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An Integrated G2M and RADERIA Model for Improved Leasing Customer Selection

Rakhmat Dedi Gunawan[1*], Junhai Wang[2]

[1]Faculty Engineering and Computer Science, Universitas Teknokrat Indonesia, Bandar Lampung, Indonesia
[2]Department of Digital Business, Zhejiang Technical Institute of Economics, Zhejiang, China

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ABSTRACT

This research is motivated by the problem of high credit risk in leasing companies, which is caused by the process of selecting prospective customers that tends to be subjective, inconsistent, and reliant on a single indicator, making it less able to comprehensively reflect customer eligibility. This study aims to develop a model for selecting prospective leasing customers that is objective and systematic through the integration of the Grey Geometric Mean (G2M) method as a criteria weighting tool and the Ranking of Alternatives through Functional Mapping of Criterion Sub-Intervals into a Single Interval (RAFSI) method as a ranking technique. Assessment data were obtained from a number of customer candidates based on financial and non-financial criteria relevant to credit risk. The criteria weights were determined objectively using G2M, and then used in the evaluation and ranking process of alternatives with RAFSI based on the ideal and anti-ideal concepts. The results of the study showed that Customer Candidate 11 ranked first with a preference value of 0.74557, followed by Customer Candidate 5 in second place with a value of 0.65177, and Customer Candidate 14 in third place with a value of 0.62825. These findings demonstrate that the proposed model is capable of producing clear, consistent, and easily interpretable rankings, making it effective as a decision support system in the selection of leasing customer candidates and contributing to the reduction of credit risk.

I. Introduction

Accurate selection of prospective leasing customers is a crucial aspect in maintaining the quality of the company's financing portfolio[1], [2]. This process serves as the starting point in controlling credit risk that can affect the financial stability of the leasing company. Mistakes in assessing the eligibility of prospective customers can potentially lead to problematic loans that impact cash flow and profitability levels. In the long term, the accumulation of uncontrolled credit risks can disrupt the continuity of the company's

*Corresponding Author: rakhmatdedig@teknokrat.ac.id (Rakhmat Dedi Gunawan)
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operations. In addition, the increasingly intense competition in the leasing industry requires companies to focus not only on increasing the amount of financing but also on the quality of the customers selected. Customer selection cannot be done simply or based solely on short-term considerations. An evaluation approach is needed that can reflect the customer's overall condition. With accurate selection, leasing companies can minimize the potential for default from the early stages of decision-making.

A common problem in the leasing customer selection process often arises due to the dominance of subjective judgments in decision-making. Many credit decisions still rely on the intuition or experience of analysts without the support of structured analysis. This situation causes evaluation results among analysts to be inconsistent even when using the same customer data. In addition, the use of a single indicator, such as income or collateral value, is often considered sufficient to determine customer eligibility[3], [4]. This approach makes the selection process partial and ignores other factors that also affect credit risk. As a result, the decisions made are less reflective of the actual conditions of the customers. Reliance on a single indicator also makes the selection system less adaptive to variations in customer characteristics. This issue highlights the need for a more systematic and comprehensive approach in the selection process.

Multi-Criteria Decision Making (MCDM)-based Decision Support Systems (DSS) play an important role in improving the quality of leasing customer selection. DSS is designed to assist decision-makers in processing complex information involving multiple criteria. Through the MCDM approach, each criterion can be considered simultaneously according to its level of importance[5], [6]. This allows for a more balanced and rational evaluation of customer eligibility. DSS also helps reduce the influence of subjectivity by prioritizing data-based calculations. In addition, the decision-making process becomes more transparent because each stage can be traced systematically[7], [8]. DSS provides consistent analytical support to credit analysts in making decisions. Thus, the role of DSS is very relevant in supporting more accurate and accountable customer selection.

Although various methods have been used in evaluating customer eligibility, conventional approaches still have significant limitations. One of the main weaknesses lies in the use of subjectively determined criteria weights. These weights often do not reflect the actual contribution of each criterion to credit risk. Moreover, the single-weighting method tends to oversimplify issues that are inherently complex. This approach is less capable of capturing the variation of information contained in customer data. As a result, evaluation outcomes become sensitive to minor changes in the data. These limitations can reduce the reliability of the decisions made. Therefore, a more adaptive and data-driven method is needed in evaluating customer eligibility.

Grey Geometric Mean (G2M) is an objective weighting method in multi-criteria decision making designed to determine the importance level of

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each criterion based on data characteristics, without relying on the subjective judgment of decision-makers[9], [10]. This method utilizes the concept of the geometric mean to represent the central tendency of data for each criterion, while also integrating the grey system approach to handle uncertainty and variations in information that often appear in real-world data. By comparing the value of each alternative to the geometric mean of the criteria, G2M can measure the relative contribution degree of criteria proportionally. The normalization process in G2M also ensures that differences in scale between criteria do not affect the weighting results[11], [12]. The resulting weights reflect the level of influence of criteria in distinguishing alternatives, making them more consistent and stable compared to conventional opinion-based weighting. Therefore, G2M is highly relevant to be applied in complex evaluation problems such as lease customer selection, where the objectivity and reliability of criteria weights are key factors in supporting accurate decisions.

Ranking of alternatives through functional mapping of criterion sub-intervals into a single interval (RAFSI) is a multi-criteria decision-making method designed to generate a clear and consistent ranking of alternatives through a functional mapping approach[13]–[15]. This method works by transforming the value of each criterion into a unified interval based on ideal and anti-ideal values, so that performance differences among alternatives can be represented proportionally. RAFSI is capable of handling both benefit and cost type criteria in an integrated manner through standard functions tailored to the characteristics of each criterion. The standardization and normalization process in RAFSI ensure that all criterion values are on a comparable scale, preventing distortion due to differences in measurement units[15], [16]. The values of the generated alternative functions reflect the overall proximity of the alternatives to the ideal condition. With this mechanism, RAFSI provides ranking results that are stable, easy to interpret, and sensitive to data changes, making it highly suitable for complex and high-risk selection problems such as assessing the feasibility of potential leasing customers.

The motivation for using G2M weighting and the RAFSI method is driven by the need for a more objective and consistent approach. G2M weighting is designed to determine criterion weights based on the characteristics of the available data. This approach helps reduce the dominance of subjective judgment in weight determination. With more objective weights, evaluation results are expected to be more stable and representative. Meanwhile, the RAFSI method offers a ranking mechanism that considers the relationship of alternatives to ideal and anti-ideal conditions. This approach provides a more comprehensive perspective in assessing customer eligibility. RAFSI not only looks at the best alternatives but also considers the distance from the worst conditions. The combination of G2M and RAFSI is expected to improve the quality of leasing customer selection results.

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The aim of this research is to develop a more accurate and objective model for selecting prospective leasing customers. This study aims to reduce the level of subjectivity in the credit decision-making process. In addition, this research also seeks to improve the consistency of customer ranking results. The integration of G2M weighting and the RAFSI method is the main focus in the development of the model. This study aims to test the effectiveness of combining these two approaches in the context of leasing customer selection. The research results are expected to provide more reliable decision recommendations. Moreover, this study also aims to provide stronger analytical support for credit analysts. Thus, the objectives of this research are not only theoretical but also practical.

The main contribution of this research lies in the development of an integrated approach in the decision support system for selecting prospective leasing customers. The integration of G2M as an objective weighting method contributes to determining more data-driven criterion weights. This approach helps reduce biases that often arise in subjective weighting. The application of RAFSI as a ranking method based on ideal and anti-ideal relations enriches the customer eligibility evaluation process. This method allows assessments to be conducted more comprehensively and balanced. Additionally, the development of the proposed DSS model provides a systematic framework for leasing companies. This model can be used as a tool for making consistent decisions. Overall, this research is expected to provide both academic and practical contributions to credit risk management based on MCDM.

II. Methodology

The Research Methodology section should provide a detailed explanation of the research procedures to ensure that the study can be replicated by other researchers. Authors should systematically describe the type of research, research approach, research object, data sources, and data collection techniques employed. The information presented should be sufficiently clear to illustrate how the study was conducted from the initial stage to the final stage.

Furthermore, authors should explain the methods, models, algorithms, or analytical techniques used in the study. If established methods are applied, relevant references should be provided as the theoretical foundation. For studies that propose a new method or modify an existing one, authors should clearly describe the development process, formulations, and the differences and advantages of the proposed approach compared to previous methods. Flowcharts, research frameworks, or process illustrations may be included to clarify the research stages.

In the final part of this section, authors should describe the data processing procedures, testing techniques, evaluation parameters, and research tools utilized, such as software applications, programming languages, or specific platforms. Explanations regarding result validation and performance evaluation methods should also be provided

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to enable readers to assess the reliability of the study. All research procedures should be presented in a logical, structured, and coherent manner, consistent with the research objectives.

The research methodology in this study is designed to provide a systematic and directed framework for addressing the complex and multi-dimensional issues of selecting potential leasing customers. The approach used emphasizes the utilization of data as the primary basis for decision-making, so the analysis process is not only descriptive but also analytical and measurable. This study adopts the concept of a DSS based on MCDM to accommodate various interrelated assessment criteria. The research stages are arranged sequentially, starting from problem identification and criteria determination, data processing, to the application of weighting and ranking methods. Each stage is designed to be integrated and support the achievement of the research objectives. This methodological approach also provides a clear basis for testing and developing a more objective and reliable leasing customer selection model.

2.1. Research Framework

The research framework in this study is designed to illustrate the logical flow and interconnection between research stages clearly and systematically. This research framework serves as a conceptual guide that explains how the problem of selecting potential leasing customers is transformed into a data-driven decision-making model. The framework integrates the processes of problem identification, determination of criteria and alternatives, data processing, up to the application of weighting and ranking methods into a single interconnected flow. Each stage is designed to support the next, so that the analysis process can proceed consistently and in a structured manner. The research framework also helps ensure that the methods used are aligned with the established research objectives. With a clear research framework, the analysis flow becomes easier to understand and replicate. Figure 1 is the research framework that was designed and implemented in this study.

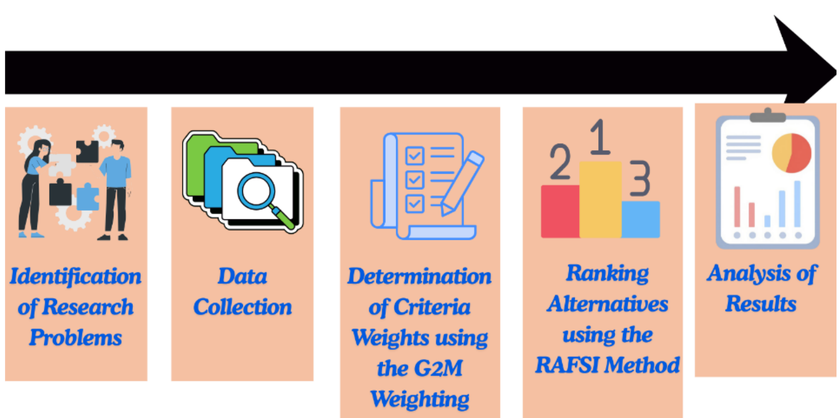

Figure 1. Research Framework

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The research stages begin with problem identification, focusing on weaknesses in the leasing customer selection process, particularly concerning subjective assessments, inconsistent decisions, and high credit risk. Once the problems are clearly formulated, relevant data is collected according to the established evaluation criteria and alternatives for prospective customers, ensuring that the data used genuinely reflects real conditions. The collected data is then processed to determine the weight of each criterion using the G2M method, aiming to produce objective weightings based on data characteristics. These criterion weights are then used in the alternative ranking process by applying the RAFSI method, where each prospective customer is evaluated based on their closeness to the ideal condition and distance from the anti-ideal condition. The final stage of the research is the analysis of the results, which is carried out to assess the consistency, rationality, and reliability of the resulting ranking sequence, as well as to evaluate the effectiveness of the model in supporting decision-making for the selection of prospective leasing customers.

2.2. G2M Weighting

G2M weighting is an objective weighting method developed to determine the importance level of criteria based on the information contained in the data. This method utilizes the concept of grey system theory to handle uncertainty and information limitations that often arise in decision-making data. G2M weighting calculates the weights of criteria through the geometric mean values of normalized data, thereby representing the relative contribution of each criterion more proportionally. This approach does not depend on the subjective judgment of decision-makers, thus reducing bias in the weighting process. Additionally, G2M weighting is sensitive to data variations, making it more adaptive to changes in conditions and the characteristics of alternatives. The resulting weights reflect the actual level of information differences between criteria.

The G2M weighting stage begins with the preparation of a decision matrix that represents the value of each alternative against each criterion based on the available data using (1). From this decision matrix, the geometric mean value for each criterion is calculated to capture the proportional tendency of the data values and reduce the impact of extreme values using (2). The obtained geometric mean values are then normalized so that they are on a uniform scale, allowing a fair comparison between criteria using (3). This normalization result is subsequently used to determine the grey value of each criterion using (4), which reflects the importance level of the criteria based on the variation and information of the data it possesses. In the final stage, the grey values of the criteria are converted into criterion weights by performing further normalization using (5), so that the total weight equals one and can be used in the evaluation and ranking process of alternatives in the decision support system.

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$$X = [x_{ij}]_{mxn} \tag{1}$$

$$GM_j = \left(\prod_{i=1}^{m} x_{ij}\right)^{1/n} \tag{2}$$

$$R_{ij} = \frac{x_{ij}}{GM_j} \tag{3}$$

$$GRG_j = \frac{1}{n}\sum_{j=1}^{n} R_{ij} \tag{4}$$

$$w_j = \frac{GRG_j}{\sum_{j=1}^{n} GRG_j} \tag{5}$$

The symbol x_{ij} represents the performance value of the i^{th} alternative against the j^{th} criterion, m indicates the number of alternatives, and n indicates the number of criteria. The symbol GM_j represents the geometric mean value for the j^{th} criterion. The symbol $\prod$ denotes the operation of multiplying all alternative values for the j^{th} criterion, while the power of 1/n is used to obtain the geometric mean value. The symbol R_{ij} is the normalized ratio value, where each element of the decision matrix is compared with the geometric mean of the related criterion. The symbol GRG_j represents the grey relational grade value for the j^{th} criterion. The symbol $\sum$ indicates the summation operation of all the ratio values for that criterion, while the factor 1/n is used to obtain the average value. The symbol w_j is the final weight of the j^{th} criterion. This weight is then used in the process of evaluating and ranking alternatives in the decision support system.

2.3. RAFSI Method

The RAFSI method is one of the Multi-Criteria Decision Making methods designed to produce a consistent ranking of alternatives by mapping the value of each criterion into a uniform evaluation interval. The main principle of RAFSI lies in the functional mapping process, where each criterion value, whether of the benefit or cost type, is transformed from its original sub-interval into a predetermined single interval. This approach aims to eliminate differences in scale and characteristics between criteria, so that all values can be compared fairly and proportionally. Once the mapping process is completed, the standardized criterion values are combined with the criterion weights to obtain the aggregate value of each alternative. The aggregate value is then used as the basis for determining the ranking order of the alternatives. RAFSI is known to be capable of producing stable and easily interpretable ranking results because each calculation step is systematic and function-based. Therefore, the RAFSI method is widely used in decision-making problems that involve heterogeneous criteria and require transparent and consistent evaluation results.

The stages of the RAFSI method begin with the preparation of a decision matrix containing the performance values of each alternative against all the criteria used in the evaluation using (1). Based on this decision matrix, ideal and anti-ideal values are determined for each criterion, representing the best and worst conditions according to the type of criteria, whether benefit or cost, using (6) and (7). The results of this mapping are then compiled into a standardized matrix using (8),

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so that all criteria are on the same scale and can be directly compared. In the next stage, the arithmetic and harmonic values are calculated as part of the aggregation process to capture the tendencies of alternative values in a balanced manner using (9) and (10). After that, matrix normalization is carried out to ensure the consistency of scale and proportion of values among alternatives using (11). The final stage is determining the alternative function values, which are obtained from the combination of standardized values and criteria weights using (12), and are subsequently used as the basis for ranking the alternatives.

$$Y_{AI_j} = \begin{cases} \max_j x_{ij} \text{ ; } benefit\ criteria \\ \min_j x_{ij} \text{ ; } cost\ criteria \end{cases} \quad (6)$$

$$Y_{AAI_j} = \begin{cases} \min_j x_{ij} \text{ ; } benefit\ criteria \\ \max_j x_{ij} \text{ ; } cost\ criteria \end{cases} \quad (7)$$

$$S_{ij} = \frac{m-1}{Y_{AI_j} - Y_{AAI_j}} x_{ij} + \frac{Y_{AI_j} - (m * Y_{AAI_j})}{Y_{AI_j} - Y_{AAI_j}} \quad (8)$$

$$A = \frac{1+m}{2} \quad (9)$$

$$H = \frac{1}{1+\frac{1}{m}} \quad (10)$$

$$t_{ij} = \begin{cases} \frac{S_{ij}}{2A} ; benefit\ criteria \\ \frac{H}{2S_{ij}} ; cost\ criteria \end{cases} \quad (11)$$

$$V_i = \sum_{j=1}^{n} w_j * t_{ij} \quad (12)$$

The symbol $Y(AI_j)$ represents the ideal value for the j-th criterion, which is the best value that can be achieved for that criterion. The symbol $Y(AAI_j)$ represents the anti-ideal value for the j^{th} criterion, which is the worst possible condition. The symbol S_{ij} is the initial function value obtained from the process of mapping alternative values into a single interval based on the ideal and anti-ideal values. The symbol m denotes the number of alternatives, while the numerator and denominator in this equation serve to adjust the value scale so that each criterion has a comparable range. The symbol A is the arithmetic mean value used as a reference parameter in the advanced transformation process. The symbol H represents the harmonic mean value used to balance the evaluation process, particularly in the treatment of cost criteria. This value serves as an adjustment factor to ensure that the mapping results remain proportional and unbiased. The symbol t_{ij} is the standardized function value for the i^{th} alternative on the j^{th} criterion. The symbol V_i represents the function value of the i^{th} alternative, obtained from the sum of the products between the criterion weights and the standardized function values.

III. Result and Discussion

The Results and Discussion section presents the research findings obtained from the implementation of the proposed method, model, or approach. Research results may be presented in the form of tables,

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figures, charts, or other visualizations to facilitate readers' understanding. Every table and figure must be properly referenced and explained within the narrative, highlighting the purpose of the presented data and its relationship to the research objectives.

The combination of G2M and the RADERIA ranking method in leasing customer selection decision-making is driven by the need for an evaluation model that is objective, consistent, and capable of handling multi-criteria complexity comprehensively. The leasing customer selection process involves various criteria with different characteristics and levels of importance, so conventional approaches often result in biased and unstable decisions. G2M is used to determine the criteria weights objectively based on the information contained in the data, thereby reducing the dominance of subjective assessments and increasing the representativeness of the weights concerning actual conditions. Meanwhile, RADERIA serves as a ranking method that evaluates alternatives based on their relationship to both ideal and anti-ideal conditions simultaneously, providing a more balanced assessment perspective. The integration of these two methods allows the decision-making process to be conducted in a more structured manner, from determining the importance of criteria to the final assessment of prospective customers' eligibility. This combined approach is also expected to enhance the consistency of ranking results and the robustness of the model against data changes. Thus, the combination of G2M and RADERIA forms a strong foundation for developing a decision support system for more reliable and data-driven leasing customer selection.

3.1. Identification of Research Problem

The selection process for prospective leasing customers is a crucial stage that greatly determines the quality of the financing portfolio and the level of credit risk faced by the leasing company. In practice, companies are often faced with situations where financing decisions must be made quickly, while the available information is varied and not always complete. This causes the customer feasibility evaluation process to tend to be conducted partially and focused only on a few main indicators, such as income or collateral. This approach is less able to comprehensively depict the customer's condition, especially in assessing long-term risk potential. As a result, it is not uncommon for decisions made to result in problematic loans that directly impact the company's financial stability. This condition indicates that there are fundamental issues in the customer selection mechanism that are not yet optimal and require a more systematic approach.

Another identified problem is the high level of subjectivity and inconsistency in the decision-making process for selecting leasing customers. Differences in background, experience, and preferences of credit analysts often influence the assessment results, making the decisions produced inconsistent even when using the same data. In addition, the evaluation methods used generally have not integrated the weighting of criteria objectively, so the importance level of each

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criterion is not determined based on the actual characteristics of the data. These limitations cause customer ranking results to be less stable and difficult to justify analytically. Therefore, this research problem focuses on the need for a decision-making model that can reduce subjectivity, increase consistency, and produce more accurate evaluations of leasing customers' eligibility through an MCDM-based approach.

3.2. Data Collection

Data collection is an important stage in this research because the quality and completeness of the data greatly determine the accuracy of the analysis results and decisions made. The data collected focuses on information relevant to the leasing customer selection process, both related to financial and non-financial aspects. Each data item is adjusted to the previously set evaluation criteria to objectively represent the condition of prospective customers. The data collection process is carried out systematically to ensure consistency, reliability, and suitability of the data with the requirements of the method used. In addition, special attention is given to the completeness and validity of the data to minimize potential errors in the subsequent processing stages. The collected data is then prepared for analysis through a preprocessing process so that it can be used optimally in determining the criteria weights and ranking of alternatives. With structured and relevant data collection, this study is expected to produce a more accurate and accountable evaluation of leasing customer selection. Table 1 presents the assessment data that will be used in this study.

Table 1. Alternative Assessment Data

Alternative	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7
Customer Candidate 1	6500000	4	4	32	120000000	32	3
Customer Candidate 2	5800000	3	3	35	100000000	29	2
Customer Candidate 3	7200000	6	5	28	150000000	41	3
Customer Candidate 4	4900000	2	3	40	90000000	27	1
Customer Candidate 5	8000000	7	5	25	180000000	45	3
Customer Candidate 6	6000000	5	4	30	130000000	38	2
Customer Candidate 7	5200000	3	2	42	85000000	26	1
Customer Candidate 8	7500000	6	5	27	160000000	40	3
Customer Candidate 9	6800000	4	4	33	140000000	35	2
Customer Candidate 10	4500000	2	2	45	80000000	25	1
Customer Candidate 11	8300000	8	5	22	200000000	48	3
Customer Candidate 12	5600000	4	3	36	110000000	31	2
Customer Candidate 13	6900000	5	4	31	145000000	37	3
Customer Candidate 14	7800000	7	5	26	170000000	43	3
Customer Candidate 15	5000000	3	3	38	95000000	28	2

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In this study, seven main criteria were used, each represented by a specific code to facilitate the process of analysis and calculation. Criterion CR-1 is Monthly Income, which is a benefit type, because higher income values indicate better payment ability. Criterion CR-2 is Job Stability, also a benefit type, where the length and stability of employment reflect the continuity of the prospective customer's source of income. Criterion CR-3 is Credit History, a benefit type as well, because a good payment history indicates a lower credit risk. Criterion CR-4 is the Installment-to-Income Ratio, which is a cost type, as the higher the installment ratio, the heavier the customer's financial burden. The CR-5 criterion is the Collateral Value and is categorized as a benefit, because a high collateral value can reduce the risk of loss for the leasing company. The CR-6 criterion is the Customer's Age, which is a benefit type, based on the assumption that productive age reflects better economic stability. Finally, the CR-7 criterion is Home Ownership Status, which is also a benefit type, because owning one's own home is generally associated with a lower credit risk.

The evaluation data of alternatives in Table 1 presents a comprehensive overview of the conditions of fifteen leasing customer candidates, assessed based on seven research criteria. Each candidate has varying values reflecting differences in financial capability, stability, and risk levels, ranging from monthly income, job characteristics, credit history, to supporting factors such as collateral value and residential status. The variation in values for each criterion indicates that no single candidate is superior across all aspects, necessitating a multi-criteria decision-making method to produce an objective and balanced assessment. This data also shows that there are candidates with high incomes but relatively large installment ratios, as well as other candidates with lower incomes but supported by certain collateral and stability.

3.3. Determining of Criteria Weight using the G2M Weighting

The determining of criteria weight stage using G2M weighting is carried out to obtain objective criterion weights based on the structure of relationships between criteria in the decision-making process. The G2M method is designed to reduce dependence on the subjective assessments of decision-makers by utilizing global comparisons between criteria, so that the resulting weights are more consistent and representative of the contribution of each criterion. Through this approach, each criterion is evaluated based on its relative importance to other criteria in a comprehensive manner, not partially. The G2M weighting results are expected to reflect the actual influence of each criterion on the evaluation objectives, thereby improving accuracy and reliability in the aggregation and ranking of alternatives in the decision support system.

The stages of the G2M weighting method begin with the preparation of a decision matrix that represents the value of each alternative against each criterion based on the data in Table 1 using (1). The resulting decision matrix is presented as follows.

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$$X = \begin{bmatrix} x_{11} & x_{12} & x_{13} & x_{14} & x_{15} & x_{16} & x_{17} \\ x_{21} & x_{22} & x_{23} & x_{13} & x_{25} & x_{26} & x_{27} \\ x_{31} & x_{32} & x_{33} & x_{33} & x_{35} & x_{36} & x_{37} \\ x_{41} & x_{42} & x_{43} & x_{43} & x_{45} & x_{46} & x_{47} \\ x_{51} & x_{52} & x_{53} & x_{53} & x_{55} & x_{56} & x_{57} \\ x_{61} & x_{62} & x_{63} & x_{63} & x_{65} & x_{66} & x_{67} \\ x_{71} & x_{72} & x_{73} & x_{73} & x_{75} & x_{76} & x_{77} \\ x_{81} & x_{82} & x_{83} & x_{83} & x_{85} & x_{86} & x_{87} \\ x_{91} & x_{92} & x_{93} & x_{93} & x_{95} & x_{96} & x_{97} \\ x_{101} & x_{102} & x_{103} & x_{103} & x_{105} & x_{106} & x_{107} \\ x_{111} & x_{112} & x_{113} & x_{113} & x_{115} & x_{116} & x_{117} \\ x_{121} & x_{122} & x_{123} & x_{123} & x_{125} & x_{126} & x_{127} \\ x_{131} & x_{132} & x_{133} & x_{133} & x_{135} & x_{136} & x_{137} \\ x_{141} & x_{142} & x_{143} & x_{143} & x_{145} & x_{146} & x_{147} \\ x_{151} & x_{152} & x_{153} & x_{153} & x_{155} & x_{156} & x_{157} \end{bmatrix}$$

The decision matrix results of the data assessment using the G2M weighting method are as follows.

$$X = \begin{bmatrix} 6500000 & 4 & 4 & 32 & 12000000 & 32 & 3 \\ 5800000 & 3 & 3 & 35 & 10000000 & 29 & 2 \\ 7200000 & 6 & 5 & 28 & 15000000 & 41 & 3 \\ 4900000 & 2 & 3 & 40 & 9000000 & 27 & 1 \\ 8000000 & 7 & 5 & 25 & 18000000 & 45 & 3 \\ 6000000 & 5 & 4 & 30 & 13000000 & 38 & 2 \\ 5200000 & 3 & 2 & 42 & 8500000 & 26 & 1 \\ 7500000 & 6 & 5 & 27 & 16000000 & 40 & 3 \\ 6800000 & 4 & 4 & 33 & 14000000 & 35 & 2 \\ 4500000 & 2 & 2 & 45 & 8000000 & 25 & 1 \\ 8300000 & 8 & 5 & 22 & 20000000 & 48 & 3 \\ 5600000 & 4 & 3 & 36 & 11000000 & 31 & 2 \\ 6900000 & 5 & 4 & 31 & 14500000 & 37 & 3 \\ 7800000 & 7 & 5 & 26 & 17000000 & 43 & 3 \\ 5000000 & 3 & 3 & 38 & 9500000 & 28 & 2 \end{bmatrix}$$

From the decision matrix, the geometric mean value for each criterion is calculated to capture the tendency of the data values proportionally and to reduce the influence of extreme values, calculated using (2). The results of the geometric mean calculation are shown in Table 2.

Table 2. Geometric Mean Value Results using the G2M Method

CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7
6289340.885	4.22483	3.63839	32.03652	125380520.2	34.27764	2.10378

The obtained geometric mean values are then normalized to be on a uniform scale, allowing fair comparison between criteria, calculated using (3). The results of the normalization calculation are shown in Table 3.

Table 3. Normalization Results using the G2M Method

Alternative	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7

*Corresponding Author: rakhmatdedig@teknokrat.ac.id (Rakhmat Dedi Gunawan)
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Customer Candidate 1	1.03349	0.94678	1.09939	0.99886	0.95709	0.93355	1.42601
Customer Candidate 2	0.92220	0.71009	0.82454	1.09250	0.79757	0.84603	0.95067
Customer Candidate 3	1.14479	1.42018	1.37423	0.87400	1.19636	1.19611	1.42601
Customer Candidate 4	0.77910	0.47339	0.82454	1.24857	0.71781	0.78769	0.47534
Customer Candidate 5	1.27199	1.65687	1.37423	0.78036	1.43563	1.31281	1.42601
Customer Candidate 6	0.95400	1.18348	1.09939	0.93643	1.03684	1.10859	0.95067
Customer Candidate 7	0.82680	0.71009	0.54969	1.31100	0.67794	0.75851	0.47534
Customer Candidate 8	1.19249	1.42018	1.37423	0.84279	1.27612	1.16694	1.42601
Customer Candidate 9	1.08119	0.94678	1.09939	1.03007	1.11660	1.02107	0.95067
Customer Candidate 10	0.71550	0.47339	0.54969	1.40465	0.63806	0.72934	0.47534
Customer Candidate 11	1.31969	1.89357	1.37423	0.68672	1.59514	1.40033	1.42601
Customer Candidate 12	0.89040	0.94678	0.82454	1.12372	0.87733	0.90438	0.95067
Customer Candidate 13	1.09709	1.18348	1.09939	0.96765	1.15648	1.07942	1.42601
Customer Candidate 14	1.24019	1.65687	1.37423	0.81157	1.35587	1.25446	1.42601
Customer Candidate 15	0.79500	0.71009	0.82454	1.18615	0.75769	0.81686	0.95067

The next process calculates the grey value for each criterion, which reflects the level of importance of the criterion based on the variation and information of its data, calculated using (4). The results of the grey value calculation are shown in Table 4.

Table 4. Grey Criteria Score Results using the G2M Method

CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7
1.01759	1.08880	1.04442	1.01967	1.03950	1.02107	1.07743

In the final stage, the criterion weights are calculated through an additional normalization process, so that the total weight equals one, calculated using (5). The results of the weight calculation are shown in Table 5.

Table 2. Criteria Weighted Value Results using the G2M Method

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CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7
0.13923	0.14898	0.14290	0.13952	0.14223	0.13971	0.14742

The criterion weights obtained through the G2M method reflect objective weighting results with relatively even importance levels across the criteria. The highest weight is given to CR-2 at 0.14898, followed by CR-7 at 0.14742, indicating that these two criteria have the strongest influence in the decision-making structure based on data characteristics. Furthermore, CR-3 and CR-5 receive weights of 0.14290 and 0.14223, signifying significant but not dominant contributions. Meanwhile, CR-1, CR-4, and CR-6 have very close weights, at 0.13923, 0.13952, and 0.13971 respectively, indicating nearly equal levels of importance. Overall, the weighting results using the G2M method show a balanced and proportional distribution of weights, thereby supporting the alternative evaluation process in a fair and consistent manner without any excessive bias toward a particular criterion.

3.4. Ranking Alternative using the RAFSI Method

The alternative ranking stage using the RAFSI Method is the final phase that plays a crucial role in the multi-criteria decision-making process because it serves to determine the preference order of alternatives objectively and rationally. At this stage, all performance values of the alternatives that have been previously normalized and weighted are processed using the RAFSI calculation mechanism, which integrates the distance to the ideal reference value both arithmetically and harmonically. This approach allows RAFSI to capture performance differences between alternatives more sensitively and stably, so that the ranking results do not rely solely on a single evaluation perspective. Thus, the RAFSI method is capable of producing alternative rankings that are consistent, transparent, and easy to interpret, while also enhancing the reliability of the decision support system in selecting the best alternative based on the overall criteria considered.

The stages of the RAFSI method begin with the preparation of a decision matrix that contains the performance values of each alternative against all criteria used in the evaluation using (1). The decision matrix results of the RAFSI method are the same as the decision matrix results of the G2M method. Based on this decision matrix, the ideal and anti-ideal values for each criterion are determined, representing the best and worst conditions according to the type of criteria using (2) and (4). The results of the ideal and anti-ideal values are presented in Table 6.

Table 6. Ideal and Anti-Ideal Results using the RAFSI Method

	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7
Ideal	8300000	8	5	22	200000000	25	3
Anti-Ideal	4500000	2	2	45	80000000	48	1

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Next, the calculation of function values is carried out to map the value of each criterion from its original sub-interval into a single predetermined evaluation interval. The results of this mapping are then arranged in the form of a standardized matrix, so that all criteria are on the same scale and can be compared directly using (4). The results of the standardized matrix values are presented in Table 8.

Table 8. Standard Matrix Results using the RAFSI Method

Alternative	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7
Customer Candidate 1	8.36842	5.66667	10.33333	8.91304	5.66667	10.73913	15.00000
Customer Candidate 2	5.78947	3.33333	5.66667	7.08696	3.33333	12.56522	8.00000
Customer Candidate 3	10.94737	10.33333	15.00000	11.34783	9.16667	5.26087	15.00000
Customer Candidate 4	2.47368	1.00000	5.66667	4.04348	2.16667	13.78261	1.00000
Customer Candidate 5	13.89474	12.66667	15.00000	13.17391	12.66667	2.82609	15.00000
Customer Candidate 6	6.52632	8.00000	10.33333	10.13043	6.83333	7.08696	8.00000
Customer Candidate 7	3.57895	3.33333	1.00000	2.82609	1.58333	14.39130	1.00000
Customer Candidate 8	12.05263	10.33333	15.00000	11.95652	10.33333	5.86957	15.00000
Customer Candidate 9	9.47368	5.66667	10.33333	8.30435	8.00000	8.91304	8.00000
Customer Candidate 10	1.00000	1.00000	1.00000	1.00000	1.00000	15.00000	1.00000
Customer Candidate 11	15.00000	15.00000	15.00000	15.00000	15.00000	1.00000	15.00000
Customer Candidate 12	5.05263	5.66667	5.66667	6.47826	4.50000	11.34783	8.00000
Customer Candidate 13	9.84211	8.00000	10.33333	9.52174	8.58333	7.69565	15.00000
Customer Candidate 14	13.15789	12.66667	15.00000	12.56522	11.50000	4.04348	15.00000
Customer Candidate 15	2.84211	3.33333	5.66667	5.26087	2.75000	13.17391	8.00000

In the next stage, the arithmetic and harmonic values are calculated as part of the aggregation process to capture the tendency of the alternative values in a balanced manner using (4), and the results of the arithmetic and harmonic values are shown in Table 9.

Table 9. Arithmetic and Harmonic Results using the RAFSI Method

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Arithmetic	Harmonic
8	0.9375

After that, matrix normalization is carried out to ensure consistency of scale and proportion of values among alternatives using (4), and the results of the matrix normalization values are shown in Table 10.

Table 10. Normalization Matrix Results using the RAFSI Method

Alternative	CR-1	CR-2	CR-3	CR-4	CR-5	CR-6	CR-7
Customer Candidate 1	8.36842	5.66667	10.33333	8.91304	5.66667	10.73913	15.00000
Customer Candidate 2	5.78947	3.33333	5.66667	7.08696	3.33333	12.56522	8.00000
Customer Candidate 3	10.94737	10.33333	15.00000	11.34783	9.16667	5.26087	15.00000
Customer Candidate 4	2.47368	1.00000	5.66667	4.04348	2.16667	13.78261	1.00000
Customer Candidate 5	13.89474	12.66667	15.00000	13.17391	12.66667	2.82609	15.00000
Customer Candidate 6	6.52632	8.00000	10.33333	10.13043	6.83333	7.08696	8.00000
Customer Candidate 7	3.57895	3.33333	1.00000	2.82609	1.58333	14.39130	1.00000
Customer Candidate 8	12.05263	10.33333	15.00000	11.95652	10.33333	5.86957	15.00000
Customer Candidate 9	9.47368	5.66667	10.33333	8.30435	8.00000	8.91304	8.00000
Customer Candidate 10	1.00000	1.00000	1.00000	1.00000	1.00000	15.00000	1.00000
Customer Candidate 11	15.00000	15.00000	15.00000	15.00000	15.00000	1.00000	15.00000
Customer Candidate 12	5.05263	5.66667	5.66667	6.47826	4.50000	11.34783	8.00000
Customer Candidate 13	9.84211	8.00000	10.33333	9.52174	8.58333	7.69565	15.00000
Customer Candidate 14	13.15789	12.66667	15.00000	12.56522	11.50000	4.04348	15.00000
Customer Candidate 15	2.84211	3.33333	5.66667	5.26087	2.75000	13.17391	8.00000

The final stage is determining the alternative function values, which are obtained from the combination of standardized values and criterion weights, and are then used as a basis for ranking the alternatives using (4). The results of the alternative function values are shown in Table 11.

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Table 11. Alternative Function Results using the RAFSI Method

Alternative	Function Values
Customer Candidate 1	0.41990
Customer Candidate 2	0.24981
Customer Candidate 3	0.56336
Customer Candidate 4	0.13085
Customer Candidate 5	0.65177
Customer Candidate 6	0.37373
Customer Candidate 7	0.12209
Customer Candidate 8	0.58177
Customer Candidate 9	0.38755
Customer Candidate 10	0.11481
Customer Candidate 11	0.74557
Customer Candidate 12	0.27692
Customer Candidate 13	0.48232
Customer Candidate 14	0.62825
Customer Candidate 15	0.22194

The alternative function values generated by the RAFSI method in Table 11 show variations in preference levels among customer candidates, with a value range between 0.11481 and 0.74557. Customer Candidate 11 has a function value of 0.74557, followed by Customer Candidate 5 (0.65177), Customer Candidate 14 (0.62825), Customer Candidate 8 (0.58177), and Customer Candidate 3 (0.56336), indicating a relatively better feasibility level compared to other alternatives. Customer Candidate 13 (0.48232), Customer Candidate 1 (0.41990), Customer Candidate 9 (0.38755), and Customer Candidate 6 (0.37373) are in the mid-value group, while Customer Candidate 12 (0.27692), Customer Candidate 2 (0.24981), and Customer Candidate 15 (0.22194) show lower function values. Meanwhile, Customer Candidate 4 (0.13085), Customer Candidate 7 (0.12209), and Customer Candidate 10 (0.11481) received the lowest function values, reflecting relatively less optimal contributions of the criteria at this evaluation stage, before further ranking processes were conducted.

3.5. Analysis of Result

The Alternative Ranking stage using the RAFSI Method is the final phase that plays a crucial role in the multi-criteria decision-making process because it serves to determine the preference order of alternatives objectively and rationally. In this stage, all the performance values of alternatives that have been previously normalized and weighted are processed using the RAFSI calculation mechanism, which integrates the distance to the ideal reference values arithmetically and harmonically. This approach allows RAFSI to capture performance differences between alternatives more sensitively and stably, so that the ranking results are not dependent on a single evaluation perspective.

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The ranking results of the alternatives using the RAFSI method are shown in Figure 2.

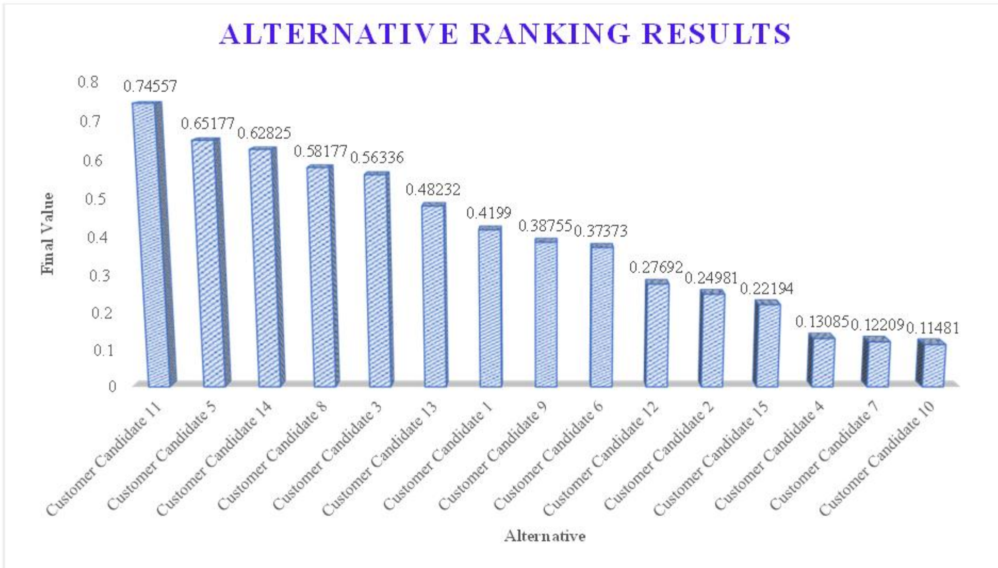

Figure 2. Ranking Results of Alternatives Using the RAFSI Method

The alternative ranking results show a clear difference in feasibility levels among candidates based on the final scores generated by the RAFSI method. Customer Candidate 11 ranks first with the highest score of 0.74557, indicating the most optimal performance across all evaluated criteria. This is followed by Customer Candidate 5 and Customer Candidate 14 with scores of 0.65177 and 0.62825, respectively, demonstrating relatively strong and consistent performance. The middle group consists of Customer Candidate 8, Customer Candidate 3, and Customer Candidate 13, who have moderate final scores and still adequately meet most of the criteria. Meanwhile, Customer Candidate 1 through Customer Candidate 12 fall within the lower-middle score range, reflecting a more limited level of criteria fulfillment. The candidates with the lowest scores are Customer Candidate 10, Customer Candidate 7, and Customer Candidate 4, indicating the poorest performance compared to the other alternatives. Overall, these results confirm the ability of the RAFSI method to produce rankings that are discriminative, stable, and easily interpreted as a basis for decision-making in selecting the most eligible leasing customers.

The main contribution of this research lies in the development of an objective and systematic decision-making framework through the integration of the G2M weighting method and the RAFSI ranking method in the context of leasing customer selection. This approach provides a methodological contribution by presenting a data-based criteria weighting process through the geometric mean, thereby reducing decision-makers' subjectivity, while also producing a more stable and discriminative ranking of alternatives through RAFSI sub-interval function mapping. In addition, this research contributes practically by

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providing an evaluation model that is transparent, easy to interpret, and relevant for financial institutions to comprehensively assess customer eligibility. From an academic perspective, the results of this study also enrich the decision support system literature by demonstrating the effectiveness of combining objective and functional methods in addressing complex and high-risk multi-criteria problems such as leasing customer selection.

IV. Conclusion

The research results show that the implementation of the G2M combination as a criteria weighting technique and the RAFSI method as a ranking approach can produce an objective, consistent, and structured decision-making process in leasing customer selection. The criteria weights obtained through G2M reflect the relative importance of each criterion based on the characteristics of the assessment data, thereby reducing dependence on subjective judgment. Furthermore, the application of the RAFSI method successfully integrates the performance values of alternatives by considering ideal and anti-ideal conditions, resulting in clear and discriminative final preference values and customer ranking order. The ranking results show that Customer Candidate 11 occupies the first rank with the highest preference score of 0.74557, indicating the most optimal level of feasibility based on all criteria evaluated using the RAFSI method. Next, Customer Candidate 5 is in second place with a preference score of 0.65177, demonstrating very competitive performance and relatively close to the best alternative. The third rank is held by Customer Candidate 14 with a preference score of 0.62825, which still reflects a high level of feasibility despite being below the top two alternatives. The differences in preference values among these top three rankings indicate the method's ability to clearly and proportionally distinguish the performance levels of alternatives, allowing the ranking results to serve as a strong and rational basis for decision-making in leasing customer selection. Based on the ranking results, this study demonstrates that the proposed model can rationally and data-drivenly identify customers with the highest eligibility levels. Overall, the findings of this study affirm that the integration of G2M and RAFSI is effective for use as a decision support system in the context of leasing customer selection, and it has the potential to be applied to other multi-criteria decision-making problems that demand accuracy, transparency, and result stability.

CRediT Authorship Contribution Statement

R. D. Gunawan: Writing – original draft, Software, Methodology, Conceptualization, Validation, Investigation. **J. Wang:** Writing – review & editing, Formal analysis, Data curation, Conceptualization.

*Corresponding Author: rakhmatdedig@teknokrat.ac.id (Rakhmat Dedi Gunawan)
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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Declaration of Generative AI and AI-assisted Technologies in The Writing Process

The authors used Generative AI to improve the writing clarity of this paper. They reviewed and edited the AI-assisted content and take full responsibility for the final publication.

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*Corresponding Author: rakhmatdedig@teknokrat.ac.id (Rakhmat Dedi Gunawan)
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