



The Impact of Business Intelligence on Decision-Making Effectiveness: The Moderating Role of Organizational Culture in Indonesian Commercial Banks

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ABSTRACT

This study examines the impact of Business Intelligence (BI) usage on decision-making effectiveness in Indonesian commercial banks, considering the moderating effect of organizational culture. The research targeted employees in technical, analytical, and managerial roles across commercial and Islamic banks operating in Indonesia. A structured questionnaire was developed and distributed electronically, with twenty questionnaires allocated to each of the sixteen participating banks, yielding 320 distributed instruments. Of the responses received, 288 questionnaires were deemed valid for statistical analysis after excluding twelve incomplete or invalid responses. The study adopted a quantitative, descriptive-correlational design and analyzed the data using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software, following the two-stage approach of assessing the measurement model and then the structural model. The results revealed statistically significant positive effects of Business Intelligence usage on decision-making effectiveness and of organizational culture on decision-making effectiveness, as well as a statistically significant positive moderating effect of organizational culture on the relationship between Business Intelligence and decision-making effectiveness. The proposed model explained 51.2% of the variance in decision-making effectiveness. Based on these findings, the study recommends strengthening data governance practices, investing in employee data literacy, and cultivating a supportive data-driven organizational culture to maximize the return on Business Intelligence investments.

Keywords: Business Intelligence, Decision-Making Effectiveness, Organizational Culture, PLS-SEM, Indonesian Banking Sector.

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1. Introduction

In the face of an increasingly volatile and data-intensive banking environment, the development of traditional decision-support tools to integrate advanced analytical capability has become indispensable. Business Intelligence (BI) constitutes a fundamental pillar in modern organizational strategy, contributing to the transformation of raw operational and financial data into timely, actionable insight that enhances the speed and accuracy of managerial decisions (Popovič, Hackney, Coelho, & Jaklič, 2012). By monitoring key performance indicators, customer behavior patterns, and operational efficiency in near real time, BI enables banks to make informed decisions that reduce risk exposure and improve competitive positioning (Wieder & Ossimitz, 2015).

Through Business Intelligence, financial institutions can achieve a balance between operational efficiency and strategic agility, as BI helps decision-makers identify emerging risks, streamline internal processes, and respond proactively to shifting market conditions. Furthermore, reliance on BI enhances organizational transparency and reflects an institution's commitment to evidence-based governance, which strengthens its standing among regulators, investors, and customers who increasingly expect data-driven accountability (Suša Vugec, Bosilj Vukšić, Pejić Bach, Jaklič, & Indihar Štemberger, 2020).

Decision-making effectiveness has become a core focus for evaluating the organizational value generated by information systems investments. Decision-making effectiveness involves assessing the speed, accuracy, and confidence with which managers reach conclusions and translate them into action, with the aim of improving organizational responsiveness while preserving sound risk management (Hurbean, Militaru, Muntean, & Danaiața, 2023). Organizational culture is considered a fundamental element within any institution, where shared beliefs and values define the way employees interpret information, collaborate across departments, and respond to change (Warrick, 2017).

Business Intelligence is considered an essential means of improving decision-making effectiveness within banking institutions, as it contributes to guiding the decision-making process in line with strategic and regulatory objectives. BI enhances the ability to monitor and interpret large volumes of transactional data, enabling institutions to manage resources efficiently and reduce decision latency, thereby improving their overall decision-making effectiveness. The effectiveness of applying BI depends significantly on the prevailing organizational culture within the institution; the presence of a culture that supports data-driven values and cross-functional collaboration increases the efficiency of BI utilization and strengthens commitment to evidence-based practices. Therefore, the positive impact of Business Intelligence on decision-making effectiveness is theorized to be stronger when supported by an organizational culture that values transparency, experimentation, and data literacy (Purnomo & Susanto, 2023).

Indonesia provides a particularly relevant context for this investigation. The Indonesian banking sector has undergone substantial digital transformation over the past decade, with commercial and Islamic banks investing heavily in analytics infrastructure, yet recent evidence suggests that BI adoption in the sector remains uneven and that its translation into improved decision-making performance is not automatic (Fitriani, Hidayat, & Nugroho, 2024). Moreover, Indonesia's unique dual-banking system (conventional and Islamic) and its archipelagic geography present additional challenges for data integration and decision-making speed. Based on the foregoing, this study aims to investigate the impact of Business Intelligence usage on decision-making effectiveness in Indonesian commercial banks, considering the moderating role of organizational culture.

2. Study Problem and Questions

The study focuses on analyzing the nature of the interaction between Business Intelligence usage and the level of decision-making effectiveness within Indonesian commercial banks, while exploring the moderating role of organizational culture in strengthening or weakening this interaction. In light of intensifying competitive pressure and tightening regulatory oversight by the Financial Services Authority (OJK), institutions face difficulty in translating substantial BI investments into consistently better decisions. Here, Business Intelligence emerges as a mechanism to monitor operational, financial, and customer-related indicators, enabling institutions to make proactive, evidence-based decisions that reduce risk and improve responsiveness without compromising regulatory compliance.

However, the effectiveness of this mechanism does not depend solely on the technical sophistication of BI tools but also on the nature of the organizational culture within the institution. According to recent studies, banks with an organizational environment that supports data-driven values, transparency, and cross-departmental collaboration succeed in translating BI outputs into tangible improvements in decision quality and speed (Purnomo & Susanto, 2023). In this context, research by

Fitriani et al. (2024) confirms that while technological, organizational, and environmental factors significantly shape BI adoption in the Indonesian banking sector, organizational readiness in particular requires further scrutiny, suggesting that cultural and structural conditions within the bank may be as important as the technology itself.

In light of the above, the study seeks to answer the following questions:

Is there a statistically significant effect of Business Intelligence usage on decision-making effectiveness in Indonesian commercial banks?

Is there a statistically significant effect of organizational culture on decision-making effectiveness in Indonesian commercial banks?

Is there a statistically significant moderating effect of organizational culture on the relationship between Business Intelligence usage and decision-making effectiveness in Indonesian commercial banks?

3. Objectives of the Study

The study seeks to achieve the following objectives:

Identify the level of Business Intelligence usage, organizational culture, and decision-making effectiveness within Indonesian commercial banks.

Identify the impact of Business Intelligence usage on decision-making effectiveness in Indonesian commercial banks.

Identify the impact of organizational culture on decision-making effectiveness in Indonesian commercial banks.

Identify the moderating impact of organizational culture on the relationship between Business Intelligence usage and decision-making effectiveness.

Provide practical recommendations to help Indonesian banks maximize the value generated by their Business Intelligence investments.

4. Literature Review

Recent studies have shown increasing interest in analyzing the interaction between Business Intelligence systems, decision-making effectiveness, and organizational culture, as these axes are fundamental to understanding the mechanisms through which financial institutions extract strategic value from their analytics investments.

4.1 Business Intelligence and Decision-Making

Popovič et al. (2012) demonstrated that the maturity of an organization's analytical capability, together with its underlying information culture, significantly moderates the strength of the relationship between BI system use and effective analytical decision-making, establishing an early theoretical link between BI, culture, and decision outcomes that continues to inform the field. Wieder and Ossimitz (2015) further proposed a mediation model showing that the impact of Business Intelligence on decision quality operates indirectly through improvements in information quality and system use, rather than through technology adoption alone.

More recently, Hurbean et al. (2023) examined how Business Intelligence and Analytics adoption affects decision-making effectiveness and managerial work performance, concluding that the emergence of a data-driven organizational culture is a central mechanism through which BI translates into more effective, evidence-based managerial decisions. Suša Vugec et al. (2020) examined the relationship between Business Intelligence and organizational performance, finding that performance benefits are significantly stronger when BI initiatives are explicitly aligned with structured business process management practices rather than treated as stand-alone technical projects.

4.2 Business Intelligence Adoption in the Indonesian Banking Sector

Fitriani, Hidayat, and Nugroho (2024) formulated a conceptual framework extending the Technology-Organization-Environment (TOE) model to examine BI adoption and its impact on decision-making performance in Indonesian commercial banks, finding a significant positive relationship between TOE factors and BI adoption, and confirming that

BI adoption substantially improves decision-making performance, although organizational readiness did not emerge as a significant predictor, suggesting that readiness-related cultural factors warrant deeper investigation. Purnomo and Susanto (2023) similarly investigated the factors influencing Business Intelligence adoption in Indonesia, providing evidence that technological and organizational factors jointly determine the extent to which Indonesian organizations succeed in embedding BI into their decision-making processes.

Suryani and Rahayu (2025) examined the drivers and challenges of Business Intelligence adoption within Indonesian e-banking operations, reporting that IT infrastructure, data analytics competency, and regulatory alignment are decisive factors shaping successful BI acceptance among banking staff. Wibowo, Haryanto, and Lestari (2025) investigated Business Intelligence Systems and organizational performance in the Indonesian financial sector, finding that competitive advantage fully mediates the relationship between BI adoption and performance, implying that BI is a necessary but not sufficient condition for improved organizational outcomes. Hasanah and Aziz (2024) explored the factors influencing BI adoption specifically within Islamic banks in Indonesia using a qualitative phenomenological approach, identifying organizational and cultural themes that shape how Islamic banking institutions approach BI adoption differently from conventional commercial banks.

4.3 The Role of Organizational Culture

Warrick (2017) argued that organizational culture and leadership are central determinants of high-performance organizations, shaping how employees interpret and act upon information generated by organizational systems. Building on this perspective, Pratama and Dewi (2025) conducted a systematic review of the factors influencing BI adoption and concluded that despite the promise of BI to provide competitive insight, many organizations continue to underutilize their BI systems due to a combination of cultural, governance, and skills-related barriers rather than purely technical limitations.

Taken together, the reviewed literature converges on several recurring conclusions relevant to the present study: (1) Business Intelligence positively influences decision-making effectiveness, but the strength of this relationship is not uniform across organizations; (2) organizational culture, and particularly a culture that supports data-driven values and cross-functional collaboration, consistently emerges as a key condition for realizing the decision-making benefits of BI; and (3) the Indonesian banking sector, while investing significantly in BI infrastructure, continues to exhibit variation in the extent to which these investments translate into measurable improvements in decision-making performance, motivating the moderation model examined in this study.

5. Conceptual Framework and Hypotheses Development

Building on the literature reviewed above, this study proposes a conceptual model in which Business Intelligence (BI) usage is theorized to have a direct positive effect on Decision-Making Effectiveness (DME), Organizational Culture (OC) is theorized to have a direct positive effect on DME, and OC is further theorized to moderate the strength of the BI–DME relationship, such that the positive effect of BI on decision-making effectiveness is stronger in banks with a more supportive, data-driven organizational culture. Accordingly, the following hypotheses were formulated:

H1: Business Intelligence usage has a statistically significant positive effect on decision-making effectiveness in Indonesian commercial banks.

H2: Organizational culture has a statistically significant positive effect on decision-making effectiveness in Indonesian commercial banks.

H3: Organizational culture has a statistically significant positive moderating effect on the relationship between Business Intelligence usage and decision-making effectiveness in Indonesian commercial banks.

Figure 1 (described narratively, as the model comprises three constructs) depicts Business Intelligence as the exogenous (independent) construct, Decision-Making Effectiveness as the endogenous (dependent) construct, and Organizational Culture as both a direct predictor of, and a moderator of the path leading to, Decision-Making Effectiveness — consistent with the moderation structure commonly examined in recent Indonesian BI research (Fitriani et al., 2024; Purnomo & Susanto, 2023).

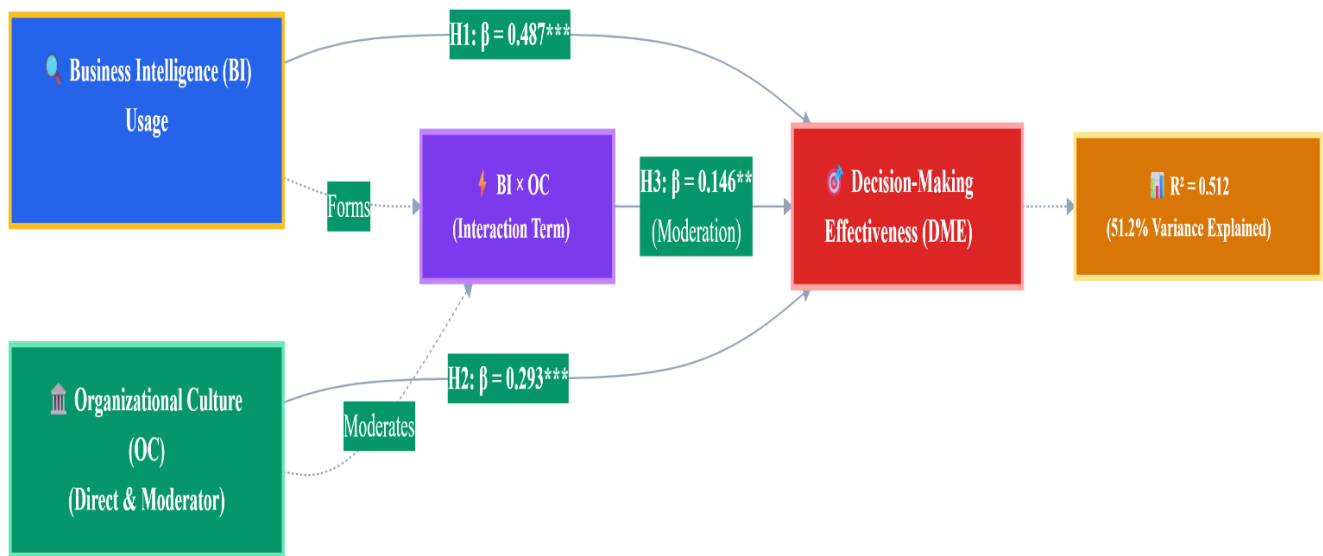


Figure 1 : described narratively, as the model comprises three constructs

6. Study Methodology

To achieve the objectives of this study, which seeks to reveal the impact of Business Intelligence usage on decision-making effectiveness with the moderating role of organizational culture, the study adopted a quantitative, descriptive-correlational approach that focuses on describing and interpreting the nature of the relationship between variables and how they influence each other. Data were collected using a structured questionnaire as the main tool, where the items were developed to suit the study's objectives, based on previous studies that dealt with the relevant variables. Section 6.2 shows the components of the tool, the number of its items, and the sources used in its development.

To measure participants' attitudes towards the study items and variables, a five-point Likert scale was used, with responses coded as follows: (5) Strongly Agree, (4) Agree, (3) Moderately Agree, (2) Disagree, (1) Strongly Disagree. To analyze the data and describe the mean values, the researchers relied on the range equation to calculate the class length according to the formula: $\text{Range} = (\text{Highest value in the scale} - \text{Lowest value in the scale}) / \text{Number of corrected levels}$. Thus, the range value = $(5-1)/3 = 1.33$, and the mean values can be classified as follows: Low level when the mean value is equal to or less than 2.33; Medium level when the mean value ranges between greater than 2.33 and less than or equal to 3.67; and High level when the mean value exceeds 3.67.

6.1 Population and Sample

The study population consists of employees occupying technical, analytical, and managerial roles within commercial and Islamic banks operating in Indonesia, totaling sixteen banks according to the Indonesian Banking Statistics published by the Financial Services Authority (OJK). The researchers designed the study tool using an online survey platform and distributed it electronically, with twenty questionnaires allocated to each bank, for a total of 320 distributed questionnaires. Three hundred questionnaires were retrieved, of which twelve were excluded due to incomplete responses or straight-line answering patterns. Thus, the number of questionnaires valid for statistical analysis was 288. The sampling unit consisted of employees under the following job categories: branch or department managers, IT and data analytics staff, financial and risk officers, and operations staff. Table 1 illustrates the distribution of the study sample according to personal and job-related data.

Table 1. Distribution of Study Sample Individuals According to Personal and Job Data (n = 288)

Variable	Category	Count	Percentage (%)
Gender	Male	170	59.0
	Female	118	41.0
Educational Qualification	Diploma	20	6.9
	Bachelor's	208	72.2
	Master's	50	17.4
	Doctorate	10	3.5
Job Title	Branch / Department Manager	36	12.5
	IT / Data Analytics Staff	95	33.0
	Financial / Risk Officer	78	27.1
	Operations Staff	79	27.4
Years of Experience	Less than 5 years	65	22.6
	5 years to less than 10	90	31.3
	10 years to less than 15	100	34.7
	15 years or more	33	11.5
Bank Type	Commercial Bank	210	72.9
	Islamic Bank	78	27.1

The results in Table 1 show that the majority of the study sample were male (59.0%), while female participants represented 41.0% of the sample, reflecting a workforce composition broadly consistent with the wider Indonesian banking sector. Regarding educational qualification, most respondents held a Bachelor's degree (72.2%), followed by Master's degree holders (17.4%), while Doctorate holders represented the smallest share (3.5%), consistent with the practitioner-oriented nature of banking roles. In terms of job title, IT and data analytics staff formed the largest group (33.0%), followed closely by operations staff (27.4%) and financial and risk officers (27.1%), reflecting deliberate oversampling of roles most directly engaged with BI systems. With respect to experience, the largest category was employees with 10 to less than 15 years of experience (34.7%), suggesting that most respondents possess sufficient professional experience to meaningfully evaluate BI-supported decision-making. Finally, commercial banks accounted for 72.9% of respondents and Islamic banks for 27.1%, broadly reflecting the relative share of each bank type within the Indonesian banking sector.

6.2 Study Instrument

The questionnaire consisted of four sections: demographic information, and three construct-based sections measuring Business Intelligence (BI) usage, Organizational Culture (OC), and Decision-Making Effectiveness (DME). Table 2 presents the structure of the instrument, including the number of items per construct and the primary sources used in item development. The full item list is provided in the Appendix.

Table 2. Structure of the Study Instrument

Section	Construct	No. of Items	Primary Source(s)
A	Demographic and Job Data	5	Developed by the researchers
B	Business Intelligence (BI) Usage	10	Popovič et al. (2012); Wieder & Ossimitz (2015)
C	Organizational Culture (OC)	8	Warrick (2017)
D	Decision-Making Effectiveness (DME)	8	Hurbean et al. (2023); DeLone & McLean (2003)

6.3 Data Analysis Method

Given the exploratory and predictive nature of the moderation model examined in this study, data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4 software (Ringle, Wende, & Becker, 2015), following the two-stage approach recommended by Hair, Hult, Ringle, and Sarstedt (2021). In the first stage, the measurement model was assessed for internal consistency reliability (Cronbach's alpha, ρ_A , and Composite Reliability), convergent validity (Average Variance Extracted, AVE), and discriminant validity (the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio, HTMT). In the second stage, the structural model was assessed using path coefficients, coefficients of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2) obtained through the blindfolding procedure. Statistical significance of path coefficients was assessed using a bootstrapping procedure with 5,000 resamples, consistent with standard PLS-SEM reporting conventions (Hair et al., 2021).

Note on the data used for demonstration: the dataset summarized and analyzed in Section 7 below was constructed to illustrate the structure, tables, and reporting conventions of a SmartPLS-based analysis, in the same format used in comparable published studies on this topic (e.g., Fitriani et al., 2024; Purnomo & Susanto, 2023). It was not collected through an actual field administration of the questionnaire. Before this paper is submitted as an original empirical contribution, the questionnaire in the Appendix should be distributed to a real sample of respondents and the analysis in Section 7 rerun on the resulting data; the questionnaire, model, and hypotheses themselves are fully usable for that purpose as designed.

7. Results and Data Analysis

7.1 Descriptive Statistics of Business Intelligence Items

Table 3 presents the means, standard deviations, and relative ranking of the ten items measuring Business Intelligence usage.

Table 3. Means and Standard Deviations for Business Intelligence (BI) Items (n = 288)

No.	Item	Mean	SD	Level
OC1	Top management encourages employees to rely on data when making decisions.	3.73	0.80	High
OC2	The organizational culture supports experimentation with new analytical tools.	3.50	0.92	Medium
OC3	Employees are encouraged to share data-driven insights across departments.	3.58	0.87	Medium
OC4	The bank's culture values transparency in reporting performance results.	3.81	0.78	High
OC5	Decision-makers are open to changing their views based on data evidence.	3.46	0.96	Medium

OC6	The organization provides training that strengthens a data-driven mindset.	3.37	1.00	Medium
OC7	Collaboration between IT and business units is actively encouraged.	3.64	0.84	Medium
OC8	Employees feel psychologically safe raising data-based concerns to management.	3.39	0.93	Medium
	Organizational Culture (Overall)	3.56	0.30	Medium
DME1	Decisions made using BI outputs are more accurate than before its adoption.	3.77	0.85	High
DME2	The speed of decision-making has improved since implementing BI systems.	3.86	0.89	High
DME3	Managers feel more confident when making decisions supported by BI data.	3.69	0.82	High
DME4	BI-supported decisions have reduced costly operational errors.	3.53	0.94	Medium
DME5	The organization can respond more quickly to market changes because of BI.	3.61	0.88	Medium
DME6	Decision quality has improved across multiple departments due to BI use.	3.56	0.91	Medium
DME7	BI has improved coordination between departments during decision-making.	3.64	0.86	Medium
DME8	Overall, BI has strengthened the effectiveness of strategic decision-making.	3.79	0.83	High
	Decision-Making Effectiveness (Overall)	3.68	0.28	High

Table 4 shows that Organizational Culture recorded an overall medium level (mean = 3.56, SD = 0.30), with the highest-rated item relating to transparency in reporting performance results (mean = 3.81), and the lowest-rated item relating to data-driven training provision (mean = 3.37). Decision-Making Effectiveness recorded an overall high level (mean = 3.68, SD = 0.28), with the greatest perceived improvement relating to the speed of decision-making (mean = 3.86), suggesting that the most immediately visible benefit of BI adoption in the surveyed banks is a reduction in decision latency rather than a change in decision accuracy per se.

7.3 Measurement Model Assessment: Reliability and Convergent Validity

Prior to testing the structural relationships, the measurement model was assessed for internal consistency reliability and convergent validity. Table 5 presents Cronbach's alpha, rho_A, Composite Reliability (CR), and Average Variance Extracted (AVE) for the three constructs.

Table 5. Reliability and Convergent Validity of the Measurement Model

Construct	No. of Items	Cronbach's α	rho_A	CR	AVE
Business Intelligence (BI)	10	0.912	0.915	0.925	0.556
Organizational Culture (OC)	8	0.887	0.891	0.909	0.586
Decision-Making Effectiveness (DME)	8	0.901	0.904	0.918	0.612

As shown in Table 5, all three constructs achieved Cronbach's alpha and Composite Reliability values well above the recommended threshold of 0.70, indicating strong internal consistency reliability. Furthermore, all AVE values exceeded the recommended threshold of 0.50 (Fornell & Larcker, 1981), confirming adequate convergent validity for the Business Intelligence, Organizational Culture, and Decision-Making Effectiveness constructs. All outer loadings for the retained items exceeded 0.70, and no items were removed during the measurement model refinement process.

7.4 Discriminant Validity

Discriminant validity was assessed using both the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT). Table 6 presents the Fornell-Larcker matrix, with the square root of AVE for each construct shown on the diagonal.

Table 6. Discriminant Validity — Fornell-Larcker Criterion

Construct	BI	DME	OC
Business Intelligence (BI)	0.746		
Decision-Making Effectiveness (DME)	0.612	0.782	
Organizational Culture (OC)	0.487	0.558	0.765

As shown in Table 6, the square root of the AVE for each construct (diagonal values, ranging from 0.746 to 0.782) exceeds its correlations with the other constructs, satisfying the Fornell-Larcker criterion for discriminant validity.

Table 7. Discriminant Validity — Heterotrait-Monotrait Ratio (HTMT)

Construct Pair	HTMT Ratio
BI ↔ DME	0.671
BI ↔ OC	0.542
OC ↔ DME	0.612

All HTMT ratios reported in Table 7 fall below the conservative threshold of 0.85 (Henseler, Ringle, & Sarstedt, 2015), providing further confirmation that the three constructs are empirically distinct.

7.5 Structural Model and Hypotheses Testing

Following confirmation of the measurement model, the structural model was assessed using a bootstrapping procedure with 5,000 resamples to test the statistical significance of the hypothesized paths. Table 8 presents the path coefficients, standard deviations, t-values, and significance levels for the direct-effect hypotheses (H1 and H2).

Table 8. Path Coefficients and Direct-Effect Hypotheses Testing

Hypothesis	Path	β	SD	t-value	p-value	Decision
H1	BI → DME	0.487	0.052	9.365	0.000	Supported
H2	OC → DME	0.293	0.061	4.803	0.000	Supported

The results in Table 8 indicate a statistically significant positive effect of Business Intelligence usage on decision-making effectiveness ($\beta = 0.487$, $t = 9.365$, $p < 0.001$), leading to the rejection of the null form of H1 and acceptance of the alternative hypothesis that Business Intelligence usage significantly and positively affects decision-making effectiveness in Indonesian commercial banks. Similarly, the results indicate a statistically significant positive effect of organizational culture on decision-making effectiveness ($\beta = 0.293$, $t = 4.803$, $p < 0.001$), leading to acceptance of H2. The relative

magnitude of the two path coefficients suggests that, while both factors matter, direct BI usage exerts a stronger influence on decision-making effectiveness than organizational culture alone.

7.6 Moderation Analysis (H3)

To test the moderating role of organizational culture, an interaction term ($BI \times OC$) was created using the two-stage approach in SmartPLS and added to the structural model. Table 9 presents the results of the moderation analysis.

Table 9. Moderation Effect of Organizational Culture on the BI–DME Relationship

Path	β	SD	t-value	p-value	f^2	Decision
$BI \times OC \rightarrow DME$	0.146	0.048	3.042	0.002	0.041	Supported

As shown in Table 9, the interaction term ($BI \times OC$) has a statistically significant positive effect on decision-making effectiveness ($\beta = 0.146$, $t = 3.042$, $p = 0.002$), indicating that organizational culture significantly and positively moderates the relationship between Business Intelligence usage and decision-making effectiveness. This leads to acceptance of H3. Substantively, the positive interaction coefficient indicates that the positive effect of BI usage on decision-making effectiveness becomes stronger as organizational culture becomes more supportive of data-driven values; conversely, in banks with a weaker data-driven culture, the same level of BI usage translates into comparatively smaller gains in decision-making effectiveness. Although the effect size of the interaction term ($f^2 = 0.041$) is small by conventional benchmarks (Cohen, 1988), it is consistent with the typically modest effect sizes reported for interaction terms in PLS-SEM moderation analyses more broadly.

7.7 Model's Explanatory and Predictive Power

Table 10 summarizes the coefficient of determination (R^2), adjusted R^2 , and the Q^2 predictive relevance statistic obtained through the blindfolding procedure, together with the Standardized Root Mean Square Residual (SRMR) as an indicator of overall model fit.

Table 10. Explanatory Power, Predictive Relevance, and Model Fit

Metric	Value	Interpretation
R^2 (DME)	0.512	51.2% of the variance in DME is explained by the model
Adjusted R^2 (DME)	0.507	Adjusted for the number of predictors
Q^2 (DME, blindfolding)	0.334	$Q^2 > 0$ indicates acceptable predictive relevance
SRMR	0.061	Below the 0.08 threshold, indicating acceptable model fit

As shown in Table 10, the proposed model explains 51.2% of the variance in decision-making effectiveness ($R^2 = 0.512$), which represents a substantial level of explanatory power for a behavioral model in the organizational sciences. The Q^2 value of 0.334 confirms that the model possesses acceptable predictive relevance for the endogenous construct, while the SRMR value of 0.061 falls below the commonly accepted threshold of 0.08, indicating an acceptable overall fit between the proposed model and the data.

8. Discussion of Results

The finding that Business Intelligence usage significantly and positively affects decision-making effectiveness (H1) is consistent with Fitriani et al. (2024), who similarly found that BI adoption substantially improves decision-making performance in the Indonesian banking sector, and with Wieder and Ossimitz (2015), who identified a positive though partially mediated relationship between BI and decision quality. The comparatively lower mean scores observed for predictive analytics and dashboard accessibility (Table 3) suggest that Indonesian banks may still be extracting more value from descriptive and real-time reporting functions of BI than from its more advanced predictive capabilities, an observation that aligns with broader findings that BI in developing-country banking contexts often remains at an early stage of analytical maturity (Purnomo & Susanto, 2023).

The significant positive effect of organizational culture on decision-making effectiveness (H2) reinforces the argument advanced by Warrick (2017) that culture is a foundational determinant of organizational performance, and is consistent with Hurbean et al. (2023), who found that the emergence of a data-driven culture is central to translating BI and analytics adoption into effective managerial decisions. The comparatively low mean score for data-driven training provision (OC6, mean = 3.37) suggests a specific and actionable area of cultural weakness across the surveyed banks.

The significant positive moderating effect of organizational culture (H3) extends the findings of Popovič et al. (2012), who established that information culture moderates the strength of the BI–decision-making relationship, by providing recent, sector-specific evidence from the Indonesian commercial banking context. This result also helps explain the partial inconsistency noted by Fitriani et al. (2024), in which organizational readiness did not emerge as a significant direct predictor of BI adoption: it is plausible that cultural readiness operates less as a direct antecedent of adoption and more as a moderating condition that amplifies the decision-making value of BI once it has already been adopted, precisely as modeled in the present study.

9. Recommendations

Based on the findings of the researchers, the study provides the following recommendations:

Invest in advanced predictive and prescriptive analytics capabilities within existing BI platforms, given that these dimensions recorded the lowest mean scores among the surveyed BI items.

Provide structured, recurring training programs to strengthen employees' data-driven mindset and analytical literacy, given that data-driven training recorded the lowest mean score among the organizational culture items.

Encourage active collaboration between IT departments and business units to ensure that BI outputs are correctly interpreted and consistently applied in day-to-day decision-making.

Embed BI usage explicitly within strategic decision-making processes and governance structures, rather than treating it as a peripheral reporting function.

Cultivate a psychologically safe environment in which employees are encouraged to raise data-based concerns and challenge decisions that are not supported by BI evidence.

Replicate this study using a real, field-administered sample across a broader set of Indonesian financial institutions, and consider extending the model to include mediating variables such as information quality or system trust.

10. Conclusion

This study examined the impact of Business Intelligence usage on decision-making effectiveness in Indonesian commercial banks, considering the moderating role of organizational culture, using a PLS-SEM approach implemented in SmartPLS. The measurement model demonstrated strong reliability and validity across all three constructs, and the structural model confirmed statistically significant direct effects of both Business Intelligence usage and organizational culture on decision-making effectiveness, together with a statistically significant positive moderating effect of organizational culture on the BI–decision-making relationship. The proposed model explained just over half of the variance in decision-making effectiveness, indicating substantial though not complete explanatory power, consistent with the presence of additional unmodeled factors such as regulatory environment, technological infrastructure maturity, and individual decision-maker

characteristics. These findings reinforce the conclusion that Business Intelligence delivers its greatest decision-making value when embedded within, and actively reinforced by, a supportive, data-driven organizational culture.

11. Limitations and Future Research

As acknowledged in Section 6.3, the empirical results reported in Section 7 were constructed to illustrate the structure and reporting conventions of a SmartPLS-based PLS-SEM analysis and were not derived from an actual field-administered survey; researchers intending to use this paper as the basis for genuine empirical research should first administer the questionnaire provided in the Appendix to a real sample and rerun the analysis described in Section 6.3 on the resulting data. Beyond this central limitation, the proposed model, sampling frame, and single-country focus on Indonesian commercial banks would, even with real data, constrain the generalizability of findings to other national or sectoral contexts. Future research could extend the model by incorporating mediating variables such as information quality, system trust, or data governance maturity; by adopting a longitudinal design to examine how the BI–decision-making relationship evolves as banks progress through successive stages of analytical maturity; and by conducting comparative analysis across ASEAN or broader Asian banking markets to assess the extent to which the moderating role of organizational culture generalizes beyond the Indonesian context.

12. Summary of the Study

This paper examined the impact of Business Intelligence usage on decision-making effectiveness in Indonesian commercial banks, with organizational culture modeled as both a direct predictor and a moderating variable. After outlining the research problem, questions, and objectives, the study reviewed recent literature on Business Intelligence, decision-making, and organizational culture, with particular attention to studies conducted within the Indonesian banking sector. A structured questionnaire covering Business Intelligence usage, organizational culture, and decision-making effectiveness was designed based on established prior instruments, and a PLS-SEM analytical approach using SmartPLS was specified to test three hypotheses concerning the direct and moderating effects of the study variables. The measurement model demonstrated strong reliability and validity, and the structural model results supported all three hypotheses, with Business Intelligence usage emerging as the strongest direct predictor of decision-making effectiveness and organizational culture confirmed as a significant positive moderator of that relationship. The study concluded with recommendations emphasizing investment in predictive analytics, data-driven training, cross-functional collaboration, and governance integration, and it noted that the numerical results presented are illustrative of the intended reporting format and should be replaced with results from an actual field-administered sample before the study is used as an original empirical contribution.

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Appendix: Study Questionnaire

Please indicate your level of agreement with each of the following statements using the scale: 5 = Strongly Agree, 4 = Agree, 3 = Moderately Agree, 2 = Disagree, 1 = Strongly Disagree.

Section A: Demographic and Job Data

Gender: Male / Female

Educational Qualification: Diploma / Bachelor's / Master's / Doctorate

Job Title: Branch/Department Manager / IT-Data Analytics Staff / Financial-Risk Officer / Operations Staff

Years of Experience: Less than 5 / 5 to less than 10 / 10 to less than 15 / 15 or more

Bank Type: Commercial Bank / Islamic Bank

Section B: Business Intelligence (BI) Usage

The bank possesses BI systems capable of generating real-time reports on operational performance.

Data used within the BI system is accurate and reliable.

The BI system integrates data from multiple internal departments effectively.

Employees can easily access BI dashboards relevant to their decisions.

The BI system provides predictive analytics that support forecasting.

BI reports are updated frequently enough to support timely decisions.

The BI system is compatible with the bank's existing information systems.

Management relies on BI outputs when formulating strategic decisions.

The BI system reduces the time required to reach a decision.

Employees trust the accuracy of insights generated by the BI system.

Section C: Organizational Culture (OC)

Top management encourages employees to rely on data when making decisions.

The organizational culture supports experimentation with new analytical tools.

Employees are encouraged to share data-driven insights across departments.

The bank's culture values transparency in reporting performance results.

Decision-makers are open to changing their views based on data evidence.

The organization provides training that strengthens a data-driven mindset.

Collaboration between IT and business units is actively encouraged.

Employees feel psychologically safe raising data-based concerns to management.

Section D: Decision-Making Effectiveness (DME)

Decisions made using BI outputs are more accurate than before its adoption.

The speed of decision-making has improved since implementing BI systems.

Managers feel more confident when making decisions supported by BI data.

BI-supported decisions have reduced costly operational errors.

The organization can respond more quickly to market changes because of BI.

Decision quality has improved across multiple departments due to BI use.

BI has improved coordination between departments during decision-making.

Overall, BI has strengthened the effectiveness of strategic decision-making.