

# Hybrid G2M Weighting and WASPAS Method for Business Partner Selection: A Decision Support Approach

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**Abstract**—Choosing the right business partner is a crucial factor in the success and continuity of a company's operations. The main issue in selecting business partners is the complexity of balancing various interconnected and often conflicting factors. Another problem lies in the subjectivity and limitations of information. Evaluators or decision-makers may have differing views on the priority of criteria or the interpretation of the available data. This study proposes a hybrid method-based decision support system approach that combines G2M Weighting and WASPAS to address the challenges in complex and uncertain multi-criteria evaluations. The G2M method is used to objectively determine the weight of criteria based on geometric averages in gray environments, so as to be able to capture data variability and uncertainty. Furthermore, the WASPAS method is applied to calculate the final value and rank the alternative business partners based on a combination of additive and multiplicative approaches. The ranking chart for business partner selection using the G2M Weighting and WASPAS method shows that Partner G gets the highest score of 9.93E+03, followed by Partner A and Partner E who have the same score of 9.43E+03. Meanwhile, Partner D had the lowest score, which was 5.97E+03. This ranking of business partner selection shows that Partner G is the best choice as a business partner based on the evaluation method used. The results of the study show that this hybrid approach provides more accurate, stable, and comprehensive evaluation results than conventional methods. This approach can be an effective solution for companies in supporting the strategic decision-making process in choosing the best business partners.

**Keywords:** Business Partner Selection; G2M Weighting; WASPAS; Decision Support System; Multi-Criteria Decision Making

## 1. INTRODUCTION

Choosing the right business partner is an important foundation in ensuring the success and sustainability of a business[1], [2]. Business partners who are aligned in the company's vision, mission, and values will support the achievement of strategic goals through strong synergies. Solid collaboration with competent partners can also improve operational efficiency, expand market networks, and strengthen competitiveness in the midst of increasingly complex and competitive business environments. On the other hand, inappropriate selection of partners risks creating various obstacles, such as conflicts of interest, imbalances of contributions, or even financial and reputational losses[3], [4]. Problems in the selection of business partners often arise due to the lack of objective and measurable criteria in the partner selection process is also a major challenge. Decision-making that relies solely on intuition or a subjective approach can pose a great risk, especially in the event of differences in vision, business goals, or management style. Therefore, the selection process of business partners must be carried out carefully and objectively by considering various criteria, such as integrity, capability, track record, and long-term commitment. This approach will assist companies in building mutually beneficial and sustainable partnership relationships.

In the context of multicriteria decision-making, the main challenge in the selection of business partners is the complexity of balancing a variety of interrelated and often conflicting factors[5]–[7]. Criteria such as financial reliability, product or service quality, reputation, suitability of the company's values, and long-term commitment need to be considered simultaneously. However, not all criteria have the same level of importance, so an assessment method is needed that can give objective and consistent weight to each aspect to produce fair and rational decisions. In addition, another challenge lies in the subjectivity and limitations of information. Assessors or decision-makers may have differing views on the priority of the criteria or interpretation of the available data[8]–[10]. Data that is incomplete or difficult to quantitatively measure, such as business ethics or cultural alignment, also adds complexity to the evaluation process. Therefore, the use of structured multicriteria decision-making methods, such as weighted aggregated sum product assessment (WASPAS), or objective methods such as grey geometric mean weighting (G2M Weighting), is important to help formulate decisions that are more transparent, systematic, and accountable.

G2M Weighting is a method of determining the weight of criteria in multicriteria decision-making that combines the concepts of grey system theory and geometric mean[11]. This method is designed to deal with uncertainty and incomplete information, which is often encountered in subjective judgments by decision-makers. G2M Weighting has a number of advantages that make it superior in the context of multicriteria decision-making, especially when faced with uncertainty and incomplete information. This method uses gray numbers in the form of intervals to represent the assessment, thus capturing the uncertainty that often arises in subjective evaluations[12]. By combining the judgments of multiple decision-makers using geometric averages, G2M

effectively reduces individual bias and results in a more objective and representative weight of criteria. The geometric approach also provides stability to very different extreme values or assessments, making it more reliable than arithmetic averages. Additionally, G2M Weighting flexibility in handling different types of data and its ability to summarize collective assessments make it well-suited for collaborative decision-making, especially in complex and dynamic environments. WASPAS is a multi-criteria decision-making method that combines two main approaches, namely the Weighted Sum Model (WSM) and the Weighted Product Model (WPM) method, to provide more accurate, stable, and flexible assessment results[13]–[15]. WASPAS has the main advantage of improving decision-making accuracy by combining two popular methods[16]–[18]. This method provides more stable and flexible results because it can adjust the contribution weight of each approach through the lambda parameter. In addition, WASPAS is easy to implement and suitable for use in a variety of alternative evaluation contexts involving many criteria.

Research on supplier selection was conducted by Jiang (2025) which combines intuitionistic fuzzy sets (IFS) with the weighted aggregate product assessment method (WASPAS). The results indicate that the combination of subjective and objective weights enhances the stability of the method under varying attribute weights[19]. Research by Torkayesh (2020) using the BWM and WASPAS models based on MCDM to determine the weights of criteria and then evaluate suppliers. To demonstrate the feasibility of the proposed methodology, we conducted a case study for an online retail store in Iran[20]. Research by Abdelkader (2023) developed a model (HYBD\_MCDM) conceptualized based on two levels of multi-criteria decision making. This model also highlights the strengths, weaknesses, and capacities of potential private partners in efforts to neutralize threats and capitalize on opportunities offered by the current construction business market[21]. Research by Ulutas (2021) used a weighted gray relational analysis and combined gray distance assessment to address this issue. Therefore, a new hybrid model that integrates both approaches is proposed to identify the best third-party logistics service providers[22].

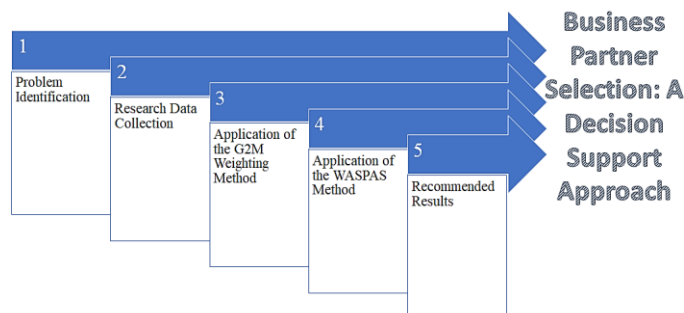
Hybrid G2M Weighting and WASPAS Method for Business Partner Selection is a combined approach that leverages the power of two methods in multicriteria decision-making: G2M Weighting for criterion weighting, and WASPAS for the final ranking of business partner alternatives. This approach is designed to increase objectivity and precision in the partner selection process, especially in conditions of incomplete information and subjective assessments. In this approach, G2M Weighting is used first to calculate the weight of the criteria based on the opinions of several decision-makers in the form of gray numbers (intervals). This weight is then used in WASPAS to evaluate and rank each partner alternative based on their performance scores against each criterion. The result is a more robust assessment system, as it is capable of handling data uncertainty (through G2M Weighting) while also producing comprehensive and accurate evaluations (through WASPAS). This hybrid approach is very suitable for strategic decision-making such as business partner selection, where many important factors must be considered simultaneously and objectively.

This study aims to apply a hybrid approach between the G2M Weighting method and WASPAS as a decision support system in the selection of business partners. In particular, this study aims to determine the weight of partner selection criteria objectively and robustly by considering the uncertainty of assessment, evaluating and ranking alternative business partners based on multi-criteria performance using the WASPAS method, and providing a systematic, transparent, and reliable decision-making framework to support managers in selecting the most suitable business partner.

## 2. RESEARCH METHODOLOGY

### 2.1 Research Stages

The research stage is a series of systematic and structured steps taken by researchers to obtain answers to the problems studied[23]–[25]. This stage starts from problem identification, planning, implementation, to reporting results that emphasize the importance of a planned scientific work sequence so that research results can be accounted for. Figure 1 is a process in the research stages that is carried out systematically in this study.



**Figure 1.** Research Stage

This research begins with the identification of problems, namely the need for a decision support system that is able to help companies in choosing business partners objectively and efficiently in the midst of the complexity of mutually influencing criteria. After the problem is clearly formulated, it is followed by the collection of research data which includes alternative data of business partners and evaluation values on each criterion such as product quality, delivery accuracy, price, and flexibility. This data was obtained through internal observation and interviews with related parties. The next stage is the application of the G2M Weighting method, which is used to determine the objective weight of each criterion based on the degree of variation and its importance in the decision-making process. Then, the weights obtained were integrated in the application of the WASPAS method to calculate the final score of each business partner alternative by combining the Weighted Sum Model (WSM) and Weighted Product Model (WPM) approaches. Finally, the recommendation results stage produces a ranking order of the best business partners that can be used as a basis for managers to make more rational and measurable decisions.

## 2.2 Decision Support System

Decision Support System (DSS) or Decision Support System is a computer-based system designed to assist decision-makers in solving semi-structured or unstructured problems. DSS combines data, analytical models, and interactive user interfaces to help make the decision-making process more effective and efficient. This system does not replace human decisions but provides various alternatives, analyses, and projections to support decision-makers in evaluating the best options based on defined criteria. In its implementation, DSS can be used in various fields such as business, healthcare, government, education, and manufacturing. With the ongoing support of advancing technology, DSS has become increasingly sophisticated and can be integrated with artificial intelligence (AI), big data, and machine learning technologies to enhance the quality of decision-making.

## 2.3 Multi-Criteria Decision Making

Multi-Criteria Decision Making (MCDM) or Multi-Criteria Decision Making is an approach to decision making that involves evaluating various alternatives based on a number of often conflicting criteria. The main goal of MCDM is to help decision makers choose the best alternative or rank alternatives based on the preference values obtained from these various criteria. MCDM is very important when decisions cannot be based on a single criterion, such as in project site selection, selection of the best employees, or determining the most appropriate supplier. The MCDM process allows decision makers to systematically compare and assess various options based on both quantitative and qualitative data, thereby producing decisions that are more rational, transparent, and accountable.

## 2.4 G2M Weighting

G2M Weighting is an objective weighting method that calculates the weight of criteria based on the geometric average of the gray relational coefficient value between alternatives to each criterion, in order to objectively capture the relative influence of each criterion under uncertain or incomplete data conditions. This method is designed to address the uncertainty and ambiguity of assessment data in decision support systems, especially when data comes from multiple sources or assessors.

The decision matrix presents the assessment data of each alternative against all the criteria considered. These values form the basis for the process of normalization and subsequent analysis.

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Equation (1) represents a decision matrix in the context of decision support systems or multicriteria analysis. In this matrix, there are  $m$  rows, each representing an alternative or object being evaluated, and  $n$  columns, each representing assessment criteria. Each element  $x_{ij}$  in the matrix indicates the performance value of the  $i$  alternative against the  $j$  criterion. In other words, matrix  $x$  presents the complete assessment data used as the basis for the multicriteria-based decision-making process.

The geometric mean value is calculated from the mean multiplication of the number of values of each alternative to a single criterion, and then rooted by the number of alternatives. This step represents the relative influence of a criterion in the aggregate.

$$GM_i = \left( \prod_{i=1}^j x_i \right)^{1/n} \quad (2)$$

Equation (2) is the formula for calculating the geometric mean of a number of values. The notation  $x_i$  refers to the value of an alternative against certain criteria, and  $n$  indicates the number of criteria being considered. The process of multiplying all the  $x_i$  values from the evaluated criteria and then taking the  $n$ th root produces the value  $GM_i$ , which reflects the overall performance of the  $i$  alternative in the form of a geometric mean.

Normalization converts the original value into a uniform scale, the goal being that all criteria can be compared fairly without being influenced by different scales.

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

Equation (3) shows the data normalization process using the geometric mean. In this formula,  $x_{ij}$  is the original value of the  $i$ -th alternative against the  $j$ -th criterion, and the result of this calculation is the normalized value  $R_{ij}$ , which represents the proportion of each criterion's contribution to the total performance of the alternative.

The gray relational coefficient measures the proximity between an alternative value and an ideal value based on normalization results. The closer the value of an alternative to the ideal value, the higher the value of the grey coefficient.

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

Equation (4) is the formula for calculating the grey relational grade (GRG) or total grey relational degree from the second alternative. The value of  $R_{ij}$  is the result of normalizing the performance value of the second alternative against the  $j$ -th criterion, while  $n$  indicates the total number of criteria used in the evaluation. The  $GRG_i$  value is obtained by taking the average of all  $R_{ij}$  values for that alternative.

The weights of the criteria are obtained by normalizing the geometric mean values of each criterion. This weight reflects the relative importance of each criterion in the decision-making process.

$$W_j = \frac{GRG_i}{\sum_{i=1}^J GRG_i} \tag{5}$$

Equation (5) is used to determine the weight of criteria based on the GRG value of each alternative. The value  $w_j$  represents the weight of the criteria that corresponds to the GRG value of the  $i$ -th alternative, while the denominator represents the total GRG value of all alternatives related to the  $j$ -th criterion.

The weighting of the criteria of G2M Weighting reflects how much of a relative contribution each criterion makes to the decision-making process. This weight is objective, because it is calculated directly from alternative performance data for each criterion without the intervention of subjective opinions.

## 2.5 WASPAS Method

WASPAS is a multicriteria decision-making method that combines WSM and WPM approaches in a single assessment framework to obtain more accurate and reliable alternative ranking results. This method is designed to maximize the accuracy of the decision by considering both the additive and multiplicative aspects of the alternative assessment of a number of criteria. WASPAS leverages the power of additive and multiplicative models simultaneously, resulting in a more accurate and balanced assessment.

The results matrix presents the assessment data of each alternative against all the criteria considered. These values form the basis for the normalization process and further analysis is made using (1). Normalization in the WASPAS method aims to change the values in the decision matrix into a more uniform scale, so that comparisons between alternatives can be made fairly. This process is different for benefit and cost criteria.

$$x_{ij} = \frac{x_{ij}}{\max x_i} \tag{6}$$

$$x_{ij} = \frac{\min x_i}{x_{ij}} \tag{7}$$

Equation (6) is used for the benefit criteria, which is a criterion where a higher value is considered better. By dividing each value  $x_{ij}$  by the maximum value of that criterion column, all values are normalized to a range between 0 and 1, where the highest value becomes 1. Equation (7) is used for the cost criteria, where a lower value is preferred. This process also normalizes the values to a similar range, but assigns the highest value (1) to the smallest value, as  $\min(x_i)$  is divided by each value  $x_{ij}$ .

The final value of each alternative in WASPAS by combining the two components of WSM and WPM. The two values are combined and the alternative with the highest final score is considered the best option.

$$Q_i = (0.5 * \sum_{j=1}^N (x_{ij} * W_j)) + (0.5 * \prod_{j=1}^N (x_{ij} * W_j)) \tag{8}$$

Equation (8) is a combined formula of the additive and multiplicative approaches in multi-criteria evaluation. In this equation:  $x_{ij}$  is the value of the  $i$ -th alternative against the  $j$ -th criteria after normalization,  $W_j$  is the weight of the  $j$ -th criteria,  $N$  is the total number of criteria, and  $Q_i$  is the final score of the  $i$ -th alternative. This final result reflects a combination of both approaches, with the highest final score being considered the best choice, which fits the purpose or needs of the decision-making.

### 3. RESULT AND DISCUSSION

Hybrid G2M Weighting and WASPAS is a decision support system approach that combines G2M Weighting and WASPAS methods to objectively and accurately select the best business partners. In this approach, the G2M method is used to objectively determine the weight of the criteria based on the geometric mean of the values in the gray environment, which is able to handle the uncertainty and ambiguity of the assessment data. Once the weighting of the criteria was obtained, the WASPAS method was applied to evaluate and rank the alternatives of business partners by combining two main decision-making models. This combination improves the accuracy of the selection because it takes into account both linear summing and proportional multiplication of the alternative performance values. This hybrid approach not only improves the reliability of decision-making, but also provides more balanced and robust results in the context of multi-criteria evaluation for the selection of strategic business partners. By integrating G2M and WASPAS, this approach is able to capture the complexity in the business partner selection process, especially when the available data is subjective or contains uncertainty. G2M ensures that the weight of each criterion is objectively determined by considering the variability of data from various assessment sources, while WASPAS provides flexibility in evaluating alternatives through a blend of additive and multiplicative approaches. The end result of this method provides a more stable rating and reflects the overall performance of each potential partner based on various relevant aspects, such as reliability, quality of service, production capacity, and long-term partnerships. Therefore, this hybrid method is very effective in the context of modern business that demands fast, accurate, and data-driven decision-making.

#### 3.1 Problem Identification

In the process of selecting a business partner, companies are often faced with complex challenges. One of the main problems is the large number of potential partner alternatives available, each with different advantages and disadvantages. This condition makes the selection process not easy, especially when the assessment criteria used are diverse and often subjective. In addition, there are still many companies that do not use a structured decision support system, so the decision to choose a partner is more based on intuition or personal experience, which has the potential to cause bias and misjudgment. The risk is even greater when the chosen partner is unable to meet expectations, both in terms of cooperation commitment, capability, and adaptability to the dynamics of the ever-changing business environment. This issue has become increasingly crucial as the complexity of business relationships increases and the importance of strategic collaboration in achieving competitive advantage. Improper selection of business partners not only impacts short-term project failure, but can also affect the company's overall reputation and operational sustainability. In many cases, the absence of a standardized evaluation method leads to inconsistencies in decision-making and difficulty in objectively evaluating partner performance. Therefore, a decision-making model is needed that is able to accommodate various criteria holistically, provide fair weighting, and generate a ranking of potential partners in a transparent and accountable manner. The integration of multi-criteria-based decision-making methods is one of the potential solutions in answering this challenge, as it is able to process complex information and support more rational and targeted decision-making.

#### 3.2 Research Data Collection

In the process of selecting a business partner, data collection is a crucial stage that determines the accuracy and success of the final decision. The data collected includes quantitative and qualitative information from potential partners, such as production capacity, financial condition, company reputation, as well as previous project portfolios. This process can be carried out through various methods, including direct interviews, questionnaire surveys to previous management or clients, review of documents and financial statements, and observation of partner operations. In addition, secondary data such as information from the company's official website, business media, and partner performance evaluation platforms are also used to enrich the appraisal process. The results of data collection shown in table 1 are assessment data on the business partner selection process carried out.

Table 1. Assessment data

Name	CR1	CR2	CR3	CR4	CR5	CR6
Partner A	9	9900	8	5	7	3
Partner B	7	8500	7	4	9	2
Partner C	8	9000	9	3	6	2
Partner D	6	7500	6	2	8	1
Partner E	8	9800	8	5	8	3
Partner F	7	8200	7	4	7	2
Partner G	9	9500	9	5	9	3
Partner H	8	9300	8	3	8	2
Partner I	7	8900	6	2	7	1
Partner J	8	9600	9	4	6	3

Criteria CR1 is Product Quality: Measures how high the quality of the product or service offered by potential partners. The higher the quality, the greater the chances of long-term collaboration and customer satisfaction. Criteria CR2 is Production Capacity: Assessing the ability of partners to produce goods or services in large quantities as needed. Adequate capacity ensures product availability and meeting market demand. Criteria CR3 is Financial Stability: Describes the financial condition of the partner, including liquidity, profitability, and sustainability of the business. Financially stable partners are less risky in long-term cooperation. Criteria CR4 is Reputation: Assess the market's image and trust in potential partners based on experience, reviews, or industry recognition. A good reputation is usually an indicator of professionalism and the quality of cooperation. Criteria CR5 is Contract Flexibility: Measures the extent to which potential partners are willing to customize the contract based on the company's specific needs. Flexibility is important to deal with market changes, sudden needs, or customization demands. Criteria CR6 is Vision and Culture Alignment: Assess the extent to which the partner's values, work culture, and long-term vision align with the company. This compatibility is important to maintain harmony and facilitate communication in the future.

### 3.3 Application of the G2M Weighting Method

The G2M Weighting Method is a new approach in determining criterion weights on MCDM problems that focuses on determining criterion weights based on a multi-objective assessment of existing data. This method is designed to address complex decision-making problems by giving appropriate weight to each criterion, reflecting both subjective input from experts and available objective data. In the application of the G2M Weighting method, the process involves integrating different types of information to obtain the most optimal set of weights in the decision-making model.

The first stage is the preparation of a decision matrix containing all alternatives evaluated based on predetermined criteria. This matrix illustrates how each alternative performs against the relevant criteria using (1).

$$X = \begin{bmatrix} 9 & 9900 & 8 & 5 & 7 & 3 \\ 7 & 8500 & 7 & 4 & 9 & 2 \\ 8 & 9000 & 9 & 3 & 6 & 2 \\ 6 & 7500 & 6 & 2 & 8 & 1 \\ 8 & 9800 & 8 & 5 & 8 & 3 \\ 7 & 8200 & 7 & 4 & 7 & 2 \\ 9 & 9500 & 9 & 5 & 9 & 3 \\ 8 & 9300 & 8 & 3 & 8 & 2 \\ 7 & 8900 & 6 & 2 & 7 & 1 \\ 8 & 9600 & 9 & 4 & 6 & 3 \end{bmatrix}$$

After compiling the decision matrix, the next step is to calculate the geometric mean value for each criterion. Geometric mean values are used to reduce distortions that can occur due to scale differences in data by using (2).

$$GM_1 = (\prod_{i=1}^j x_1)^{1/10} = (9 * 7 * 8 * 6 * 8 * 7 * 9 * 8 * 7 * 8)^{1/10} = 7.6459$$

$$GM_2 = (\prod_{i=1}^j x_2)^{1/10} = (9900 * 8500 * 9000 * 7500 * 9800 * 8200 * 9500 * 9300 * 8900 * 9600)^{1/10} = 8989.3142$$

$$GM_3 = (\prod_{i=1}^j x_3)^{1/10} = (8 * 7 * 9 * 6 * 8 * 7 * 9 * 8 * 6 * 9)^{1/10} = 7.6182$$

$$GM_4 = (\prod_{i=1}^j x_4)^{1/10} = (5 * 4 * 3 * 2 * 5 * 4 * 5 * 3 * 2 * 4)^{1/10} = 3.5151$$

$$GM_5 = (\prod_{i=1}^j x_5)^{1/10} = (7 * 9 * 6 * 8 * 8 * 7 * 9 * 8 * 7 * 6)^{1/10} = 7.4291$$

$$GM_6 = (\prod_{i=1}^j x_6)^{1/10} = (3 * 2 * 2 * 1 * 3 * 2 * 3 * 2 * 1 * 3)^{1/10} = 2.0477$$

Because each criterion can have different units and it is necessary to normalize the values in the decision matrix so that all data are on a uniform scale using (3).

$$R_{11} = \frac{x_{11}}{GM_1} = \frac{9}{7.6459} = 1.1771$$

The results of data normalization based on predetermined criteria are shown in table 2 which shows the normalization value for each alternative in each criterion.

Table 2. Normalization data

Name	CR1	CR2	CR3	CR4	CR5	CR6
Partner A	1.1771	1.1013	1.0501	1.4224	0.9422	1.4651
Partner B	0.9155	0.9456	0.9189	1.1379	1.2115	0.9767
Partner C	1.0463	1.0012	1.1814	0.8535	0.8076	0.9767
Partner D	0.7847	0.8343	0.7876	0.5690	1.0768	0.4884
Partner E	1.0463	1.0902	1.0501	1.4224	1.0768	1.4651
Partner F	0.9155	0.9122	0.9189	1.1379	0.9422	0.9767
Partner G	1.1771	1.0568	1.1814	1.4224	1.2115	1.4651
Partner H	1.0463	1.0346	1.0501	0.8535	1.0768	0.9767
Partner I	0.9155	0.9901	0.7876	0.5690	0.9422	0.4884
Partner J	1.0463	1.0679	1.1814	1.1379	0.8076	1.4651

The next step is to calculate the gray relation coefficient to assess the relationship between the alternative and the ideal solution. It measures how close each alternative is to the best achievable solution for each criterion by using (4).

$$GRG_1 = \frac{1}{10} \sum_{j=1}^n R_{11,110}$$

$$GRG_1 = \frac{1}{10} * (1.1771 + 0.9155 + 1.0463 + 0.7847 + 1.0463 + 0.9155 + 1.1771 + 1.0463 + 0.9155 + 1.0463)$$

$$GRG_1 = 1.0071$$

The results of the gray relation coefficient value based on the predetermined criteria are shown in table 3 which shows the value of the gray relation coefficient value in each criterion.

Table 3. Gray relation coefficient value

	CR1	CR2	CR3	CR4	CR5	CR6
$GRG_i$	1.0071	1.0034	1.0107	1.0526	1.0095	1.0744

The final step is to give weight to each criterion. The weight of this criterion can be calculated based on the relative importance of each criterion using (5).

$$w_1 = \frac{GRG_1}{\sum_{i=1}^j GRG_{1,6}} = \frac{1.0071}{1.0071+1.0034+1.0107+1.0526+1.0095+1.0744} = \frac{1.0071}{6.1578} = 0.1635$$

The results of the predetermined criterion weight value are shown in table 4 which shows the final value of the criterion weight for each criterion.

Table 4. Criterion weight value

	CR1	CR2	CR3	CR4	CR5	CR6
$w_i$	0.1635	0.1630	0.1641	0.1709	0.1639	0.1745

The result of the weight of the first criterion (CR1) has a weight of 0.1635, followed by the second criterion (CR2) with a weight of 0.1630. The third criterion (CR3) received a weight of 0.1641, while the fourth criterion (CR4) had the highest weight, which was 0.1709. Meanwhile, the fifth criterion (CR5) has a weight of 0.1639, and the sixth criterion (CR6) has a weight of 0.1745, which is the second highest weight. These weighted values will be used in the next stage of the calculation process to determine the relative importance of each criterion to the assessed alternative.

### 3.4 Application of the WASPAS Method

The WASPAS method was applied in this study to help in the selection of the best business partners. WASPAS provides a more comprehensive and balanced approach to evaluation. The process begins by building a normalized decision matrix, which is then multiplied by the weight of the pre-calculated criteria. This approach ensures that both additive and multiplicative utility sizes are considered, thereby increasing precision in decision-making. The WASPAS method allows for a systematic and objective assessment of potential partners based on various performance criteria. After calculating the WSM and WPM scores separately, the final composite score is calculated for each candidate, which allows for a clear and accountable ranking. This approach not only improves decision accuracy, but also helps minimize the risks associated with the selection of business partners by providing a transparent and measurable evaluation framework. The results of the implementation of WASPAS are a strategic guide for companies in choosing the partner that best suits their operational and strategic goals, simultaneously, resulting in a more accurate and balanced assessment.

The results matrix presents the assessment data of each alternative against all the criteria considered. These values form the basis for the normalization process and further analysis is made using (1).

$$X = \begin{bmatrix} 9 & 9900 & 8 & 5 & 7 & 3 \\ 7 & 8500 & 7 & 4 & 9 & 2 \\ 8 & 9000 & 9 & 3 & 6 & 2 \\ 6 & 7500 & 6 & 2 & 8 & 1 \\ 8 & 9800 & 8 & 5 & 8 & 3 \\ 7 & 8200 & 7 & 4 & 7 & 2 \\ 9 & 9500 & 9 & 5 & 9 & 3 \\ 8 & 9300 & 8 & 3 & 8 & 2 \\ 7 & 8900 & 6 & 2 & 7 & 1 \\ 8 & 9600 & 9 & 4 & 6 & 3 \end{bmatrix}$$

Normalization in the WASPAS method aims to change the values in the decision matrix to a more uniform scale, so that comparisons between alternatives can be fairly calculated using (6) because all criteria are beneficial.

$$x_{11} = \frac{x_{11}}{\max x_1} = \frac{9}{9} = 1$$

The results of data normalization based on predetermined criteria are shown in table 5 which shows the normalization value for each alternative in each criterion.

**Table 5.** Normalization data

Name	CR1	CR2	CR3	CR4	CR5	CR6
Partner A	1.0000	1.0000	0.8889	1.0000	0.7778	1.0000
Partner B	0.7778	0.8586	0.7778	0.8000	1.0000	0.6667
Partner C	0.8889	0.9091	1.0000	0.6000	0.6667	0.6667
Partner D	0.6667	0.7576	0.6667	0.4000	0.8889	0.3333
Partner E	0.8889	0.9899	0.8889	1.0000	0.8889	1.0000
Partner F	0.7778	0.8283	0.7778	0.8000	0.7778	0.6667
Partner G	1.0000	0.9596	1.0000	1.0000	1.0000	1.0000
Partner H	0.8889	0.9394	0.8889	0.6000	0.8889	0.6667
Partner I	0.7778	0.8990	0.6667	0.4000	0.7778	0.3333
Partner J	0.8889	0.9697	1.0000	0.8000	0.6667	1.0000

The final value of each alternative in WASPAS by combining the two components of WSM and WPM is calculated using (8).

$$Q_1 = (0.5 * \sum_{j=1}^N (x_{11,6j} * W_{1,6j})) + (0.5 * \prod_{j=1}^N (x_{11,6j}^{W_{1,6j}}))$$

$$Q_1 = (0.5 * 0.9453) + (0.5 * 9.4126E - 01)$$

$$Q_1 = 9.4330E - 01$$

The results of the final values of the alternatives are shown in table 6 which shows the final values for each alternative by the WASPAS method.

**Table 6.** Final value

Name	Final Value
Partner A	9.4330E-01
Partner B	8.0873E-01
Partner C	7.7870E-01
Partner D	5.9680E-01
Partner E	9.4295E-01
Partner F	7.6953E-01
Partner G	9.9336E-01
Partner H	8.0328E-01
Partner I	6.1748E-01
Partner J	8.8356E-01

The final result of the application of the WASPAS method is in the form of composite values obtained from the combination of the two scores, taking into account the proportion of contribution of each model. The alternative that has the highest composite value will be considered the best alternative based on the criteria that have been set. This process provides a more objective and transparent guide in making the final decision, taking into account both additive and multiplicative factors simultaneously.

### 3.5 Recommended Results

The results of the evaluation in the selection of business partners obtained the ranking of alternative business partners that best suit the predetermined criteria. This process considers various important aspects. Using a combination of G2M Weighting and WASPAS, the results obtained provide a clear picture of the relative advantages of each business partner based on an objective and comprehensive assessment. The results of the business partner selection ranking are shown in figure 2.

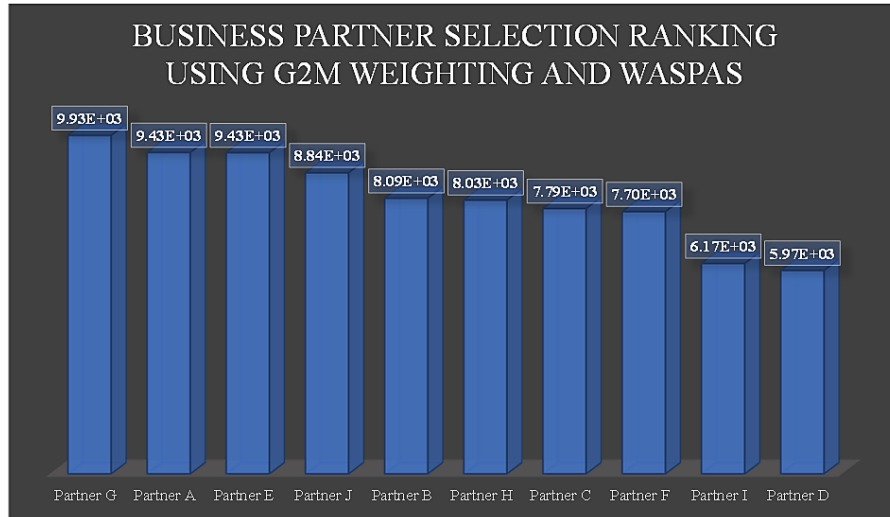


Figure 2. Business Partner Selection Ranking

The ranking chart for business partner selection using the G2M Weighting and WASPAS method shows that Partner G gets the highest score of 9.93E+03, followed by Partner A and Partner E who have the same score of 9.43E+03. Meanwhile, Partner D had the lowest score, which was 5.97E+03. This ranking of business partner selection shows that Partner G is the best choice as a business partner based on the evaluation method used.

## 4. CONCLUSION

The results of this study show that the combination of the Hybrid G2M Weighting and WASPAS methods provides an effective and objective approach in the selection of business partners. By using the G2M Weighting method to determine the weight of criteria more objectively, as well as the WASPAS method which is able to provide accurate and transparent ratings for various alternative business partners. This approach not only ensures the selection of partners that best suits the company's needs, but also minimizes the risk of biased or subjective decisions. The results of the partner selection ranking using the G2M Weighting and WASPAS methods show that Partner G obtained the highest score of 9.93E+03, followed by Partner A and Partner E who obtained the same score of 9.43E+03. Meanwhile, Partner D obtained the lowest score of 5.97E+03. This partner selection ranking shows that Partner G is the best choice as a business partner based on the evaluation method used. The final result of the application of this method provides clear recommendations regarding the best business partners based on predetermined criteria, such as product quality, managerial capabilities, price, and delivery time. Thus, this study shows that the Hybrid G2M Weighting and WASPAS approaches can be successfully applied as a decision-making tool in the selection of business partners more efficiently and effectively. The implementation of this system is expected to help companies make better decisions and support the sustainability of long-term mutually beneficial business relationships.

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