# MCDM ANALYSIS OF FACTORS THAT CONTRIBUTE TO THE IMPROVEMENT OF THE ORGANIZATION'S BUSINESS

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***Abstract**: In this paper, a multiple-criteria approach is applied in the evaluation and ranking of dimensions and factors that contribute to the improvement of the organization's business. The evaluation and prioritization of the mentioned dimensions and factors were performed with the help of **PI**vot **P**airwise **RE**lative **C**riteria **I**mportance **A**ssessment – PIPRECIA method. The main goal of this paper is to point out the usefulness of the application of Multiple-criteria decision-making (MCDM) methods in the implementation of this type of analysis.*
***Keywords**: Multiple-criteria decision-making, PIPRECIA method, analysis, business improvement, organizations, competitive advantage*

## 1. INTRODUCTION

In general, the achievement of goals in every area of human life could be considered a success. In business conditions, success reflects the difference between performance and results of capable and incapable management. There is no unique definition of that what business success is. Additionally, there exist a minimum of two significant dimensions for success: 1) financial vs. other success; and 2) short- vs. long-term success (Chittithawornnet al., 2011).

Achieving business success requires investing efforts in all considered fields that influence reaching the set of goals. In that sense, in today's environment, organizations are very sensitive to changes of different aspects that could improve or hinder their business performance and competitiveness. A lot of different dimensions and factors affect the success of an organization regardless of its type. So, managers need to consider,

acknowledge and take advantage of the particular influential dimensions and factors (Jasra et al., 2011). Given the fact that the improvement of the business of an organization is influenced by various factors, the application of Multiple-Criteria Decision-Making methods (MCDM) is perfectly justified. The key reason in favor of this statement is that MCDM methods can successfully help define which factors have the greatest impact on achieving better business results.

Multiple-criteria decision-making is very suitable for the realization of appropriate analyzes and drawing adequate conclusions. So far, a large number of different MCDM methods have been proposed, to name a few: AHP (Saaty, 1980), TOPSIS (Hwang and Yoon, 1981), PROMETHEE (Brans and Vincke, 1985), ELECTRE (Roy, 1991), ANP (Saaty, 1996) and VIKOR (Opricovic, 1998). Multiple-criteria decision-making methods have been applied in the analysis and solution of different types of problems (Yazdani et al., 2016; Zavadskas et al., 2018; Chowdhury and Paul, 2020; Goraya and Singh, 2021; Yalcin et al., 2022).

The main goal of this paper is to point out the applicability of MCDM methods in the case of performing an analysis to define the factors that have the greatest impact on improving the business of an organization. ***PI****vote* ***P****airwise* ***RE****lative* ***C****riteria* ***I****mportance* ***A****ssessment* - PIPRECIA method, proposed by Stanujkic et al. (2017) was used for that purpose. The proposed method was applied to a hypothetical example that is not related to any particular organization. The analysis and ranking of four dimensions were performed, which were divided into five factors to obtain the most authoritative results. The evaluation process is entrusted to one competent decision-maker.

## 2. PIPRECIA METHOD

PIPRECIA method, developed by Stanujkic et al. (2017), represents an improved version of the SWARA method proposed by Keršuliene et al. (2010).

The calculation procedure of this method is shown by the following steps:

**Step 1.** Selection of criteria to be included in the evaluation process. Unlike the classic SWARA method, PIPRECIA does not require the mandatory sorting of criteria according to expected importance.

**Step 2.** Determine the relative importance *of* $s_j$, starting with the second criteria, as follows:

$$s_j = \begin{Bmatrix} > 1 & when & C_j \succ C_{j-1} \\ 1 & when & C_j = C_{j-1} \\ < 1 & when & C_j \prec C_{j-1} \end{Bmatrix}. \quad (1)$$

**Step 3.** Determining the coefficient $k_j$ in the following way:

$$k_j = \begin{Bmatrix} 1 & j = 1 \\ 2 - s_j & j > 1 \end{Bmatrix}. \quad (2)$$

**Step 4.** Determining the recalculated value of $q_j$, as follows:

$$q_j = \begin{Bmatrix} 1 & j = 1 \\ \frac{q_{j-1}}{k_j} & j > 1 \end{Bmatrix}. \quad (3)$$

**Step 5.** Determination of relative weights considered criteria as follows:

$$w_j = \frac{q_j}{\sum_{k=1}^{n} q_k}, \quad (4)$$

where $w_j$ signifies the relative weight of the criteria $j$.

## 3. NUMERICAL EXAMPLE

From this point forward, the authors will make the evaluation and ranking of dimensions and factors that affect the organization's business improvement and achievement of the business success. This is a hypothetical example that is not related to any particular organization because the goal is to test the possibilities of the PIPRECIA method in the implementation of analyzes of this type. The presented dimensions on which the evaluation itself will be based have been broken down into an appropriate number of factors to obtain as realistic and authoritative results as possible. The list of dimensions and corresponding factors is shown in Table 1.

**Table 1**. Overview of dimensions and factors important for improving the business of the organization

| Dimensions | | Factors | |
|---|---|---|---|
| $C_1$ | Competition advantage | $C_{11}$ | Length of business |
| | | $C_{12}$ | Good marketing |
| | | $C_{13}$ | Good management |
| | | $C_{14}$ | Stimulating environment |
| | | $C_{15}$ | Business innovation |
| $C_2$ | Innovation | $C_{21}$ | Financial support |
| | | $C_{22}$ | Creativity of employees |
| | | $C_{23}$ | Monitoring competitors |
| | | $C_{24}$ | Consumer requirements |
| | | $C_{25}$ | Movement in the industry |
| $C_3$ | Conquering a new market | $C_{31}$ | Good marketing plan |
| | | $C_{32}$ | Added value for consumers |
| | | $C_{33}$ | A well-designed business plan |
| | | $C_{34}$ | Competition |
| | | $C_{35}$ | Innovative products/services |
| $C_4$ | Market performance | $C_{41}$ | Product/service quality |
| | | $C_{42}$ | Commercials |
| | | $C_{43}$ | Innovative performance |
| | | $C_{44}$ | Price of product/service |
| | | $C_{45}$ | The image of the organization |

**Source**: Author's research

Only one decision-maker is involved in the decision-making process because the paper aims to check and prove the applicability of MCDM methods in the analysis and solution of problems of this type. First, the importance of dimensions that have an impact on improving the organization's business will be determined. They will be evaluated using formulas (1) - (4). Table 2 shows the relative importance of the assessed dimensions.

**Table 2**. The relative importance of estimated dimensions

| Dimensions | $s_j$ | $k_j$ | $q_j$ | $w_j$ |
|---|---|---|---|---|
| $C_1$ | | 1 | 1 | 0.30 |
| $C_2$ | 1.00 | 1.00 | 1.00 | 0.30 |
| $C_3$ | 0.60 | 1.40 | 0.71 | 0.22 |
| $C_4$ | 0.80 | 1.20 | 0.60 | 0.18 |
| | | | 3.31 | 1.00 |

**Source**: Author's research

The obtained results indicate that dimensions $C_1$ – *Competitive advantage* and $C_2$ – *Innovation* have the greatest significance from the perspective of the decision-maker. In second place is dimension $C_3$ – *Conquering a new market*, while the least important is dimension $C_4$ – *Market performance*.

As can be seen from Table 1, each dimension is broken down into an appropriate number of factors. In this regard, the local significance of each group of factors will now be determined separately. This time, the formulas (1) - (4) were also used. Table 3 shows the relative importance of factors belonging to dimension $C_1$ – *Competitive advantage.*

**Table 3.** The relative importance of assessed factors – *Competitive advantage*

| **Eligibility criteria** | $s_j$ | $k_j$ | $q_j$ | $w_j$ |
|---|---|---|---|---|
| $C_{11}$ | | 1 | 1 | 0.26 |
| $C_{12}$ | 0.80 | 1.20 | 0.83 | 0.21 |
| $C_{13}$ | 0.60 | 1.40 | 0.60 | 0.15 |
| $C_{14}$ | 1.20 | 0.80 | 0.74 | 0.19 |
| $C_{15}$ | 1.00 | 1.00 | 0.74 | 0.19 |
| | | | 3.92 | 1.00 |

**Source**: Author's research

Among the factors related to competitive advantage, the most significant factor was $C_{11}$ – *Length of business*, while the least significant factor was $C_{13}$ – *Good management*.

Table 4 contains the relative importance of factors belonging to dimension $C_2$ – *Innovation*.

**Table 4**. The relative importance of assessed factors – *Innovation*

| **Eligibility criteria** | $s_j$ | $k_j$ | $q_j$ | $w_j$ |
|---|---|---|---|---|
| $C_{21}$ | | 1 | 1 | 0.20 |
| $C_{22}$ | 1.20 | 0.80 | 1.25 | 0.26 |
| $C_{23}$ | 0.80 | 1.20 | 1.04 | 0.22 |
| $C_{24}$ | 0.60 | 1.40 | 0.74 | 0.16 |
| $C_{25}$ | 1.00 | 1.00 | 0.74 | 0.16 |
| | | | 4.78 | 1.00 |

**Source**: Author's research

The obtained results indicate that the most influential factor from the group *Innovation* is factor $C_{22}$ – *The creativity of employees*. Factors that, according to the results obtained, are the least influential are factors $C_{24}$ – *Consumer requirements* and $C_{25}$ – *Movement in the industry*.
Finally, Table 6 shows the relative importance of factors related to dimension $C_4$ – *Market performance*.

**Table 6**. The relative importance of the assessed factors – *Market performance*

| **Eligibility criteria** | $s_j$ | $k_j$ | $q_j$ | $w_j$ |
|---|---|---|---|---|
| $C_{41}$ | | 1 | 1 | 0.21 |
| $C_{42}$ | 1.10 | 0.90 | 1.11 | 0.23 |
| $C_{43}$ | 1.00 | 1.00 | 1.11 | 0.23 |
| $C_{44}$ | 0.80 | 1.20 | 0.93 | 0.19 |
| $C_{45}$ | 0.60 | 1.40 | 0.66 | 0.14 |
| | | | 4.81 | 1.00 |

**Source**: Author's research

As can be seen in Table 6, the factors that stood out as the most influential are $C_{42}$ - *Advertising* and $C_{43}$ - *Innovative approach*.

Table 7 shows the importance of dimensions, the local importance of factors, and the global importance of factors based on which the final rank of factors is defined. More precisely, the order of factors according to their influence on the improvement of the business of an organization is defined.

**Table 7**. Final ranking of the evaluated factor

| **Dimensions** | | **Importance dimension** | **Eligibility criteria** | **Local importance criteria** | **Global importance criteria** | **Rank** |
|---|---|---|---|---|---|---|
| $C_1$ | Competitive advantage | 0.30 | $C_{11}$ | 0.26 | 0.078 | 1 |
| | | | $C_{12}$ | 0.21 | 0.063 | 3 |
| | | | $C_{13}$ | 0.15 | 0.045 | 8 |
| | | | $C_{14}$ | 0.19 | 0.057 | 6 |
| | | | $C_{15}$ | 0.19 | 0.057 | 6 |
| $C_2$ | Innovation | 0.30 | $C_{21}$ | 0.20 | 0.06 | 4 |
| | | | $C_{22}$ | 0.26 | 0.078 | 1 |
| | | | $C_{23}$ | 0.22 | 0.066 | 2 |
| | | | $C_{24}$ | 0.16 | 0.048 | 7 |
| | | | $C_{25}$ | 0.16 | 0.048 | 7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $C_3$ | Conquest new markets | 0.22 | $C_{31}$ | 0.27 | 0.059 | 5 |
| | | | $C_{32}$ | 0.19 | 0.041 | 10 |
| | | | $C_{33}$ | 0.16 | 0.035 | 13 |
| | | | $C_{34}$ | 0.20 | 0.044 | 9 |
| | | | $C_{35}$ | 0.18 | 0.040 | 11 |
| $C_4$ | Performance on the market | 0.18 | $C_{41}$ | 0.21 | 0.038 | 12 |
| | | | $C_{42}$ | 0.23 | 0.041 | 10 |
| | | | $C_{43}$ | 0.23 | 0.041 | 10 |
| | | | $C_{44}$ | 0.19 | 0.034 | 14 |
| | | | $C_{45}$ | 0.14 | 0.025 | 15 |

**Source**: Author's research

Based on the results shown in Table 7, we can see that individual factors are significant for the decision-makers. Undoubtedly all offered factors are exceptionally significant for the business improvement of organizations. However, in some cases, it is extremely important to identify the more influential ones, especially in situations when it is necessary to allocate resources for the implementation of appropriate activities.

## 4. CONCLUSION

In this paper, the ranking of dimensions and factors that affect the improvement of the organization's business is performed with the help of multicriteria decision-making methods. more precisely PIPRECIA methods. Four dimensions are ranked: $C_1$ – *Competitive advantage*, $C_2$ – *Innovation*, $C_3$ – *Conquering a new market, and* $C_4$ – *Market performance.* Each of these dimensions includes an appropriate number of factors. The conducted research aimed to point out the applicability of the PIPRECIA method, especially in cases where it is necessary to define which factors and, accordingly, which activities contribute to improving business performance.

The obtained results indicate that, in this considered case, the factors $C_{11}$ – *Length of business* and $C_{22}$ – *Creativity of employees* have the greatest weight and the greatest influence on the improvement of the organization's business. The factor $C_{45}$ – *Image of the organization* stood out as the least influential factor.

The key shortcoming of this paper is the fact that only one decision-maker is involved in the decision-making process, and thus the results obtained are highly subjectivized. In addition, it is a hypothetical example

that is not related to any particular company. There is a reasonable belief that depending on the type of business of the organization, as well as the respondents themselves, different dimensions would be perceived as significant and influential. In addition, the procedure itself is based on the application of integers that cannot adequately reflect the variability of the environment and uncertainty.

However, regardless of that, the usefulness and applicability of multicriteria decision-making methods in this area are completely adequate and justified. A recommendation for further research would include the application of the proposed method in defining key influencing factors on the business of a particular type of organization. In addition, the use of an extended model based on fuzzy, gray, or neutrosofic numbers is recommended.

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