

Aligning Business Intelligence Towards Effective Decision-Making of Financial Institutions

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ABSTRACT

This study aims to assess the role of Timeliness & Real-time Analytics (TRA) in enhancing Decision-Making Efficiency (DME), and analyze the effect of User Adoption & Accessibility (UAA) on Decision-Making Efficiency (DME) in selected financial institutions in Delta State, Nigeria. The study uses a quantitative research methodology, with data collected from a sample of 223 employees of selected financial institutions in Delta State, Nigeria. A structured questionnaire was used to gather responses, and data analysis was conducted using descriptive and inferential statistics, including correlation and regression analyses, to evaluate the relationships between TRA, UAA, and DME. The findings reveal that both TRA and UAA significantly enhance decision-making efficiency in the financial institutions studied. Specifically, Timeliness & Real-time Analytics (TRA) improves the speed and accuracy of decisions, enabling institutions to respond quickly to market changes. Additionally, high levels of User Adoption & Accessibility (UAA) positively influence decision-making efficiency by ensuring that decision-makers have easy access to relevant data and tools. Based on these findings, the study recommends that financial institutions invest in improving real-time data analytics systems, and prioritize user-friendly BI tools along with comprehensive training programs to increase adoption rates. Financial institutions should also foster a culture that supports data-driven decision-making to enhance the utilization of BI systems.

Keywords: Business Intelligence, Decision-Making Efficiency, Timeliness & Real-time Analytics, User Adoption & Accessibility

1. INTRODUCTION

In today's rapidly evolving financial landscape, Business Intelligence (BI) has become a critical tool for organizations seeking to enhance their decision-making efficiency. BI includes a variety of technologies and processes that convert raw data into actionable insights, empowering organizations to make well-informed, strategic decisions (Sertiya Putri & Yulianti, 2024). Among the essential components of BI, Timeliness and Real-time Analytics (TRA) and User Adoption and Accessibility (UAA) are particularly influential in shaping Decision-Making Efficiency (DME) within financial institutions. In Delta State, Nigeria, understanding how these BI components affect decision-making processes is essential for financial institutions that aim to remain competitive and operationally effective. Timeliness and Real-time Analytics (TRA) are crucial for ensuring the prompt availability of data and the ability to analyze it as events unfold. In the fast-paced financial industry, the ability to access and process real-time data is vital for identifying opportunities and managing risks effectively. Studies have shown that interactive dashboards and automated reporting systems significantly enhance real-time decision-making by providing timely, accurate information (Bakare et al., 2024; Okorie, 2022). This underscores the importance of TRA in helping financial institutions quickly adapt to market shifts and retain their competitive advantage.

User Adoption and Accessibility (UAA) focus on the degree to which end-users embrace and efficiently utilize BI tools. High adoption rates and easy access are key to maximizing the value derived from BI investments. Research on BI adoption in Nigerian financial institutions found that user-friendly interfaces and comprehensive training programs are essential for the successful implementation of BI systems (Bakare et al.,

2024). This highlights the need for financial institutions to foster a culture that encourages BI usage and ensures that the tools are accessible to all relevant stakeholders, thereby improving decision-making efficiency. Decision-Making Efficiency (DME) refers to the effectiveness and speed with which organizations can make well-informed decisions. Efficient decision-making enables financial institutions to navigate complex market conditions, optimize operations, and achieve their strategic goals. The integration of accurate, high-quality, and timely data through BI systems enhances DME by providing decision-makers with the necessary insights to make swift, informed choices (Bakare et al., 2024). Understanding how BI components interact with DME is therefore crucial for financial institutions aiming to strengthen their decision-making processes.

In the context of Delta State, Nigeria, financial institutions face unique challenges that influence the effectiveness of BI initiatives, such as limited infrastructure, data management challenges, and varying levels of technological adoption. A thorough review of IT innovations and data analytics in Nigerian enterprises has highlighted the need for customized BI strategies that address these specific challenges in order to improve decision-making (Bakare et al., 2024). This underscores the importance of aligning BI implementations with the local operating environment. Furthermore, the dynamic nature of the financial sector demands continuous improvement of BI systems. Emerging technologies like predictive analytics and machine learning are being increasingly integrated into BI frameworks to provide more advanced insights and forecasting abilities. A study on integrating BI with predictive analytics in banking revealed that these capabilities help banks make better decisions regarding market entry, product development, and customer relationship management (FinTrak, 2023). This highlights the need for financial institutions to stay up-to-date with technological advancements to maintain decision-making efficiency.

The role of organizational culture in BI adoption is equally significant. A culture that supports data-driven decision-making and fosters continuous learning can increase user adoption and optimize the benefits of BI tools. Research on data analytics adoption in Nigeria emphasizes the importance of aligning organizational culture with BI strategies to ensure successful implementation and enhanced decision-making (Bakare et al., 2024; Gwani, 2024). Therefore, it is crucial for financial institutions to consider cultural factors when designing and deploying BI strategies.

Although Business Intelligence (BI) systems have been widely recognized as tools that can improve the efficiency of decision-making in the financial sector, their adoption and utilization in Nigerian financial institutions is still not optimal. Several previous studies have identified various challenges in BI integration. Rikwentishe et al. (2022) found that BI tools such as online analytical processing, advanced analytics, data warehousing, and data mining had no significant relationship with the decision-making process in the Nigeria Customs Service. This suggests that there is a gap in the effective implementation of BI. In addition, research by Bakare et al. (2024) highlighted that although interactive dashboards and automated reporting have the potential to improve real-time decision-making in financial services, their adoption is still hampered by infrastructure limitations and varying technology readiness in Nigerian financial institutions.

Several other studies have also highlighted the factors that influence BI adoption in financial institutions. Federal University Wukari's research (2021) identified organizational readiness, compatibility, complexity, top management support, and competitive pressure as the main factors at play in BI adoption in the Nigerian banking sector. Meanwhile, Nithya & Kiruthika (2021) asserted that BI integration can improve decision-making performance by providing accurate and real-time data, although this study was more of a literature review and did not collect empirical data. The study by Agu et al. (2024) also emphasizes the importance of BI in improving operational efficiency and profitability in financial institutions, but it uses more secondary data and does not empirically test variable relationships.

Some studies show a significant impact of data accuracy and data quality on decision making (Mmeje et al., 2024), while other studies show that factors such as data security and system integration have no significant influence (Federal University Wukari, 2021). Second, existing research has focused more on variables such as data accuracy, real-time analytics, and user adoption, while other factors such as system integration, user training, and organizational culture have not been studied in depth (Gwani, 2024; Nithya & Kiruthika, 2021).

In terms of methodology, most of the reviewed studies used quantitative approaches such as surveys and regression analysis to measure the impact of BI on decision-making efficiency. However, some qualitative and mixed-method studies have also been applied with varying results (Mmeje et al., 2024; Nithya &

Kiruthika, 2021). Studies such as Al-Okaily and Al-Okaily (2022) tend to rely on quantitative data without considering organizational and cultural aspects of BI adoption that may be better understood through qualitative methods. Additionally, Nithya & Kiruthika (2021) relied solely on a literature review without empirical data, which limits the practical implications of their findings. Therefore, future research could take a more balanced methodological approach by combining quantitative and qualitative data to provide more comprehensive insights.

From a geographic perspective, most of the studies reviewed focused on Nigeria or a specific region, with few studies comparing other countries' experiences in BI adoption in the financial sector (Agu et al., 2024; Al-Okaily et al., 2023). Comparative studies covering other countries in Africa or other emerging economies may provide additional insights into how factors such as market structure, technological readiness, and regulation affect the effectiveness of BI implementation.

Based on these research gaps, this study aims to explore the impact of two key BI components-Timeliness and Real-time Analytics (TRA), and User Adoption and Accessibility (UAA)-on decision-making efficiency in selected financial institutions in Delta State, Nigeria. By identifying and analyzing these factors, this research is expected to provide greater insight into improving BI adoption and utilization, thereby contributing to improved decision-making efficiency in the Nigerian financial sector.

2. LITERATURE REVIEW

2.1. Timeliness & Real-time Analytics (TRA)

Timeliness refers to the availability of up-to-date data when needed, while Real-time Analytics (TRA) involves the immediate processing and analysis of data as it becomes available. In the financial sector, the ability to access and analyze real-time data is vital for making prompt and informed decisions, especially in fast-paced market environments. BI tools equipped with real-time analytics capabilities enable financial institutions to monitor transactions, assess risks, and respond swiftly to emerging opportunities or threats (Adapt IT, 2023).

2.2. User Adoption & Accessibility (UAA)

User Adoption & Accessibility (UAA) pertains to the extent to which end-users embrace and effectively utilize BI tools and the ease with which they can access these systems. High user adoption rates are indicative of the perceived value and usability of BI tools within an organization. Ensuring accessibility involves designing user-friendly interfaces and providing adequate training to empower users to leverage BI tools effectively. In financial institutions, fostering a culture that encourages the use of BI tools can enhance data-driven decision-making and improve overall organizational performance (Kruk, 2024).

2.3. Decision-Making Efficiency (DME)

Decision-Making Efficiency (DME) refers to the effectiveness and speed with which decisions are made within an organization. High DME implies that decisions are not only made quickly but are also well-informed and yield positive outcomes. BI plays a pivotal role in enhancing DME by providing timely and accurate insights, thereby reducing the time required to analyze information and increasing the likelihood of making sound decisions. In the context of financial institutions, improved DME can lead to better risk management, optimized operations, and increased competitiveness in the market (OptimizDBA Team, 2023). Thus, the integration of BI components such as Data Accuracy, Data Quality, Timeliness & Real-time Analytics, and User Adoption & Accessibility is crucial for enhancing Decision-Making Efficiency in financial institutions. By ensuring that data is accurate, high-quality, timely, and accessible, organizations can make informed decisions that drive strategic success and operational excellence.

2.4. Information Processing Theory (IPT)

IPT draws parallels between human cognition and computer systems, focusing on how individuals encode, process, and retrieve information. George Armitage Miller, a cognitive psychologist and computer scientist, is credited with laying the foundation of IPT in the 1950s. His seminal work, "The Magical Number Seven, Plus or Minus Two," proposed that human short-term memory has a limited capacity of seven items

plus or minus two (Miller, 1956). This theory has been instrumental in understanding cognitive processes and has influenced the design of information systems that align with human cognitive capabilities.

IPT underscores the importance of efficient information processing and highlights how decision-makers must cope with information overload by streamlining and simplifying complex data (Kohli & Devaraj, 2003). With the advent of digital transformation and big data analytics, organizations can leverage IPT to design systems that optimize how information is processed to ensure quicker and more accurate decision-making.

2.5. Integration of the Theories with Business Intelligence and Decision-Making Efficiency

The theories of DDDM, IPT, and CI are intricately linked to business intelligence (BI) components such as Data Accuracy (DA), Data Quality (DQ), Timeliness & Real-time Analytics (TRA), and User Adoption & Accessibility (UAA). High DA and DQ ensure that the data utilized in decision-making is reliable and relevant, aligning with DDDM's emphasis on empirical data. TRA and UAA facilitate the timely and accessible processing of information, resonating with IPT's focus on efficient information processing. CI benefits from these BI components by enabling the collection of accurate and timely competitive data, thereby enhancing strategic decision-making.

In the context of financial institutions in Delta State, Nigeria, the application of these theories can significantly impact Decision-Making Efficiency (DME). By leveraging accurate, high-quality, and timely data, institutions can make informed decisions that enhance operational efficiency, customer satisfaction, and competitive positioning. Recent studies have highlighted the importance of data-driven approaches in the financial sector, noting that the rise of data science represents a revolutionary cycle in data-driven decision-making. Financial institutions that integrate BI tools, such as data visualization and real-time reporting systems, achieve higher efficiency in decision-making (Sertiya Putri & Yulianti, 2024).

Thus, the integration of DDDM, IPT, and CI theories with BI components provides a comprehensive framework for enhancing decision-making processes in financial institutions. This approach not only improves the accuracy and timeliness of decisions but also aligns organizational strategies with the evolving demands of the financial industry.

H01: Timeliness & Real-time Analytics (TRA) has no significant relationship with Decision-Making Efficiency (DME) in selected financial institutions in Delta State, Nigeria.

H02: User Adoption & Accessibility (UAA) does not significantly affect Decision-Making Efficiency (DME) in selected financial institutions in Delta State, Nigeria.

3. RESEARCH METHODS

This study adopted a comprehensive research methodology to examine the relationship between Business Intelligence (BI) components and Decision-Making Efficiency (DME) within selected financial institutions in Delta State, Nigeria. The methodology included a detailed explanation of the research design, population, sample, data collection methods, and techniques for analysis.

3.1. Research Design

The research design for this study was a quantitative correlational design, aimed at investigating the relationship between BI components and decision-making efficiency. This design was suitable for identifying patterns, examining the strength of relationships, and making predictions regarding the variables in the study. A cross-sectional approach was used to collect data at a single point in time, enabling a snapshot of the current practices within the selected financial institutions. The correlational design allowed for assessing the impact of BI components—data accuracy, data quality, timeliness & real-time analytics, and user adoption & accessibility—on decision-making efficiency in these institutions.

3.2. Population of the Study

The population of this study included employees in the selected financial institutions within Delta State, Nigeria, specifically targeting managers, data analysts, and IT personnel who were directly involved in the implementation and use of business intelligence systems. The total population size across the ten selected financial institutions was estimated to be 500 individuals. The table 3.1, below presents the breakdown of the

population by financial institution and branch location: The total estimated population size across these institutions was 500, and this served as the population for this study. This table ensures that the population size aligns with the breakdown of the financial institutions and their branch locations across Delta State, Nigeria.

To determine the sample size, Taro Yamane's formula was employed, which is widely used in social sciences for calculating sample sizes in a population. Thus, the sample size for this study was 223 respondents, which was drawn from the 10 selected financial institutions.

3.3. Sampling Techniques

This study adopted a stratified random sampling technique. The sample was stratified into three distinct categories: managers, data analysts, and IT personnel. Stratified sampling was chosen because it ensured that each key group involved in BI adoption and decision-making processes was adequately represented. Once the strata were defined, respondents were randomly selected from each group within the institutions, ensuring that the sample reflected the diversity and roles involved in BI implementation.

3.4. Method of Data Collection

This study collected data through primary and secondary sources to ensure the validity and completeness of the information analyzed. Primary data was obtained through a structured questionnaire addressed to managers, data analysts, and IT personnel at selected financial institutions. The questionnaire was designed to measure respondents' perceptions and experiences regarding Business Intelligence (BI) adoption and its impact on decision-making efficiency, using a 5-point Likert scale. Meanwhile, secondary data was collected from company reports, industry publications, and internal documents of financial institutions relevant to BI implementation. This secondary data was used to confirm and enrich the findings from the primary data, resulting in a more comprehensive understanding of the effectiveness of BI in decision-making in the Nigerian financial sector.

3.5. Validity and Reliability of Research Instruments

The validity of the research instrument was tested through content validity checks by three experts in the fields of business intelligence, banking, and organizational decision-making, who assessed the suitability and relevance of the items in the questionnaire to the research objectives, so adjustments were made based on their feedback to improve content validity. Meanwhile, the reliability of the questionnaire was tested using the Cronbach's Alpha coefficient, where values above 0.70 are considered acceptable in social science research. To ensure internal consistency, a pilot test was conducted with 30 respondents who were not included in the final sample of the study.

3.6. Techniques for Data Analysis

The data collected were analyzed using descriptive and inferential statistics. Descriptive statistics such as mean, standard deviation, and frequency distributions were used to describe the characteristics of the respondents and the data collected on BI components and decision-making efficiency. For inferential analysis, multiple regression analysis was employed to assess the relationship between the independent variables (data accuracy, data quality, timeliness & real-time analytics, and user adoption & accessibility) and the dependent variable (decision-making efficiency). The regression model was specified as follows:

$$DME = \beta_0 + \beta_1 TRA + \beta_2 UAA + \epsilon$$

Where:

DME = Decision-Making Efficiency

TRA = Timeliness & Real-time Analytics

UAA = User Adoption & Accessibility

β_0 = Constant

β_1, β_2 = Coefficients for the independent variables

ϵ = Error term

3.7. Data Analysis

The data gathered from 223 respondents across selected financial institutions in Delta State, Nigeria, were analyzed to examine the role of Timeliness & Real-time Analytics (TRA) and User Adoption & Accessibility (UAA) in enhancing Decision-Making Efficiency (DME). Various statistical techniques were employed to explore the relationships between these variables, including descriptive statistics, correlation analysis, and regression analysis.

3.8. Descriptive Statistics

The data were summarized using means and standard deviations for the key variables. Respondents were asked to rate the level of timeliness of data and real-time analytics in their institutions, as well as the adoption and accessibility of business intelligence tools. On average, the financial institutions reported moderate to high levels of timeliness and real-time analytics (TRA), as well as user adoption and accessibility (UAA) of business intelligence tools. However, variability was observed in these dimensions, with some institutions showing more advanced BI integration than others.

4. RESULTS AND DISCUSSION

4.1. Instrument Reliability

After the data was collected, a reliability test of the research instrument was conducted using Cronbach's Alpha coefficient to measure the internal consistency of each main variable. The analysis results show that Timeliness & Real-Time Analytics (TRA) has a Cronbach's Alpha value of 0.80, User Adoption & Accessibility (UAA) of 0.84, and Decision-Making Efficiency (DME) of 0.86. These values are within the acceptable range in social science research, indicating that the research instruments have a good level of reliability and are suitable for use in the data collection process.

4.2. Correlation Analysis

To test the relationship between TRA, UAA, and DME variables, a Pearson correlation analysis was conducted. The results of the analysis showed a strong positive relationship between these variables:

- a) The relationship between Timeliness & Real-time Analytics (TRA) and Decision-Making Efficiency (DME) shows a strong positive correlation with a coefficient of 0.78. This indicates that the higher the level of real-time analytics and the availability of timely data, the more efficiency in the decision-making process in financial institutions.
- b) The relationship between User Adoption & Accessibility (UAA) and Decision-Making Efficiency (DME) has a correlation coefficient of 0.72, which indicates a significant positive relationship. This finding confirms that the higher the level of adoption and accessibility to Business Intelligence (BI) tools, the more efficient the decision-making process in financial institutions.

4.3. Regression Analysis

Multiple regression analysis was conducted to measure the effect of TRA and UAA on DME. The analysis results show that both variables play a significant role in improving decision-making efficiency, with the following contributions:

- a) TRA has a stronger influence on DME with a standardized regression coefficient of 0.57, indicating that the availability of real-time and timely data has a greater impact on decision-making efficiency.
- b) UAA has a regression coefficient of 0.49, indicating that the ease of use and accessibility of BI tools also contribute to improved decision-making efficiency, although the impact is lower than that of TRA.

4.4. Discussion

4.4.1. Effect of Timeliness & Real-time Analytics (TRA) on Decision-Making Efficiency (DME) in selected financial institutions in Delta State, Nigeria

The correlation analysis results show that there is a strong positive relationship between Timeliness & Real-time Analytics (TRA) and Decision-Making Efficiency (DME) with a correlation value of 0.78. This shows

that the higher the level of timeliness and the use of real-time analytics in Business Intelligence (BI) systems, the higher the efficiency in decision-making.

In addition, the regression analysis shows that TRA has a regression coefficient of 0.57, which means that TRA is the dominant factor in determining decision-making efficiency compared to other factors. This suggests that the speed of access to real-time data and its ability to support rapid analysis play a crucial role in improving decision-making efficiency in financial institutions.

In the context of the financial industry, fast and data-driven decisions are essential to capitalize on market opportunities and avoid risks. If financial institutions have access to real-time and accurate information, they can respond to market changes faster, reduce uncertainty in decisions, and improve operational effectiveness. Thus, the null hypothesis (H01) is rejected, and it can be concluded that TRA has a significant relationship with decision-making efficiency.

4.4.2. Effect of User Adoption & Accessibility (UAA) on Decision-Making Efficiency (DME) in selected financial institutions in Delta State, Nigeria

The correlation results show that User Adoption & Accessibility (UAA) has a strong positive relationship with Decision-Making Efficiency (DME) with a correlation value of 0.72. This indicates that the easier it is for users to access BI tools and the higher the level of user adoption, the more efficient the decision-making process carried out by financial institutions.

In addition, the regression analysis results show that UAA has a regression coefficient of 0.49, which means that although its impact on decision-making efficiency is slightly smaller than TRA, this factor still has a significant role in supporting decision-making effectiveness. Financial institutions that successfully increase BI adoption through user training, ease of access, and management support for BI use will be better able to utilize this system to support better business decisions.

This finding indicates that companies that provide training and facilitate access to BI will have a higher level of decision-making efficiency compared to companies that pay less attention to this aspect. Therefore, the null hypothesis (H02) is rejected, and it can be concluded that UAA has a significant influence on decision-making efficiency in financial institutions.

Based on the analysis of the two hypotheses, this study proves that both Timeliness & Real-time Analytics (TRA) and User Adoption & Accessibility (UAA) play an important role in improving decision-making efficiency in financial institutions. TRA has a greater influence than UAA, suggesting that the speed and accuracy of data is a major factor in improving decision efficiency. However, without good user adoption, the benefits of BI will not be maximized. Therefore, financial institutions need to balance BI technology upgrades with effective user adoption strategies to achieve optimal decision-making efficiency.

5. CONCLUSIONS

The study concludes that Timeliness & Real-time Analytics (TRA) and User Adoption & Accessibility (UAA) significantly enhance Decision-Making Efficiency (DME) in financial institutions in Delta State, Nigeria, with TRA exerting a slightly stronger influence. Institutions that prioritize timely access to data, real-time analytics, and ensure widespread adoption and accessibility of Business Intelligence (BI) tools are better positioned to make fast and effective decisions. To optimize decision-making, financial institutions should implement interactive dashboards, predictive technologies, and automation, supported by strong infrastructure such as cloud storage and high-speed data processing systems.

From a strategic and policy standpoint, BI should be viewed not just as a technology, but as an essential component of business strategy. Managers must integrate BI into decision-making processes and provide continuous training to boost user competence. In parallel, policymakers should support digital transformation through regulations promoting data transparency, information security, and standardization of BI usage. Incentives for effective BI adoption can further accelerate performance improvements, reduce operational risk, and enhance institutional competitiveness.

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