collected through a structured questionnaire, using a 5-point Likert scale. The study used

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partial least squares structural equation modelling (PLS-SEM) for data analysis. The study model is adapted from the works of Ahwera (2021) and Basward *et al.*, (2021):

$SD = \beta_0 + \beta_1 BP_i + \beta_2 BPr_i + \beta_5 FT_i + \beta_5 FT_i \times BP_i + \beta_5 FT_i \times BPr_i + e$

Where:

β_0 = constant;

$\beta_1 BP_i$ = budget planning coefficient

$\beta_2 BPr_i$ = budget participation coefficient

$\beta_5 FT_i$ = Fintech coefficient

SD = Service Delivery:

4.0 Data Analysis

4.1 Measurement (Outer) Model

Before evaluating the study's measurement model, a Confirmatory Factor Analysis (CFA) was conducted to examine the factor loadings of the constructs. The study comprises four constructs: Financial Technology (FT), Budget Planning (BP), Budget Participation (BPr), and Service Delivery (SD), each measured by five items. The CFA results indicated that two items from Budget Planning (BP4 and BP5) and two items from Budget Participation (BPr1 and BPr5) had factor loadings below the recommended threshold of 0.50. Consequently, these items were excluded from the final measurement model. Figure 1 displays the study's path diagram, highlighting the retained scale items.

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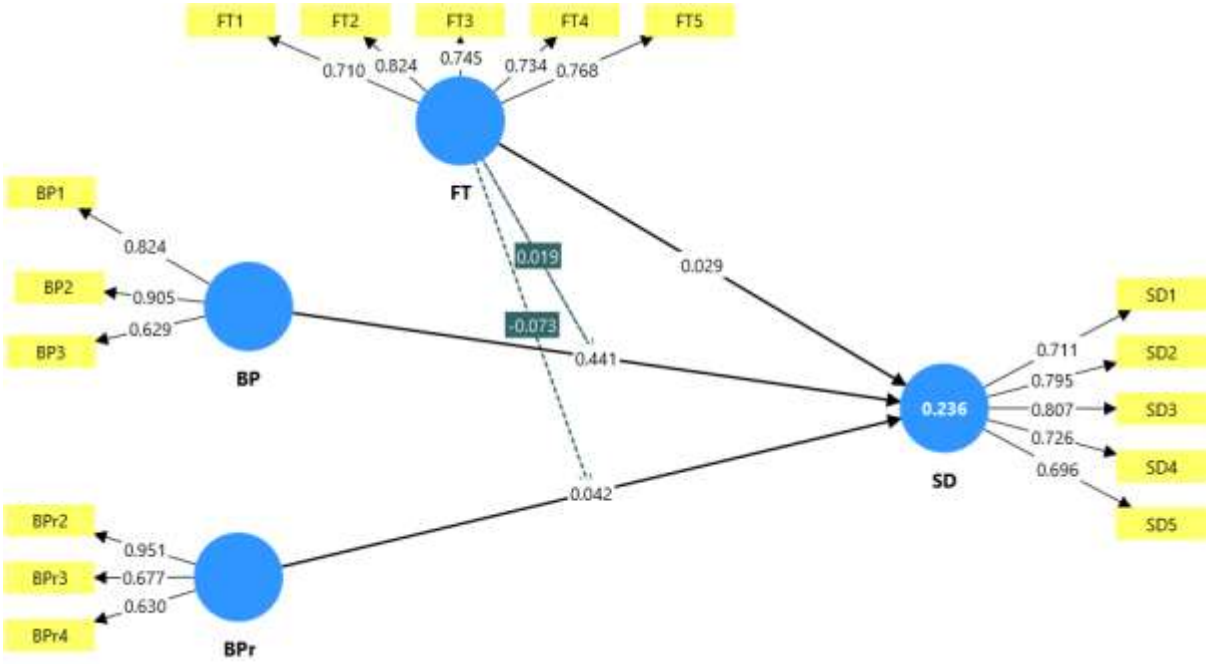

Figure 1: Path Diagram

4.2 Reliability and Convergent Validity Test

The initial step in the measurement model evaluation involved assessing reliability and convergent validity. A construct is deemed reliable when its Cronbach's Alpha (CA) and Composite Reliability (CR) values exceed the recommended threshold of 0.70. To evaluate convergent validity, the study adopted the Fornell and Larcker (1981) criterion. According to this approach, a construct demonstrates convergent validity if its factor loadings and Average Variance Extracted (AVE) are above 0.50, and its CR exceeds 0.70.

Table 2. Reliability and Convergent Validity Test

	Cronbach's alpha	**Composite Reliability**	**Average variance extracted (AVE)**
BP	0.693	0.834	0.631
BPr	0.727	0.805	0.587
FT	0.826	0.870	0.573
SD	0.808	0.864	0.560

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The findings from the reliability and convergent validity assessments in Table 2 demonstrate that all constructs satisfy the recommended criteria for Composite Reliability (CR) and Average Variance Extracted (AVE). The CR values range between 0.805 and 0.870, surpassing the minimum threshold of 0.70, thus confirming the constructs' internal consistency. While the Cronbach's Alpha (CA) values vary from 0.693 to 0.826 - with Budget Planning (BP) marginally below the 0.70 benchmark at 0.693 - this value is still considered acceptable, particularly in exploratory research settings. Moreover, the AVE values for all constructs exceed the 0.50 cutoff, ranging from 0.560 to 0.631, indicating solid convergent validity. Collectively, these results confirm that the measurement model is both reliable and valid, with the items effectively representing their respective theoretical constructs.

4.3 Discriminant Validity Test

To evaluate discriminant validity, the study applied two complementary methods, the Fornell-Larcker criterion and the Heterotrait-Monotrait Ratio (HTMT). The Fornell-Larcker approach assesses discriminant validity by comparing the square root of each construct's Average Variance Extracted (AVE) with its correlations with other constructs. Discriminant validity is established when the square root of the AVE exceeds the corresponding inter-construct correlations. The HTMT method evaluates the ratio of correlations across different constructs (heterotrait) to correlations within the same construct (monotrait), with a threshold value below 0.90 (Gold *et al.,* 2001) indicating satisfactory discriminant validity. Utilizing both techniques enhances the reliability of the assessment and confirms that the constructs are conceptually distinct and not excessively correlated.

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4.3.1 Discriminant Validity – Fornell and Larcker Criterion

Table 3 shows the study's discriminant validity test using Fornell and Larcker's Criterion.

Table 3 Fornell and Larcker Criterion

	BP	**BPr**	**FT**	**SD**
BP	0.794			
BPr	0.266	0.766		
FT	0.219	0.111	0.757	
SD	0.473	0.180	0.154	0.748

Table 3 presents the Fornell and Larcker criterion results used to assess discriminant validity among the study constructs. The diagonal values represent the square roots of the Average Variance Extracted (AVE) for each construct, all exceeding 0.75, which indicates good convergent validity. These diagonal values are greater than the off-diagonal correlations between constructs, confirming that each construct shares more variance with its own indicators than with other constructs in the model. Specifically, Budget Planning (BP) shows a strong distinctiveness with a square root of AVE at 0.794, while Budget Participation (BPr), Financial Technology (FT), and service delivery (SD) also demonstrate adequate discriminant validity with values of 0.766, 0.757, and 0.748, respectively. The relatively low correlations between constructs further reinforce that the measurement model reliably differentiates between the latent variables, supporting the robustness of the study's construct validity.

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4.4.2 Discriminant Validity – HTMT Criterion

Table 4 shows the result of the Heterotrait-Monotrait (HTMT) ratio.

Table 4 Discriminant Validity – HTMT Criterion

	BP	**BPr**	**FT**	**SD**	**FT x BP**	**FT x BPr**
BP						
BPr	0.346					
FT	0.270	0.209				
SD	0.593	0.176	0.146			
FT x BP	0.305	0.228	0.285	0.189		
FT x BPr	0.250	0.261	0.303	0.210	0.587	

Table 4 shows the results of the Heterotrait-Monotrait Ratio (HTMT) criterion used to assess discriminant validity among the constructs. All HTMT values between pairs of constructs are well below the conservative threshold of 0.90, indicating that the constructs are distinct and not excessively correlated. For instance, the highest HTMT value is 0.593 between Budget Planning (BP) and Service delivery (SD), which is still comfortably below the cutoff, confirming adequate discriminant validity. Other cross-construct HTMT values, such as between Budget Participation (BPr) and Financial Technology (FT) at 0.209, and between the interaction terms (FT x BP and FT x BPr) and their respective main constructs, also remain low. These results collectively demonstrate that each construct measures a unique concept and that the model's latent variables are sufficiently differentiated, supporting the reliability and validity of the measurement framework in this study.

Evaluation of Structural (Inner) Model

4.4 Collinearity Problem

Following the evaluation of the measurement model, the analysis proceeded to the initial stage of the structural model assessment. To ensure the accuracy of the regression

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estimates, the study first checked for potential collinearity among the constructs. This was assessed using the Variance Inflation Factor (VIF), with values above 5 indicating potential multicollinearity issues. As presented in Table 5, all VIF values ranged from 1.123 to 1.614, well below the critical threshold. These results suggest that multicollinearity is not a concern in the model, thereby validating the reliability of the subsequent regression analysis within the structural model.

Table 5 Multi-Collinearity Test

VARIABLE	**VIF**
BP -> SD	1.148
BPr -> SD	1.123
FT -> SD	1.160
FT x BP -> SD	1.614
FT x BPr -> SD	1.592

4.5 Coefficient of determination R^2

The R-square (R^2) value represents the degree to which the endogenous variable is explained by the exogenous variables in a model. It quantifies the proportion of variance in the dependent construct that can be predicted based on the independent constructs. Interpreting R^2 values typically involves benchmark thresholds that offer a general guideline. According to Chen (as cited in Fauzi, 2022), an R^2 value of 0.19 is considered weak, 0.33 indicates a moderate effect, and 0.67 reflects a strong explanatory power. These benchmarks help evaluate the effectiveness of the model in capturing the relationships among constructs. In general, a higher R^2 value implies stronger predictive capability of the exogenous variables, indicating a more robust and reliable structural model.

Table 6 R-square value

	R-square	**R-square adjusted**
SD	0.236	0.227

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Table 6 shows that the R-square (R^2) value for the endogenous variable Service delivery (SD) is 0.236, with an adjusted R-square of 0.227. This indicates that approximately 23.6% of the variance in SD is explained by the exogenous variables included in the model. In other words, the independent constructs account for nearly one-quarter of the changes observed in Service Delivery. The remaining 76.4% of the variance is due to other factors not captured in the current model, suggesting that additional variables may influence the dependent variable beyond those examined in this study. While this R^2 value reflects a modest explanatory power, it underscores the significance of the included predictors and points to opportunities for future research to explore other relevant determinants of service delivery.

4.6 Effect size f-square analysis

Table 7 shows the result of the Effect size.

Table 7 : Effect size f^2

Variable	f-square
BP -> SD	0.222
BPr -> SD	0.002
FT -> SD	0.001
FT x BP -> SD	0.000
FT x BPr -> SD	0.008

Effect size (f^2) measures the contribution of each exogenous latent variable to the R^2 of the endogenous latent variable, providing insight into their practical significance (Fawad, 2022). According to Cohen's guidelines, f^2 values of 0.35, 0.15, and 0.02 represent large, moderate, and small effects, respectively (as cited in Fawad, 2022). Table 7 shows the effect sizes for the study's constructs: Budget Planning (BP) has a moderate effect on Service delivery (SD) with an f^2 value of 0.222; Budget Participation (BPr) exhibits a negligible effect of 0.002; Financial Technology (FT) also shows a minimal effect size of

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0.001. The interaction between FT and BP yields an effect size of 0.000, indicating no practical impact, while the interaction between FT and BPr has a small effect with an f^2 of 0.008. These results suggest that among the predictors, Budget Planning has the most substantial practical influence on Organisational effectiveness, while the other variables and interaction terms have little to no meaningful effect.

4.7 Predictive relevance Q^2 analysis

Table 8 LV Prediction summary

	Q^2predict	**RMSE**	**MAE**
SD	0.212	0.894	0.676

The Q^2 statistic measures the predictive relevance of the model, indicating how well it can predict the values of the endogenous construct (Hair, Hult, Ringle, Sarstedt, & Thiele, 2017). In this study, the Q^2 value for Service Delivery (SD) is 0.212, which is greater than zero and signifies moderate predictive relevance. According to Chin (as cited in Fauzi, 2022), Q^2 values of 0.02, 0.15, and 0.35 indicate weak, moderate, and strong predictive relevance, respectively. Therefore, the obtained Q^2 value suggests that the model has a meaningful ability to predict Service delivery. Additionally, the Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) values of 0.894 and 0.676, respectively, provide further evidence of the model's accuracy in prediction. Overall, these results confirm the model's satisfactory predictive power regarding the endogenous variable.

4.8 Bootstrapping Procedure:

To assess the study's hypotheses, a bootstrapping technique with 5,000 resamples was employed, offering a robust method for estimating the accuracy of the path coefficients. The results of this analysis are presented in Table 9 and serve as the basis for evaluating the significance of the proposed relationships. According to the standard decision criteria, an effect is deemed statistically significant if the t-statistic exceeds 1.96 and the p-value is below 0.05. Meeting these thresholds indicates that the relationship is significant at the 5% level, suggesting a low probability that the findings are due to random variation. This method enhances the credibility of the results and reinforces the validity of the study's hypothesized relationships.

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4.9 Test of Hypothesis

The path coefficient results presented in Table 9 serve as the primary basis for analysing the study's hypotheses. These coefficients quantify the strength and direction of the relationships between the constructs in the structural model. By examining the significance and magnitude of these path coefficients, the study determines whether the hypothesized effects are supported by the data, thereby providing evidence to accept or reject each hypothesis.

Table 9 Path coefficient estimate

	Co-efficient	**Standard Error (SE)**	**T statistics**	**P values**
BP -> SD	0.441	0.037	12.034	0.000
BPr -> SD	0.042	0.043	0.974	0.330
FT -> SD	0.029	0.035	0.852	0.394
FT x BP -> SD	0.019	0.044	0.426	0.670
FT x BPr -> SD	-0.073	0.041	1.750	0.080

The results of the path coefficient estimates in Table 9 provide detailed insights into the relationships between the study variables and their impact on Service Delivery **(SD)** in revenue-generating institutions in North-central Nigeria.

Budget Planning (BP) → Service Delivery **(SD):** The analysis shows a positive and statistically significant relationship between Budget Planning and Organisational effectiveness, with a path coefficient of **0.441**. This indicates that a one-unit increase in Budget Planning corresponds to a 0.441-unit increase in Service Delivery. The t-statistic value of **12.034**, which exceeds the critical value of 1.96, along with a p-value of **0.000**, confirms that this relationship is highly significant and unlikely to be due to chance. Therefore, the null hypothesis stating no effect is rejected in favor of the alternative hypothesis. This finding supports the assertion that effective Budget Planning is essential for enhancing organisational efficiency and financial success in these institutions. It aligns with previous studies, such as those by Ekaru, (2022), emphasizing that thorough

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budgetary preparations contribute substantially to improved financial outcomes and operational success in the public sector. Practically, this underscores the need for policymakers and financial managers to prioritize careful and adequate budgeting processes to sustain and improve the financial health of revenue-generating institutions.

Budget Participation (BPr) → Service Delivery **(SD):** The influence of Budget Participation on Service Delivery is also positive, with a coefficient of **0.042**, but this relationship is not statistically significant. The t-statistic of **0.974** falls below the critical threshold of 1.96, and the p-value of **0.330** exceeds the 0.05 significance level. These results imply that the effect of Budget Participation on Service Delivery is weak and could be due to random variation, leading to acceptance of the null hypothesis for this path. This suggests that while participation in budgetary activities may conceptually be important, in this context it does not have a statistically meaningful direct effect on organisational outcomes. This finding diverges somewhat from research by Ngacha and McDonald (2023) and Tirtosudarmo *et al.*, (2022), who found stronger effects of participatory budgeting, but it aligns with studies like those by Panyako and Miroga (2024). The implication for practice is that institutions should not solely rely on budget participation to drive performance improvements without considering additional mechanisms such as accountability or execution quality.

Financial Technology (FT) → Service Delivery **(SD):** The direct effect of Financial Technology on Service Delivery is positive but very weak **(0.029)** and statistically insignificant, as indicated by a t-statistic of **0.852** and a p-value of **0.394**. This result suggests that Financial Technology, in isolation, does not have a meaningful direct impact on performance outcomes in these institutions, possibly reflecting nascent adoption stages or ineffective integration of fintech solutions within budgeting and operational processes.

Moderation Effect of Financial Technology (FT) on Budget Planning → Service Delivery **(SD):** The interaction term between Financial Technology and Budget Planning (FT x BP) shows a coefficient of **0.019**, with a t-statistic of **0.426** and a p-value of **0.670**, indicating a statistically insignificant moderating effect. This means that Financial Technology does not significantly alter the strength or direction of the relationship between Budget Planning and Service Delivery in the studied institutions. The null hypothesis of no moderation effect is therefore accepted. This result suggests that while both Budget Planning and Financial Technology have their own roles, their interaction does not enhance or weaken organisational outcomes in a meaningful way, perhaps due to limited synergies or challenges in aligning fintech tools with budgetary practices.

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Moderation Effect of Financial Technology (FT) on Budget Participation → Service Delivery **(SD):** Similarly, the moderation effect of Financial Technology on the relationship between Budget Participation and Service Delivery is also statistically insignificant. The interaction term (FT x BPr) has a negative coefficient of **-0.073,** with a t-statistic of **1.750** and a p-value of **0.080,** which is above the 0.05 cutoff but relatively close. While this could suggest a trend toward a weak negative moderating effect, it does not reach statistical significance, and thus the null hypothesis is retained. This finding indicates that Financial Technology does not significantly influence how Budget Participation impacts organisational outcomes. The nearly negligible moderation suggests that the effectiveness of participatory budgeting is largely independent of technological integration, or that the current financial technologies in place have not sufficiently matured or aligned with participation mechanisms to affect performance outcomes.

5.1 Conclusion

It was glaring in the course of these research work that effective budget planning significantly enhances the Service Delivery of revenue-generating institutions in North-central Nigeria, underscoring its critical role in driving financial success and operational efficiency. While budget participation and financial technology showed positive but statistically insignificant direct effects on organisational effectiveness, financial technology did not significantly moderate the relationships between budget planning or participation and performance. These results suggest that, although financial technology has the potential to influence financial management processes, its current integration does not meaningfully strengthen budget-related outcomes in these institutions.

5.2 Recommendations

- Based on the study's findings, it is recommended that North-Central Nigerian institutions should prioritize regarding strengthening their budget planning processes.
- Given its significant positive impact on service delivery, institutions should invest in training for budget officers to ensure accurate and strategic budget formulation.
- Policymakers should also promote transparency and accountability by aligning budget allocations with institutional goals to maximize resource use.

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- While financial technology (FinTech) did not have a statistically significant moderating effect, institutions should continue to carefully integrate technological tools that support financial management without adding complexity.
- Strengthening monitoring and evaluation frameworks remains vital, as budget participation showed a positive effect. Future efforts should focus on leveraging technology to enhance participatory budgeting and performance tracking to unlock greater benefits for public service delivery.

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