

Business Intelligence Solutions to Administrative Challenges in Tertiary Institutions in South Southern, Nigeria

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ABSTRACT

Tertiary institutions in Nigeria face increasing pressure to modernize administrative governance through digital transformation to overcome operational inefficiencies and data fragmentation. This study examined the potential of Business Intelligence (BI) solutions in addressing administrative challenges within tertiary institutions in the South-South region of Nigeria, specifically evaluating levels of adoption, institutional support, and administrative effectiveness. Utilizing a descriptive cross-sectional survey design, data were collected from 137 academic administrators and ICT personnel and analyzed using a structured Extract, Transform, Load (ETL) framework via Python. Descriptive results revealed moderate administrative challenges (Mean = 3.34) and BI adoption (Mean = 3.01), contrasting with high institutional support (Mean = 4.16). While correlation analysis showed a strong positive relationship between institutional support and BI effectiveness ($r = 0.702$, $p < 0.05$), regression analysis indicated that BI adoption alone was not a significant predictor of administrative effectiveness ($\beta = 0.046$, $p > 0.05$), explaining only 0.2% of the variance. These findings suggest that the mere presence of BI technology does not guarantee administrative transformation; rather, success depends on strategic integration, staff competence, and sustained management backing beyond simple tool acquisition.

Keywords: Business Intelligence, Tertiary Education, Administrative Effectiveness, Data-Driven Decision Making, South-South Nigeria, ETL Framework.

INTRODUCTION

Tertiary education is widely recognized as a critical driver of national development through its contribution to human capital development, economic productivity, and social advancement. In Nigeria, tertiary institutions are increasingly required to demonstrate operational efficiency, accountability, and improved educational outcomes within a context characterized by constrained financial resources, expanding student populations, and heightened regulatory oversight (Ogunode & Adanna, 2022; Wajim & Ukpata, 2023). The effectiveness of institutional administration is therefore central to achieving these objectives. However, persistent weaknesses in administrative data management and decision-support mechanisms continue to undermine the performance of many Nigerian tertiary institutions (Arowoogun et al., 2024; Folorunso, 2024).

A significant proportion of these administrative inefficiencies stem from the reliance on manual processes and fragmented information systems. Such systems often result in data silos, inconsistencies, and delays in the generation of accurate and reliable information required for managerial decision-making (Odionu et al., 2024; Oshinaike, 2021; Fahm, 2023). These limitations affect core administrative domains, including student administration, financial management, human resource management, institutional performance evaluation, and resource optimization. Consequently, institutional leaders lack comprehensive, real-time visibility into

organizational performance, thereby constraining evidence-based planning, monitoring, and policy implementation (George & Wooden, 2023; Okoye et al., 2023).

The administrative challenges confronting tertiary institutions in the South-South region of Nigeria are further compounded by region-specific constraints, such as infrastructural inadequacies, uneven access to digital technologies, and broader socio-economic pressures that affect institutional capacity and governance effectiveness (Chukwu et al., 2021; Ike & Obionu, 2022). Addressing these challenges requires a strategic shift towards modern administrative frameworks that prioritize digital transformation, data integration, and analytics-driven decision-making (Goel & Nelson, 2021; Ogunode & Jegede, 2021; Nadabo, 2023).

Business Intelligence (BI) has emerged as a strategic management tool capable of enhancing administrative effectiveness through the systematic integration, analysis, and visualization of organizational data. BI encompasses a range of technologies and analytical techniques designed to convert large volumes of institutional data into actionable insights that support operational, tactical, and strategic decision-making (Eboigbe et al., 2023; Al-Okaily et al., 2023). Through the application of dashboards, predictive analytics, and data mining techniques, BI enables institutions to improve transparency, optimize resource allocation, and strengthen performance monitoring systems (Al-Eisawi et al., 2021; Al-Okaily et al., 2023).

Despite its demonstrated effectiveness in higher education systems globally, the adoption and institutionalization of BI solutions within Nigerian tertiary institutions particularly in the South-South region remain limited. Structural barriers such as poor data quality, insufficient technical capacity, organisational resistance to change, and the financial cost of BI implementation continue to impede widespread adoption. A policy-informed and empirical understanding of how BI solutions can be leveraged to address context-specific administrative challenges is therefore necessary to guide institutional reform and digital transformation initiatives.

To ensure conceptual precision, four constructs central to this study must be distinguished. Administrative challenges refer to the operational inefficiencies, data fragmentation, and governance difficulties that tertiary institutions encounter in their day-to-day administrative functioning (Eze & Okoronkwo, 2019; Ogunode & Ajape, 2021). BI adoption refers to the extent to which an institution has acquired, deployed, and begun utilizing BI tools and systems within its administrative operations (Chi & Mahmud, 2020; Al-Okaily et al., 2023). Administrative effectiveness, the primary outcome variable, is operationalized as a composite construct measuring how efficiently, transparently, and accountably an institution achieves its administrative objectives including timely reporting, resource optimization, and evidence-based planning. It is conceptually distinct from administrative challenges: an institution may face moderate operational difficulties yet still maintain reasonable administrative effectiveness depending on its governance capacity.

Furthermore, BI effectiveness is a perceptual variable capturing respondents' assessments of how well deployed BI systems perform their intended analytical and reporting functions. An institution may report high BI effectiveness while recording no significant improvement in overall administrative effectiveness, precisely because utilization, strategic integration, and organizational support mediate the relationship between the two. A policy-informed and empirical understanding of how BI can be leveraged to address these context-specific challenges is necessary to guide institutional reform.

This paper seeks to examine the potential of Business Intelligence solutions in addressing administrative challenges faced by tertiary institutions in the South-South region of Nigeria.

REVIEW OF RELATED WORKS

The adoption of business intelligence (BI) in tertiary institutions within developing contexts is increasingly viewed as a critical strategy for enhancing administrative efficiency and strategic decision-making. Sorour et al. (2019) emphasize that the integration of BI and analytics serves as a fundamental mechanism for institutions to monitor quality assurance and align internal operational data with external stakeholder requirements. By

proposing a framework that consolidates diverse data sources, their work highlights that real-time data access is essential for university management to bridge the gap between institutional outcomes and their broader strategic missions.

Building on the technical requirements for such systems, Pinheiro (2014) provides a foundational examination of the components necessary for a successful BI initiative in higher education. His research identifies Extract, Transform, and Load (ETL) processes as the critical backbone of BI systems, ensuring that disparate data sets are compatible before being stored in a data warehouse. This work underscores that effective data processing is a prerequisite for enabling advanced analytical operations, which allow educational leaders to move beyond basic reporting and toward predictive institutional insights.

Addressing the importance of sustainability and long-term planning, Scholtz et al (2018) explore the application of BI frameworks to manage sustainability information. They argue that management dashboards act as vital interfaces, enabling leaders to evaluate whether strategic goals are being met across multi-faceted university environments. Their research suggests that BI is not merely a technical deployment but a strategic tool that supports institutional survival by providing a clear, monitoring-based interface for performance management.

The necessity of aligning BI solutions with specific, localized institutional environments is further highlighted by Mutanga (2015), who developed a Context-Aware Business Intelligence Framework (CABIF) for the South African higher education sector. Mutanga argues against "one-size-fits-all" approaches, demonstrating that because universities operate under unique statutory obligations and internal structures, their BI solutions must be context-aware. Using a mixed-method design science approach, his study confirms that integrating siloed data—such as finance, student records, and human resources—into a centralized web portal is essential for ensuring both legal compliance and accurate, data-driven administrative planning.

Finally, the organizational challenges associated with these technologies are examined through a broader lens by Hweka et al. (2023), who note that BI implementation is often a complex, resource-intensive undertaking. They suggest that the barriers to adoption extend beyond technical requirements to include significant organizational, cultural, and human factors, such as the need for comprehensive user training and the fostering of a data-driven culture. Their work underscores that for institutions in developing regions to succeed, they must address these multidimensional challenges through a comprehensive strategy that balances technical deployment with human capacity building and institutional change management.

METHODOLOGY

Research Design and Study Area

This study adopted a descriptive cross-sectional survey design to examine the role of Business Intelligence (BI) solutions in addressing administrative challenges in tertiary institutions in the South-South region of Nigeria. The design is appropriate because it enables the collection of quantitative data from respondents at a single point in time, allowing for the assessment of BI adoption, institutional support systems, and administrative effectiveness. The study was conducted across tertiary institutions in the South-South geopolitical zone of Nigeria, which includes Rivers, Delta, Akwa Ibom, Cross River, Bayelsa, and Edo States. These states host a combination of federal, state, and private universities, polytechnics, and colleges of education, providing a diverse institutional environment suitable for comparative analysis of BI implementation.

Population, Sample, and Data Collection

The population comprised academic administrators, ICT personnel, and management staff in selected tertiary institutions within the South-South region of Nigeria. A stratified random sampling technique was employed to ensure proportional representation across institution types (universities, polytechnics, and colleges of education), ownership structures (federal, state, and private), and administrative roles.

A total of 150 structured questionnaires were administered. The instrument captured data on demographic characteristics, administrative challenges, BI adoption, BI effectiveness, BI adoption barriers, and institutional support, using a five-point Likert scale. The questionnaire was validated by experts in Information Systems and Educational Management to ensure content relevance and clarity. A pilot study was conducted, and reliability was confirmed using Cronbach's Alpha, with all constructs exceeding the acceptable threshold of 0.70. Out of the 150 distributed questionnaires, 137 valid responses were retrieved and used for analysis. Thirteen responses were excluded during preprocessing due to duplication and incomplete entries to ensure data integrity.

Research Methodology Flowchart

The systematic execution of this research, spanning from initial identification to final analysis, is illustrated in Figure 1. This flowchart serves as a visual guide to the study's procedural logic, detailing the movement from data acquisition through the ETL-based transformation process to the final statistical interpretation. It demonstrates how the research components are interconnected to ensure empirical rigor and replicability.

- *Start:* This stage marks the formal initiation of the research protocol, where the research objectives were defined to specifically address the gap between administrative challenges and the adoption of Business Intelligence (BI) in tertiary institutions in South-South Nigeria.
- *Sampling:* To achieve a representative overview, the study utilized a Stratified Random Sampling technique. This ensured that the sample population—comprising academic administrators, ICT personnel, and management staff—was proportionally drawn from the diverse landscape of federal, state, and private universities, polytechnics, and colleges of education across the South-South geopolitical zone.
- *Input Data:* Following the sampling phase, primary data was acquired through a structured questionnaire. This instrument was designed to capture granular insights on key variables, including administrative challenges, BI adoption levels, institutional support frameworks, and overall BI effectiveness, all measured on a five-point Likert scale.
- *Data Cleansing & Analysis:* This core processing stage involved a hybrid approach using SPSS, Python, and Regression Analysis. The raw data underwent rigorous cleansing to remove incomplete or duplicate entries, ensuring data integrity. Subsequently, the cleaned dataset was subjected to descriptive statistics and Spearman's rank-order correlation to uncover relationships, while simple linear regression was applied to test the predictive power of BI adoption on administrative effectiveness.
- *Are Results Consistent?:* This critical decision node acts as a quality assurance checkpoint. Here, the internal consistency of the constructs was validated using Cronbach's Alpha (with a threshold > 0.70). This verification step ensured that the findings were reliable, robust, and capable of supporting valid conclusions before concluding the research.
- *End:* This terminal stage signifies the successful completion of the methodological workflow, yielding the final analyzed results and actionable recommendations for stakeholders in tertiary education administration.

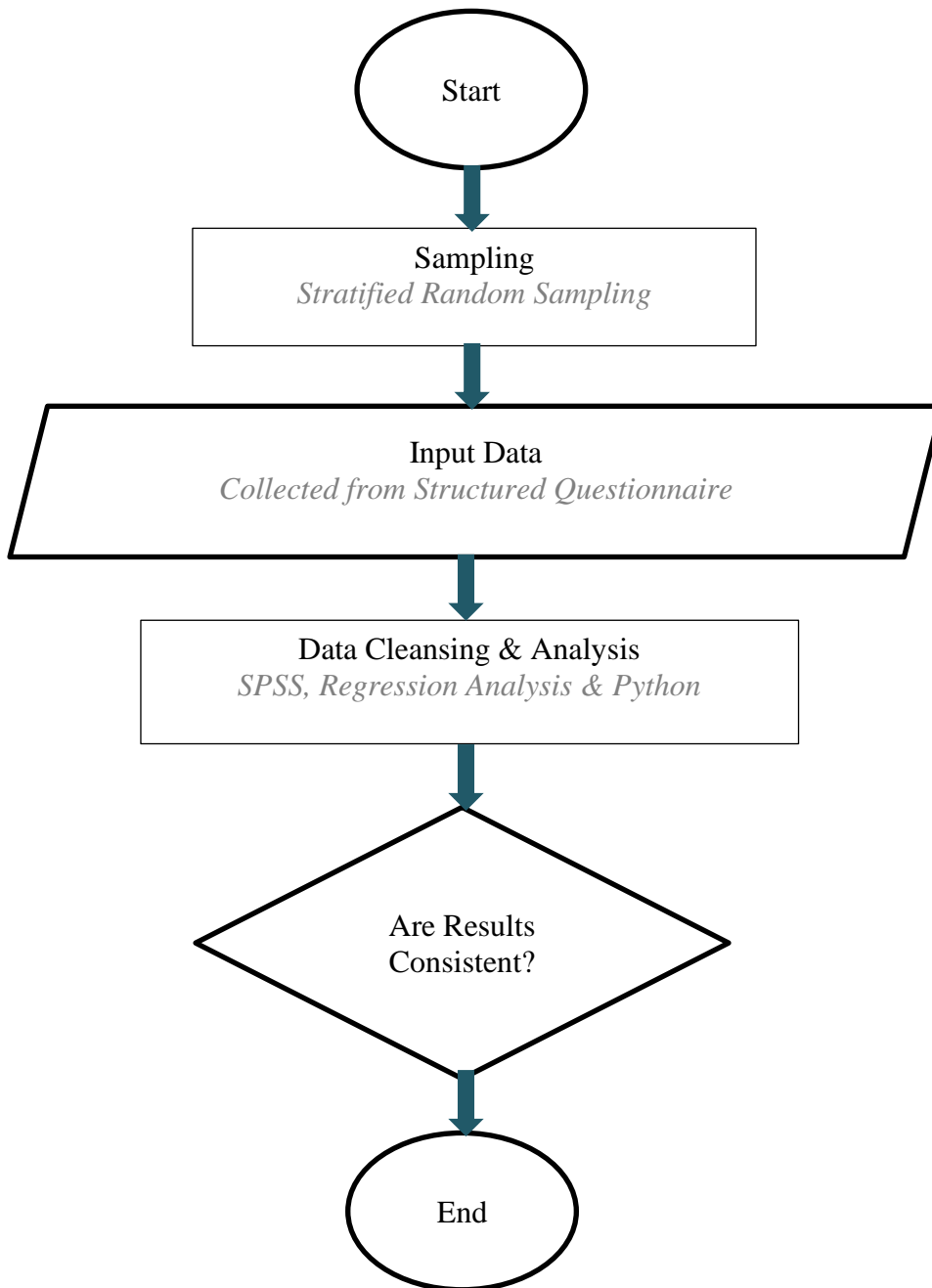


Figure 1: Research Methodology Flowchart

Business Intelligence Data Processing Framework (ETL Approach)

To align with the analytical nature of Business Intelligence systems used in the study, a structured ETL (Extract, Transform, Load) framework was adopted for data processing and analysis.

- **Data Extraction (Extract Phase):** Data were extracted directly from validated survey responses obtained from respondents across the selected institutions. These responses captured perceptions of administrative challenges, BI adoption levels, institutional support, and BI effectiveness.
- **Data Transformation (Transform Phase):** The extracted dataset was processed using Python programming. Data transformation involved the removal of duplicate responses, handling of incomplete or inconsistent entries, standardization of Likert-scale variables, detection and treatment of outliers, and coding of categorical variables into numerical formats. This process ensured that the dataset was clean, consistent, and suitable for statistical analysis. Python libraries such as Pandas, NumPy, and SciPy were used during this stage to ensure accuracy, reproducibility, and computational efficiency.

- **Data Loading (Load Phase):** After transformation, the cleaned dataset was loaded into a structured analytical environment using Python for statistical processing. The dataset was then organized into defined variables representing administrative challenges, BI adoption, BI effectiveness, BI adoption barriers, and institutional support. This structured format provided the foundation for all subsequent descriptive and inferential analyses conducted in the study.

Data Analysis Technique

Data analysis was conducted using the Python programming language, with the support of libraries such as Pandas, NumPy, Matplotlib, Seaborn, and Statsmodels. The analysis began with descriptive statistics, where frequency distributions, percentages, means, and standard deviations were used to summarize respondents' demographic characteristics and key study variables.

Reliability analysis was conducted using Cronbach's Alpha to determine the internal consistency of the measurement constructs. Correlation analysis using Spearman's rank-order correlation was employed to examine the relationships among administrative challenges, BI adoption, BI effectiveness, BI adoption barriers, and institutional support. This method was appropriate due to the ordinal nature of Likert-scale data used in the study. Furthermore, simple linear regression analysis was used to determine the extent to which BI adoption predicts administrative effectiveness in tertiary institutions. In addition, data visualization techniques such as bar charts and heatmaps were used to present trends and relationships in a clear and interpretable format.

RESULTS

Demographic Characteristics of Respondents

Table 1 presents the demographic characteristics of the respondents involved in the study. A total of 137 respondents participated in the survey. The gender distribution revealed that 88 respondents (64.23%) were male, while 49 respondents (35.77%) were female, indicating a male-dominated sample population.

Table 1: Demographic Characteristics of Respondents (N = 137)

Variable	Category	Frequency (<i>f</i>)	Percentage (%)
Gender	Male	88	64.23
	Female	49	35.77
Age Group	Below 30 years	11	8.03
	31–40 years	55	40.15
	41–50 years	54	39.42
	Above 50 years	17	12.41
Qualification	PhD	31	22.63
	MSc./MBA	62	45.26
	BSc./HND	40	29.20
	ND/NCE	4	2.92
Institution Type	University	37	27.01
	Polytechnic	98	71.53
	College of Education	2	1.46
Ownership	Federal	108	78.83
	State	21	15.33
	Private	8	5.84
Position	Professor/Chief Lecturer	10	7.30
	Dean of Faculty	6	4.38
	HOD	41	29.93
	Administrative Officer	15	10.95

	ICT Staff	5	3.65
	Others	60	43.80
Experience	Below 5 years	53	38.69
	5–10 years	39	28.47
	11–15 years	18	13.14
	Above 15 years	27	19.71

With respect to age distribution, the majority of respondents were within the 31–40 years age bracket, accounting for 55 respondents (40.15%), closely followed by those within the 41–50 years category with 54 respondents (39.42%). Respondents above 50 years constituted 12.41%, while those below 30 years represented the least proportion at 8.03%. This finding suggests that the study participants were largely mature and economically active personnel with substantial institutional experience.

Regarding educational qualification, respondents possessing MSc./MBA qualifications constituted the highest proportion with 62 respondents (45.26%), followed by BSc./HND holders representing 29.20%. PhD holders accounted for 22.63%, while respondents with ND/NCE qualifications represented only 2.92%. This distribution indicates that the respondents were largely academically qualified to provide informed responses concerning business intelligence implementation in tertiary institutions.

The distribution of respondents according to institution type showed that polytechnics accounted for the majority with 98 respondents (71.53%), followed by universities with 37 respondents (27.01%), while colleges of education represented only 1.46%. In terms of ownership structure, federal institutions dominated the sample with 108 respondents (78.83%), whereas state-owned and private institutions accounted for 15.33% and 5.84% respectively.

Furthermore, the occupational distribution revealed that respondents categorized under “Others” constituted the largest group with 43.80%, followed by Heads of Department (29.93%) and Administrative Officers (10.95%). Professors/Chief Lecturers accounted for 7.30%, while ICT staff represented 3.65% of the sample. In relation to years of experience, respondents with less than five years of experience formed the majority with 38.69%, followed by those with 5–10 years of experience (28.47%). Respondents with above 15 years and 11–15 years of experience accounted for 19.71% and 13.14% respectively.

Reliability Analysis of Study Variables

Table 2 presents the reliability analysis of the major constructs used in the study. Cronbach’s Alpha coefficients were computed to determine the internal consistency and reliability of the measurement scales.

Table 2: Reliability Analysis of Study Variables

Variable	Number of Items	Cronbach’s Alpha	Interpretation
Administrative Challenges	6	0.742	Reliable
BI Adoption	5	0.848	Very Reliable
BI Effectiveness	5	0.905	Excellent Reliability
BI Adoption Barriers	6	0.778	Reliable

The results showed that the Administrative Challenges construct recorded a Cronbach’s Alpha value of 0.742, indicating acceptable reliability. The BI Adoption construct yielded an alpha coefficient of 0.848, suggesting a high level of internal consistency among the items measuring business intelligence adoption.

Similarly, the BI Effectiveness construct produced the highest reliability coefficient of 0.905, indicating excellent reliability and strong consistency among the measurement items. The BI Adoption Barriers construct recorded a Cronbach’s Alpha value of 0.778, which also satisfied the acceptable threshold for reliability. Overall, all constructs exceeded the recommended benchmark value of 0.70, thereby confirming the reliability and suitability of the research instrument for data analysis.

Assessment of Business Intelligence Adoption and Administrative Challenges

Table 3 presents the descriptive statistics of the major study variables.

Table 3: Descriptive Statistics of Major Variables

Variable	Mean	Standard Deviation	Interpretation
Administrative Challenges	3.34	0.77	Moderate
BI Adoption	3.01	0.91	Moderate
BI Effectiveness	3.74	0.86	High
BI Adoption Barriers	2.28	0.70	Low
Institutional Support	4.16	0.90	High

Result revealed that administrative challenges recorded a mean score of 3.34 with a standard deviation of 0.77, indicating a moderate level of administrative challenges within tertiary institutions in the South-South region of Nigeria. Business intelligence adoption also recorded a moderate mean score of 3.01 and a standard deviation of 0.91, suggesting that the implementation and utilization of business intelligence tools within the institutions remain moderate.

The effectiveness of business intelligence systems recorded a relatively high mean score of 3.74 with a standard deviation of 0.86, implying that respondents perceived business intelligence systems as effective in improving institutional administrative processes. In contrast, business intelligence adoption barriers recorded a low mean score of 2.28 and a standard deviation of 0.70, indicating that barriers hindering BI adoption were generally low among the sampled institutions.

Institutional support recorded the highest mean score of 4.16 with a standard deviation of 0.90, suggesting strong institutional commitment and support towards the implementation and use of business intelligence systems. This finding implies that tertiary institutions in the South-South region are increasingly recognizing the importance of data-driven administrative systems in enhancing operational effectiveness.

Relationship Between Business Intelligence Variables and Administrative Challenges

Table 4 presents the correlation analysis showing the relationships among the major study variables.

Table 4: Relationship Between Business Intelligence Variables and Administrative Challenges

Variables	r	p-value	Decision
Administrative Challenges and BI Adoption	-0.052	0.549	Not Significant
Administrative Challenges and BI Effectiveness	0.551	0.000	Significant
Administrative Challenges and BI Adoption Barriers	-0.477	0.000	Significant
Administrative Challenges and Institutional Support	0.520	0.000	Significant
BI Adoption and BI Effectiveness	0.049	0.573	Not Significant
BI Adoption and Institutional Support	-0.180	0.035	Significant
BI Effectiveness and BI Adoption Barriers	-0.729	0.000	Significant
BI Effectiveness and Institutional Support	0.702	0.000	Significant
BI Adoption Barriers and Institutional Support	-0.720	0.000	Significant

Result showed that there was no significant relationship between administrative challenges and BI adoption ($r = -0.052, p > 0.05$). This suggests that the mere adoption of business intelligence tools may not automatically translate into the reduction of administrative challenges within tertiary institutions.

However, a significant positive relationship was observed between administrative challenges and BI effectiveness ($r = 0.551, p < 0.05$), indicating that effective utilization of BI systems contributes substantially to addressing administrative problems. Similarly, institutional support demonstrated a significant positive

relationship with administrative challenges ($r = 0.520, p < 0.05$), implying that stronger institutional support enhances the capacity of institutions to manage administrative issues effectively.

The findings further revealed a significant negative relationship between BI adoption barriers and BI effectiveness ($r = -0.729, p < 0.05$). This indicates that increased barriers to BI adoption significantly reduce the effectiveness of business intelligence systems in tertiary institutions. Likewise, institutional support showed a strong positive relationship with BI effectiveness ($r = 0.702, p < 0.05$), emphasizing the critical role of management and organizational support in maximizing the effectiveness of BI systems.

Additionally, BI adoption barriers were negatively associated with institutional support ($r = -0.720, p < 0.05$), suggesting that stronger institutional support helps to minimize the barriers affecting business intelligence implementation.

Influence of Business Intelligence Adoption on Administrative Effectiveness

Table 5 presents the regression analysis examining the influence of business intelligence adoption on administrative effectiveness in tertiary institutions.

Table 5: Relationship Between Business Intelligence Variables and Administrative Challenges

Variable	Coefficient (β)	t-value	p-value
Constant	3.607	14.163	0.000
BI Adoption	0.046	0.565	0.573
Model Summary	Value		
R ²	0.002		
Adjusted R ²	-0.005		
F-statistic	0.319		
Model p-value	0.573		

Decision: BI adoption did not significantly predict administrative effectiveness among tertiary institutions in the South-South region of Nigeria ($p > 0.05$).

The regression results revealed that BI adoption did not significantly predict administrative effectiveness ($\beta = 0.046, t = 0.565, p = 0.573$). The model recorded an R² value of 0.002, indicating that business intelligence adoption explained only 0.2% of the variation in administrative effectiveness.

Furthermore, the overall regression model was not statistically significant ($F = 0.319, p > 0.05$). This finding suggests that although business intelligence systems are present within the institutions, their adoption alone may not be sufficient to significantly improve administrative effectiveness. The implication is that factors such as user competence, institutional readiness, management support, technological infrastructure, and strategic integration may play more significant roles in determining the effectiveness of business intelligence systems in tertiary institutions within the South-South region of Nigeria.

DISCUSSION OF FINDINGS

This study examined the potential of Business Intelligence (BI) solutions in addressing administrative challenges faced by tertiary institutions in the South-South region of Nigeria. The findings revealed important patterns regarding the level of BI adoption, institutional support, administrative effectiveness, and the structural factors influencing the successful implementation of data-driven administrative systems within higher educational institutions.

The demographic characteristics of the respondents indicate that the study captured the perceptions of experienced and professionally qualified personnel involved in institutional administration. The majority of respondents were between 31 and 50 years of age and possessed postgraduate qualifications, suggesting that the respondents were sufficiently knowledgeable to assess the realities of BI implementation within their

institutions. The dominance of respondents from polytechnics and federal institutions further reflects the growing emphasis on digital transformation and administrative modernization within publicly funded tertiary institutions in Nigeria.

The reliability analysis demonstrated that all study constructs achieved Cronbach's Alpha values above the recommended threshold of 0.70, thereby confirming the internal consistency and reliability of the research instrument. The high reliability coefficient recorded for BI effectiveness suggests that respondents exhibited relatively consistent perceptions concerning the role of BI systems in improving institutional administration. This finding aligns with the argument of Stewart and Dewan (2022), who noted that BI studies within higher education environments require reliable measurement frameworks capable of capturing organizational intelligence, decision-support capacity, and institutional performance indicators. Similarly, Paradza and Daramola (2021) emphasized that reliable BI measurement constructs are necessary for evaluating organizational value creation and digital transformation outcomes.

The descriptive findings revealed that administrative challenges within tertiary institutions remain moderate despite increasing digitalization efforts. This suggests that many institutions continue to experience bureaucratic inefficiencies, fragmented data systems, delayed reporting processes, and difficulties in resource coordination. These findings are consistent with the observations of Paredes et al. (2025), who argued that many higher educational institutions in developing economies still struggle with administrative inefficiencies due to weak integration of information systems and poor data governance structures. The persistence of these challenges indicates that technological modernization alone may not immediately eliminate deeply rooted organizational inefficiencies.

The study further revealed that the level of BI adoption among tertiary institutions was moderate. This finding suggests that institutions within the South-South region of Nigeria are gradually embracing BI technologies, although adoption remains below optimal levels. The finding supports the work of Al-Okaily et al. (2023), who found that higher educational institutions often experience gradual BI adoption due to financial limitations, infrastructural concerns, organizational resistance, and varying levels of digital readiness. Similarly, Chi and Mahmud (2020) observed that BI implementation within institutions usually progresses incrementally as organizations transition from traditional administrative systems toward data-driven governance models.

One of the most important findings of the study is the high perceived effectiveness of BI systems in institutional administration. Respondents agreed that BI solutions improve decision-making processes, enhance transparency, strengthen performance monitoring, and reduce delays associated with manual administrative procedures. This finding corroborates the conclusions of Shollo et al. (2019), who argued that the success of BI systems largely depends on their ability to support organizational intelligence, improve analytical capabilities, and facilitate evidence-based decision-making. The finding also aligns with Alkhwalidi et al. (2025), who emphasized that institutions with stronger data-driven cultures tend to derive greater administrative value from BI technologies.

The finding that BI adoption barriers were relatively low suggests that many traditional obstacles to technological implementation may be gradually declining within tertiary institutions in the region. Respondents generally perceived infrastructural limitations, skill deficiencies, management resistance, and coordination problems as less severe barriers to BI adoption. This result may reflect increasing institutional awareness regarding digital transformation, improved internet penetration, growing ICT reforms, and continuous investment in educational technologies. The finding supports the work of Sequeira et al. (2024), who observed that higher educational institutions globally are increasingly overcoming technological barriers through strategic ICT planning, staff training, and policy-driven digitalization initiatives.

Institutional support emerged as one of the strongest factors influencing BI effectiveness, recording the highest mean score among all measured variables. This finding demonstrates the importance of management commitment, organizational culture, policy support, and strategic leadership in ensuring successful BI implementation. The result agrees with Isiaku and Adalier (2024), who found that management support and perceived usefulness significantly influence the successful adoption and utilization of BI systems within

organizations. Similarly, Alkhwalid et al. (2025) argued that institutional readiness and leadership commitment are fundamental determinants of successful data-driven transformation within educational institutions.

The correlation findings provide additional insight into the relationships among the study variables. The study found no significant relationship between BI adoption and administrative challenges, indicating that the mere presence of BI technologies does not automatically eliminate institutional inefficiencies. This finding is theoretically important because it challenges the assumption that technological adoption alone guarantees organizational transformation. Shollo et al. (2019) similarly argued that BI systems often fail to produce meaningful outcomes when organizations lack effective implementation frameworks, analytical competencies, or integration strategies. Therefore, the value of BI systems depends not merely on adoption but on the quality of utilization, organizational integration, and strategic alignment.

Conversely, the study identified a significant positive relationship between BI effectiveness and administrative performance. This suggests that when BI systems are effectively utilized, they substantially improve institutional administration through better monitoring, faster reporting, improved accountability, and enhanced strategic planning. This finding supports the Resource-Based View (RBV) theory, which proposes that organizational resources only become valuable when effectively utilized to achieve institutional goals. Paradza and Daramola (2021) similarly noted that BI systems generate organizational value when institutions successfully integrate analytical insights into operational and strategic decision-making processes.

The strong negative relationship observed between BI adoption barriers and BI effectiveness further demonstrates that organizational obstacles can significantly reduce the benefits derived from BI systems. Institutions characterized by poor ICT infrastructure, inadequate technical expertise, fragmented databases, and weak managerial support are less likely to achieve successful BI outcomes. This finding aligns with Al-Okaily et al. (2023), who reported that infrastructural and organizational barriers remain major constraints to BI success within higher educational institutions.

The regression findings further revealed that BI adoption alone did not significantly predict administrative effectiveness. Although this may initially appear contradictory to the high perceived effectiveness of BI systems, the finding actually presents a more nuanced understanding of digital transformation within tertiary institutions. The result suggests that adoption without strategic integration produces limited institutional impact. Many institutions may adopt BI technologies primarily for modernization or compliance purposes without fully embedding them into administrative workflows and decision-making structures. This finding is consistent with the conclusions of Paredes et al. (2025), who argued that the effectiveness of BI systems depends not simply on technological acquisition but on institutional capacity for analytical utilization, staff competence, data governance, and organizational integration.

To bridge the gap between mere technological adoption and actual administrative effectiveness, this study proposes a structured BI-Driven Administrative Optimization Workflow. This model serves as a strategic blueprint for tertiary institutions in South-South Nigeria to move beyond compliance-based adoption toward value-driven utilization.

The Proposed Workflow Architecture

1. **Data Harvesting Layer:** Systematic collection from fragmented institutional silos, including Academic records, Financial Management Systems, Personnel/HR units, and General Administration.
2. **Integration & Centralization:** Transforming raw data through a unified database system to ensure "one version of the truth," addressing the moderate administrative challenges currently caused by data fragmentation.
3. **Analytical Processing:** Deployment of BI tools such as interactive dashboards and predictive analytics to generate real-time institutional intelligence.
4. **Strategic Application:** Utilizing insights for high-impact areas identified in the study: performance monitoring, resource allocation, and policy evaluation.
5. **The Feedback Loop:** A continuous assessment mechanism that evaluates the impact of BI-driven decisions on administrative performance, ensuring the system evolves with institutional needs.

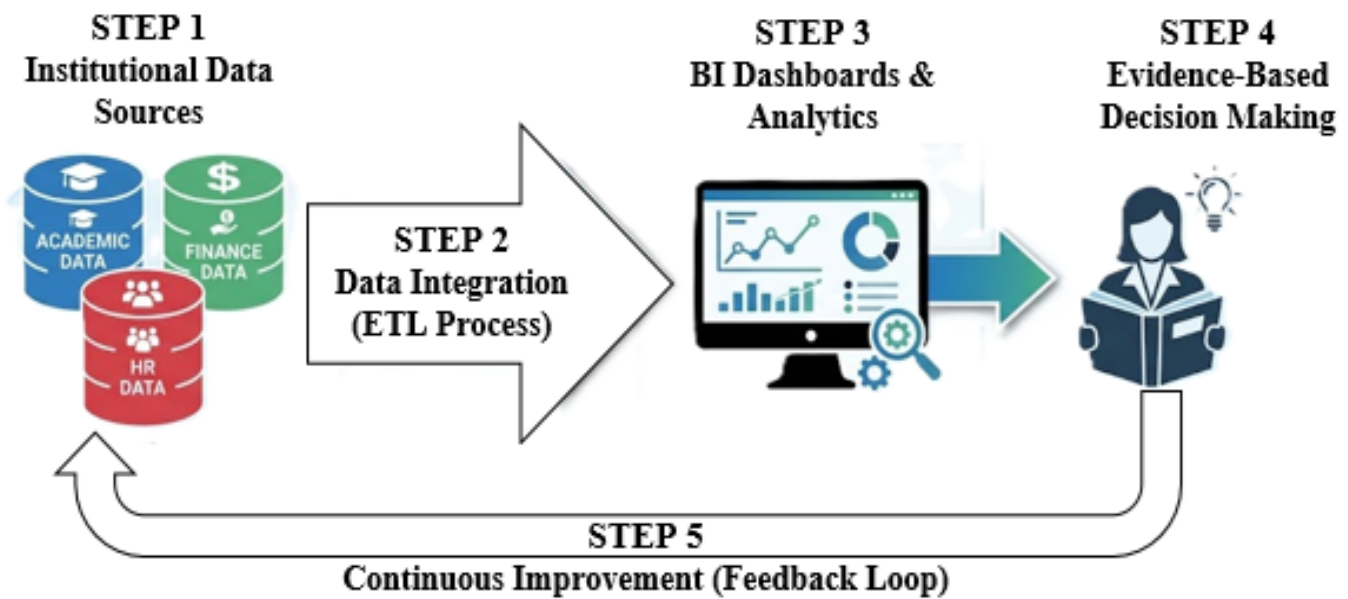


Figure 3: Proposed BI Integration Workflow Architecture

Based on these findings, the study proposes a conceptual workflow for effective BI implementation within tertiary institutions. The workflow begins with institutional data collection from academic, financial, personnel, and administrative units. The collected data should then be centralized and integrated into a unified database system capable of supporting real-time analytics. Following data integration, BI tools such as dashboards, reporting systems, and predictive analytics platforms should be deployed to transform raw institutional data into actionable insights. The generated insights should subsequently support strategic decision-making, performance monitoring, policy evaluation, and institutional planning. Finally, continuous feedback and performance assessment mechanisms should be established to evaluate the effectiveness of BI-driven decisions and promote continuous administrative improvement.

CONCLUSION AND RECOMMENDATIONS

This study investigated the potential of Business Intelligence (BI) solutions to address administrative challenges in tertiary institutions within the South-South region of Nigeria. The findings indicate that while institutions are actively exploring digital transformation, BI adoption remains at a moderate level, and the mere presence of these technologies does not inherently guarantee administrative effectiveness. Although respondents acknowledged that BI systems are perceived as effective in enhancing decision-making, transparency, and performance monitoring, regression analysis demonstrated that adoption alone is not a statistically significant predictor of administrative improvement. Instead, the study concludes that the successful leverage of BI requires more than simple tool acquisition; it depends critically on strong institutional support, strategic integration into administrative workflows, and a data-driven organizational culture that prioritizes capacity building over passive technology implementation.

Based on the study's findings, the following recommendations are proposed to enhance the effectiveness of BI adoption in tertiary institutions:

- **Strategic Integration and Capacity Building:** Tertiary institutions should shift focus from the mere acquisition of BI tools toward the strategic integration of these systems into core administrative functions. Management must prioritize comprehensive staff training programs to bridge technical skill gaps, ensuring that administrative personnel possess the competence to utilize BI analytical outputs effectively.

- **Strengthening Institutional Support and Data Governance:** Given that institutional support is a primary driver of BI effectiveness, leadership must cultivate a sustained commitment to data-driven governance. Institutions should establish robust data governance frameworks that prioritize data quality, security, and integration across fragmented silos to ensure that BI systems provide a reliable "single version of the truth" for decision-making.
- **Adoption of a Continuous Improvement Framework:** Institutions should adopt the proposed BI-driven administrative optimization workflow to ensure systematic evaluation and feedback. By treating BI implementation as an evolving process rather than a one-time project, institutions can continuously monitor the impact of analytical insights on administrative performance, allowing for agile adjustments that align technological deployment with emerging institutional needs.

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