



Implementation of Analytical Hierarchy Process in Determining Customer Relationship Management Features in Regional Syariah Banks

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Abstract

Background: Limited resources and the increasing complexity of service needs pose significant challenges for regional Islamic banks in prioritizing Customer Relationship Management (CRM) system features. PT Bank NTB *Syariah* faces fragmented customer data management, limited customer behavior analysis, and ongoing regulatory and security compliance demands, necessitating a structured decision-making approach.

Objective: This study aims to determine CRM system feature priorities quantitatively and objectively using the Analytical Hierarchy Process (AHP) method.

Method: The study employed AHP involving five internal expert panelists representing information technology, business, compliance, and service quality functions. Four evaluation criteria were established: (1) business performance improvement, (2) customer relationship management, (3) customer data and information management, and (4) compliance and security. Pairwise comparisons determined criteria and alternative priorities, with consistency ratios calculated to ensure reliability.

Result: The AHP analysis revealed that customer data and information management received the highest weight among the evaluation criteria, highlighting the strategic importance of data in Islamic banking digital transformation. At the alternative level, the Customer 360° View feature obtained the highest priority weight (0.2586), followed by *Omnichannel* Interaction & Complaint Management (0.2307), and AI *Chatbot* & Digital Assistant (0.1080). All pairwise comparison matrices achieved a Consistency Ratio (CR) value of ≤ 0.10 , confirming consistent and reliable judgments.

Conclusion: This study provides a structured multi-criteria decision-making framework based on AHP for prioritizing CRM feature implementation in regional Islamic banks. The findings support measurable and strategic resource allocation while enhancing service quality and accelerating digital transformation efforts.

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INTRODUCTION

Digital transformation has become a key strategic agenda in the banking industry, as customer expectations for fast, integrated, and data-driven services increase (Modiha, 2024; Paramitha & Fasa, 2025; Wiles, 2019). For regional banks, this transformation process faces even more complex challenges due to limited resources, fragmented information systems, and high demands for regulatory compliance and customer data protection (Munira, 2025; Rizvi et al.,

2020; Wang et al., 2024). These conditions require banks to not only adopt technology but also prioritize system implementation rationally and based on needs.

Empirically, PT Bank NTB Syariah has demonstrated significant growth in assets and customer numbers in recent years. However, this increase has not been fully matched by optimization of service quality and utilization of customer data (Qin et al., 2026; Yang et al., 2024). Customer data remains scattered across several operational systems that operate separately, making it difficult for the bank to obtain a comprehensive view of customer profiles and behavior. This fragmentation has resulted in limited service personalization, inconsistent handling of cross-channel interactions, and limited analytical support for business decision-making (Habsari et al., 2022; Heryana et al., 2020).

Customer Relationship Management (CRM) systems are seen as a strategic solution to address these issues because they integrate customer data, manage cross-channel interactions, and provide data-driven analytics (Baashar et al., 2020; Gil-Gomez et al., 2020; Guerola-Navarro et al., 2021). However, CRM systems comprise various features with varying levels of complexity, implementation costs, and business impact (Khalaf Hamoud et al., 2020; Suoniemi et al., 2022). In regional banks with limited budgets and system development capacity, implementing all CRM features simultaneously can potentially lead to inefficiencies if not based on clear priorities (Semwayo, 2024).

A literature review shows that most CRM research in the banking sector still focuses on the impact of CRM on customer satisfaction or loyalty, or discusses CRM implementation conceptually. Research specifically examining the prioritization of CRM system features using a multi-criteria decision-making approach, particularly in the context of regional banks, is still limited (Alojaiman, 2023; Taherdoost & Madanchian, 2023). Furthermore, previous research generally has not simultaneously integrated aspects of business performance, customer relationship management, customer data management, and compliance and security within a single, structured evaluation framework.

Compared to existing studies, several gaps become apparent. While previous research has examined CRM adoption success factors or post-implementation outcomes, few studies have addressed the pre-implementation phase, where organizations must prioritize features under resource constraints. Empirical studies by Sultana (2024) emphasized customer-centric outcomes but provided limited guidance on feature selection methodologies. Similarly, AHP applications in banking have predominantly focused on vendor selection or performance evaluation rather than feature prioritization.

What remains unaddressed is how regional banks with limited IT infrastructure and specialized Islamic banking requirements can systematically determine which CRM features deliver the highest strategic value while maintaining regulatory compliance. Based on these gaps, this study proposes the use of the Analytical Hierarchy Process (AHP) method as a Multi-Criteria Decision-Making (MCDM) approach to determine the priority of CRM system features at PT Bank NTB *Syariah*. The novelty of this study lies in the development of a CRM system feature prioritization model that simultaneously considers aspects of business performance, customer relationship management, customer data and information management, and compliance and security in the context of regional banks.

This study is expected to provide practical contributions in the form of a basis for making measurable CRM implementation decisions, as well as academic contributions in enriching the study of multi-criteria decision-making in the banking information system domain. This study addresses these gaps by applying the Analytical Hierarchy Process to systematically prioritize CRM features for PT Bank NTB *Syariah*, integrating four critical criteria: business performance, customer relationship management, data management, and compliance. The research contributes a validated decision-making framework for regional Islamic banks to optimize resource allocation in digital transformation initiatives.

METHOD

This study uses a quantitative approach with the Analytical Hierarchy Process (AHP) method as a multi-criteria decision-making framework. The quantitative approach was chosen to produce measurable and objective weighting and priority of Customer Relationship Management (CRM) System features based on expert assessments. The AHP method was used because it is able to accommodate the complexity of decisions involving various criteria and alternatives, and provides a mechanism for testing the consistency of assessments through the Consistency Ratio.

Research data were obtained through a pairwise comparison questionnaire structured based on a decision hierarchy structure consisting of research objectives, criteria, sub-criteria, and alternative CRM System features. This questionnaire was filled out by a panel of internal experts at PT Bank NTB Syariah who have competence and experience in the fields of information technology, business, customer service, and compliance. The selection of the expert panel was carried out purposively to ensure that the assessments provided reflect the operational and strategic needs of the organization.

Respondents' assessments were processed using the geometric mean aggregation method to obtain representative values from the entire expert panel. Priority weights for each criterion, sub-criteria, and alternative CRM System features were then calculated. Furthermore, consistency testing was performed on each pairwise comparison matrix to ensure the reliability of the analysis results. The final result of the study was a priority ranking of CRM System features that can be used as a basis for making decisions about system implementation in stages and based on data.

The subjects of this study were a panel of internal experts directly involved in the planning, management, and utilization of information systems and customer services at PT Bank NTB Syariah. The panel of experts was selected as respondents because this study aimed to determine the priority of Customer Relationship Management (CRM) System features at the strategic decision-making level, which requires experience-based assessment and organizational understanding.

The expert panel was selected purposively, taking into account competency, work experience, and direct involvement in business processes and information systems. The expert panel consisted of five respondents representing key organizational functions, including information technology, systems development, business, service quality, and compliance and data management. This cross-functional representation was intended to ensure that the assessment provided balanced technical, operational, and managerial perspectives.

The number of expert panels in this study was adjusted to the principles of the Analytical Hierarchy Process (AHP) method, which emphasizes the quality and consistency of assessments over a large number of respondents. The use of a limited but competent expert panel is considered sufficient to produce valid priority weights, as long as the level of assessment consistency meets the established threshold (Consistency Ratio ≤ 0.10). Thus, the expert panel assessments in this study can reliably represent organizational needs and be used as a basis for determining the implementation priorities of CRM System features.

Developing a decision hierarchy structure is the initial and crucial step in implementing the Analytical Hierarchy Process (AHP) method because it determines the evaluation framework used in the decision-making process. In this study, a hierarchical structure was developed to map the problem of prioritizing Customer Relationship Management (CRM) System features into systematically organized decision elements.

The decision hierarchy structure consists of three main levels. The first level represents the research objective, which is to prioritize CRM system features that best meet the organization's needs. The second level includes evaluation criteria representing the main factors in selecting CRM system features, while the third level consists of alternative CRM system features that will be evaluated and ranked. The determination of criteria and alternatives is carried out through a synthesis of literature reviews, analysis of organizational problems, and discussions with an internal panel of experts to ensure relevance and applicability within the research context.

The criteria used in the hierarchical structure are designed to reflect the strategic and operational dimensions of the organization, including aspects of business performance, customer relationship management, customer data and information management, and compliance and security. Each criterion is further broken down into more specific sub-criteria to facilitate the

pairwise comparison process and increase the accuracy of the assessment. Alternative CRM system features are determined based on features commonly used in the banking industry and relevant to the organization's needs.

The hierarchical decision structure that has been developed is then used as the basis for developing the paired comparison questionnaire and the AHP analysis process. The clear and structured hierarchy allows the evaluation process to be carried out consistently, transparently, and methodologically accountable.

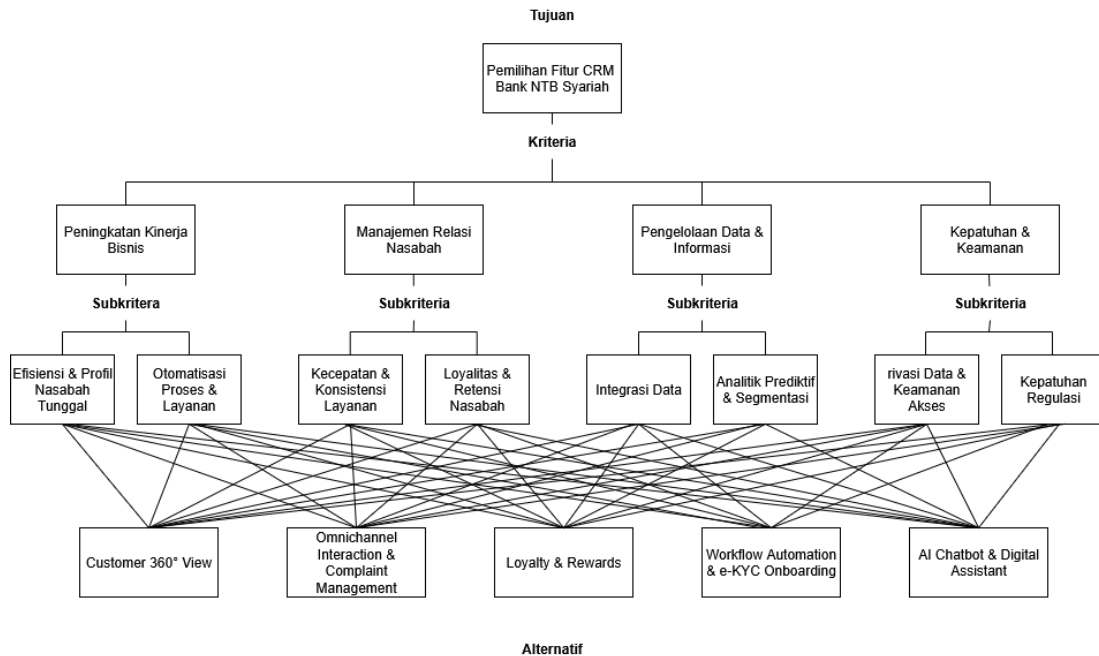


Figure 1. AHP Decision Hierarchy

The research instrument used in this study is a pairwise comparison questionnaire compiled based on the decision hierarchy structure of the Analytical Hierarchy Process (AHP) method. The questionnaire is designed to obtain an expert panel's assessment of the relative importance levels between elements in each hierarchical level, including comparisons between criteria, between subcriteria, and between alternative Customer Relationship Management (CRM) System features. The questionnaire is compiled based on the fundamental comparison scale of AHP developed by Saaty, with a value range of 1 to 9 to represent the relative importance levels between elements.

Each question in the questionnaire was structured systematically, requiring respondents to compare only two elements at a time, minimizing cognitive load and increasing consistency of assessment. A brief explanation of the definition of each criterion, subcriteria, and alternative was included in the questionnaire to ensure uniformity of respondent understanding.

Table 1. AHP Questionnaire

Left Criteria	Rating Scale	Right Criteria
K1. Improving Business Perform.	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	K2. Customer Relationship Management
K1. Improving Business Perform.	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	K3. Customer Data & Information Management
K1. Improving Business Perform.	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	K4. Compliance & Security
K2. Customer Relationship Management	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	K3. Customer Data & Information Management
K2. Customer Relationship Management	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	K 4. Compliance & Security
K 3. Customer Data & Information Management	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	K 4. Compliance & Security

Before the questionnaire was distributed to the expert panel, conceptual validation was conducted through an internal review to ensure clarity of wording, relevance of the elements being compared, and suitability for the research objectives. The questionnaire was then distributed to the expert panel in a targeted manner, and the results were collected for further processing using the geometric mean aggregation method. This approach was used to combine individual assessments into a single representative value that reflects the expert panel's consensus, prior to calculating priority weights and testing consistency in the AHP analysis stage.

Data analysis was conducted using the Analytical Hierarchy Process (AHP) method based on the results of the paired comparison questionnaire that had been collected. Data from the expert panel was compiled into a paired comparison matrix. All AHP calculations, including pairwise comparison matrix construction, eigenvector determination, priority weight computation, and consistency ratio testing, were performed using Microsoft Excel 2019 with custom formulas based on Saaty's AHP methodology. The spreadsheet-based approach provided transparency in computational procedures and enabled systematic validation of consistency across all expert assessments.

Table 2. Pairwise Comparison Matrix of Criteria – Respondent 1

Criteria	K1	K2	K3	K4
K1. Improving Business Performance	1.00	0.33	0.20	0.20
K2. Customer Relationship Management	3.00	1.00	0.33	1.00
K3. Customer Data & Information Manag	5.00	3.00	1.00	1.00
K4. Compliance & Security	5.00	1.00	1.00	1.00
Amount	14.00	5.33	2.53	3.20

Next, priority weights were calculated through a normalization process of the pairwise comparison matrix. These weights represent the relative importance of each criterion, subcriteria, and alternative in the Decision structure.

Table 3. Criteria Weight – Respondent 1

Criteria	Row Value	Total Rows (Vector Priority)	Criteria Weight (Priority)
K1	0.0714 + 0.0625 + 0.0789 + 0.06	0.275	0.069
K2	0.2143 + 0.1875 + 0.1316 + 0.31	0.846	0.211
K3	0.3571 + 0.5625 + 0.3947 + 0.31	1,627	0.407
K4	0.3571 + 0.1875 + 0.3947 + 0.31	1,252	0.313

Next, the eigenvalue calculation was carried out, the λ value for each criterion was obtained by dividing the value of the relative weight vector by the weight of the corresponding criterion. The eigen values were used in testing the consistency of the criteria matrix.

Table 4. Eigen value – Respondent 1

Criteria	λ Max	Results
K1	4,1147	4,1158
K2	4,0978	
K3	4,1756	
K4	4,0751	

The Consistency Index was used to measure the absolute level of inconsistency in a comparison matrix.

Table 5. Consistency Index – Respondent 1

Consistency Index	Results (CI)
$(4.1158 - 4) / (4 - 1)$	$0.1158 / 3$ 0.0386

The consistency of the assessment is tested by calculating the Consistency Ratio (CR) value, and the analysis results are declared valid if $CR \leq 0.10$.

Table 6. Consistency Ratio – Respondent 1

Consistency Index	Results (CR)
0.0386/0.9	0.0429 Consistent

Alternative global weights were obtained by multiplying the local weights at each level of the hierarchy, which are then used to compile a final ranking of Customer Relationship Management (CRM) System features. The final result of the analysis is a priority order of CRM System features that forms the basis for system implementation recommendations.

RESULTS AND DISCUSSION

Results

Weight of Criteria and Subcriteria

The results of the Analytical Hierarchy Process (AHP) analysis show a clear difference in importance between criteria in prioritizing Customer Relationship Management (CRM) System features. This difference in weighting reflects the organization's strategic focus on the issues deemed most pressing to be resolved through CRM implementation (Cricelli et al., 2020).

Table 7. Criteria Weighting Results

Rank	Criteria	Mark
1	K 3. Customer Data & Information Management	0.3190
2	K 4. Compliance & Security	0.2824
3	K2. Customer Relationship Management	0.2456
4	K1. Improving Business Performance	0.1530

The customer data and information management criterion received the highest weighting and ranked first compared to other criteria. This finding indicates that CRM's ability to integrate, manage, and provide accurate customer data is seen as a key foundation for digital transformation. This assessment aligns with the empirical conditions of organizations, where customer data is still scattered across various systems and has not been fully utilized to support decision-making and service personalization (Rafiki, 2019). Therefore, strengthening data capabilities is considered a prerequisite for optimal service improvement and business performance.

The customer relationship management and business performance improvement criteria ranked next with lower weights. This indicates that improving interaction quality and achieving business performance remain important goals, but their effectiveness is highly dependent on the availability of integrated and analytical customer data. Meanwhile, compliance and security criteria received relatively stable weights, reflecting that these aspects are viewed as mandatory requirements that must be met, but not as key differentiating factors in determining CRM feature priority.

Table 8. Sub-Criteria Weight Results

Rank	Subcriteria	Mark
1	K3.2 Predictive Analytics & Segmentation	0.2017
2	K2.2 Customer Loyalty & Retention	0.1866
3	K4.2 Regulatory Compliance	0.1484
4	K4.1 Data Privacy & Access Security	0.1340
5	K3.1 Data Integration	0.1173
6	K1.1 Process Efficiency & Single Customer Profile	0.1172
7	K2.1 Speed & Consistency of Service	0.0590
8	K1.2 Process & Service Automation	0.0358

At the sub-criteria level, the global weighting results presented in Table 9 indicate that sub-criteria related to customer data analytics and customer segmentation make the largest contribution to the overall decision structure. The dominance of these sub-criteria confirms that the organization prioritizes the CRM System's ability to generate data-driven insights to understand customer behavior, identify business opportunities, and support the design of more targeted services.

Other sub-criteria related to service process efficiency and interaction management serve as supporting factors, but are not the primary drivers in determining priorities. Overall, the weighting results for the criteria and sub-criteria indicate that CRM system implementation is more focused on strengthening data management capabilities as a basis for improving service quality and organizational performance. This finding provides strong analytical justification for the CRM feature priorities generated during the alternative evaluation phase and strengthens the consistency between the research problem and the analysis results.

CRM Feature Alternative Priorities

The results of the global weight synthesis show clear differences in priority between alternative Customer Relationship Management (CRM) System features. These differences reflect the extent to which each feature is able to meet the organization's needs based on the established criteria and sub-criteria.

Table 9. Criteria Weighting Results

Rank	Alternative	Mark
1	A1 = Customer 360° View	0.2586
2	A2 = Omnichannel Interaction & Complaint Manage	0.2307
3	A5 = AI Chatbot & Digital Assistant	0.2235
4	A4 = Workflow Automation & e-KYC Onboarding	0.1785
5	A3 = Loyalty & Rewards	0.1086

The Customer 360° View feature ranks first with the highest weighting. This feature's dominance indicates that the CRM System's ability to provide a comprehensive and integrated view of customer profiles is seen as the most strategic need. This feature enables the consolidation of customer data from various systems, thus supporting behavioral analysis, segmentation, and data-driven decision-making. The high weighting of Customer 360° View is consistent with the results of the previous criteria weighting, where customer data and information management was the most dominant factor.

The Omnichannel Interaction & Complaint Management feature ranked second. These results indicate that consistent and effective management of cross-channel customer interactions is considered important, particularly in improving service quality and customer experience. However, its weighting is lower than that of Customer 360° View, indicating that optimizing customer interactions is considered more effective if supported by adequate data integration and quality.

AI Chatbot & Digital Assistant features ranked next with a relatively lower weighting. This finding indicates that AI-based features are viewed as service enablers, but have not been prioritized compared to strengthening data foundations and system integration. This suggests that adopting advanced technologies like AI will yield optimal benefits only if organizations have robust data and process readiness.

Overall, the results of the alternative rankings indicate that the priority of CRM System implementation is more directed at strengthening core capabilities, namely data integration and customer information management, before adopting advanced features that are automation and service innovation.

Discussion

This study aims to determine the priority of Customer Relationship Management (CRM) system features objectively and measurably using the Analytical Hierarchy Process (AHP) method. The analysis results indicate that the main problem in CRM implementation lies not in feature availability, but rather in determining the order of implementation priorities that aligns with the needs and level of organizational readiness.

At the criteria level, customer data and information management emerged as the most dominant factor, with analytics and customer segmentation as the top priorities. These findings confirm that CRM success depends heavily on an organization's ability to comprehensively integrate, manage, and utilize customer data. Thus, CRM is understood not merely as an interaction support system, but as a foundation for data-driven decision-making.

The consistency of these findings is reflected in the evaluation results of alternative CRM features. Customer 360° View ranked first with the highest weighting (0.2586), indicating that a single customer view is perceived as the primary foundation of CRM. This feature enables the consolidation of customer data across systems and is a prerequisite for analytics, service personalization, and cross-channel integration. This position indicates that the organization prioritizes addressing structural issues related to data fragmentation before developing other CRM features.

The Omnichannel Interaction & Complaint Management alternative ranked second (0.2307), indicating that improving the consistency and quality of cross-channel customer interactions is a critical need after establishing a data foundation. These results confirm that omnichannel effectiveness relies heavily on customer data integration, thus positioning this feature as a further step in strengthening the Customer 360° View.

Furthermore, AI Chatbot & Digital Assistant ranked third (0.2235). This position indicates that AI-based technology is seen as a supporter of service efficiency and responsiveness, the optimal benefits of which can only be achieved if an organization already has historical data and a mature core CRM system. Thus, AI is positioned as a service accelerator in the intermediate stages of CRM implementation, rather than as an initial priority.

The Workflow Automation & e-KYC Onboarding alternative ranked fourth (0.1785), reflecting its role in improving the efficiency and consistency of internal operational processes. While its weighting is lower than that of other alternatives, this feature remains relevant as a bolster for CRM operational stability, particularly in supporting the ongoing increase in customer interaction volume.

The Loyalty & Rewards alternative ranked last with the lowest weight (0.1086). This weighting does not indicate the low strategic value of this feature but rather emphasizes that the effectiveness of a loyalty program is highly dependent on CRM maturity, particularly customer analytics and segmentation capabilities. Therefore, this feature is understood as a long-term initiative optimally implemented after a strong CRM foundation is established.

Overall, the results of this study indicate that CRM feature priorities should be determined based on the organization's readiness, not solely on technology trends or feature completeness. The resulting priority order—starting with strengthening the data foundation, followed by optimizing interactions, technology-based efficiency, and enhancing customer value—provides strategic guidance for a phased, measurable, and low-risk CRM implementation. Thus, this study provides practical and methodological contributions in supporting CRM implementation decisions that align with organizational needs and resource constraints.

This study has several limitations. Prioritization of Customer Relationship Management (CRM) system features was based on the assessment of an internal expert panel, so the results represent the organization's perspective and do not yet encompass the end-user perspective. Furthermore, the Analytical Hierarchy Process (AHP) method relies on subjective assessments of respondents, although the consistency level has met the established threshold. This study is also limited to a single case study, so generalization of the results requires contextualization. Technical aspects of implementation, such as cost estimation, system integration complexity, and infrastructure readiness, are not discussed in this study.

The results of this study provide clear managerial implications for planning the implementation of a Customer Relationship Management (CRM) system. The highest priority given to the Customer 360° View feature suggests that management should focus the initial stages of CRM implementation on customer data integration and consolidation as the system's core foundation. This approach allows organizations to build analytical capabilities and data-driven decision-making before developing other CRM features.

The high ranking of Omnichannel Interaction & Complaint Management features indicates the importance of improving the consistency and quality of customer interactions across channels, the implementation of which needs to be aligned with the readiness of integrated data. Meanwhile, the position of AI Chatbot & Digital Assistant as a medium priority indicates that the adoption of AI-based technologies should be carried out gradually after the core CRM system has matured. Workflow Automation & e-KYC Onboarding and Loyalty & Rewards features are positioned as follow-up initiatives that support operational efficiency and customer retention after the CRM foundation is established.

Overall, the results of this study can be used by management as a basis for preparing a CRM implementation roadmap that is gradual, measurable, and aligned with organizational readiness, so that resource allocation and technology investment can be carried out more effectively.

CONCLUSION

This study successfully prioritized Customer Relationship Management (CRM) System features objectively and measurably using the Analytical Hierarchy Process (AHP) method. The analysis showed that customer data and information management was the most dominant criterion in CRM feature selection, underscoring the importance of data integration and utilization as the foundation of an organization's digital transformation.

At the alternative level, the Customer 360° View feature occupies the highest priority, followed by Omnichannel Interaction & Complaint Management, AI Chatbot & Digital Assistant, Workflow Automation & e-KYC Onboarding, and Loyalty & Rewards. This sequence indicates that effective CRM implementation needs to be carried out in stages, starting with strengthening the data foundation, then improving the quality of interactions and service efficiency, until strengthening customer value and retention. Thus, this study provides a systematic and applicable decision-making framework for organizations in setting priorities and a strategic roadmap for CRM implementation.

Future research could expand this study by incorporating external perspectives, such as customers or business partners, to gain a more comprehensive understanding of CRM feature prioritization. Furthermore, the use of other Multi-Criteria Decision Making (MCDM) methods or hybrid approaches, such as AHP-TOPSIS or AHP-Fuzzy, could be considered to accommodate the uncertainty and dynamics of decision-makers' preferences. Further research could also incorporate implementation aspects, such as cost analysis, infrastructure readiness, and post-implementation performance impacts of CRM, to strengthen the practical relevance and empirical validity of the research findings.

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AUTHOR CONTRIBUTION STATEMENT

Nurul Muslimah conceptualized the research framework, developed the decision hierarchy structure, designed the AHP research instrument, conducted data analysis using the Analytical Hierarchy Process methodology, and drafted the original manuscript. She was also responsible for interpreting the results and formulating the discussion and conclusions.

Muhammad Saiful Hakim contributed to the research design validation, supervised the methodological implementation, reviewed the consistency analysis procedures, and provided

critical revisions to strengthen the theoretical foundation and discussion. He also ensured the academic rigor, coherence, and alignment of the manuscript with journal standards. Both authors collaboratively reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work, ensuring the accuracy and integrity of the research.

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