Routledge
Taylor & Francis Group

Economic Research-Ekonomska Istraživanja

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rero20

What do project managers need to know to succeed in face-to-face communication?

Hedieh Shakeri , Mohammad Khalilzadeh , Saulius Raslanas & Edmundas Kazimieras Zavadskas

To cite this article: Hedieh Shakeri , Mohammad Khalilzadeh , Saulius Raslanas & Edmundas Kazimieras Zavadskas (2020): What do project managers need to know to succeed in face-to-face communication?, Economic Research-Ekonomska Istraživanja, DOI: 10.1080/1331677X.2020.1819851

To link to this article: https://doi.org/10.1080/1331677X.2020.1819851

Published online: 15 Oct 2020.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA
https://doi.org/10.1080/1331677X.2020.1819851

What do project managers need to know to succeed in face-to-face communication?

Hedieh Shakeri[a], Mohammad Khalilzadeh[b,c], Saulius Raslanas[d] and Edmundas Kazimieras Zavadskas[e]

[a]Department of Industrial Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran; [b]CENTRUM Católica Graduate Business School, Lima, Peru; [c]Pontificia Universidad Católica del Perú, Lima, Peru; [d]Department of Construction Management and Real Estate, Vilnius Gediminas Technical University, Vilnius, Lithuania; [e]Institute of Sustainable Construction, Vilnius Gediminas Technical University, Vilnius, Lithuania

ABSTRACT

Despite emphasising the great importance of project communications to enhance success in the literature, there are few studies underlining the application of psychology to project communications, and no studies regarding the identification and analysis of factors affecting face-to-face communications with stakeholders in different situations. The research here aims to fundamentally address this shortcoming. The factors affecting face-to-face communications and different communication situations have been identified by interview with several experts in psychology and project managers working in oil and gas megaprojects. The data have been analysed by using two questionnaires and the hybrid Fuzzy DEMATEL-ISM and BWM methods. The final results show that the importance of each of these effective factors in face-to-face communication varies in different situations, and that some of these factors influence each other and some are influenced by one or another. Proxima has the greatest influence on other factors. Also, body language has great influence on other factors. The results of the current study could still serve as a reflection of what might be expected at a more general level for face-to-face communications to support good communications planning. The Video Neuro advertising Recommender System improved by applying the obtained research results.

ARTICLE HISTORY
Received 26 March 2020
Accepted 1 September 2020

KEYWORDS
Communications management; communication psychology; face-to-face communications; fuzzy DEMATEL; interpretive structural modelling (ISM); best worst method (BWM)

JEL CODES
M1; Y4; Y5

1. Introduction

Today, failure of projects is a major challenge in the field of project management. In this regard, one of the most important recognised factors is the project communication (Zwikael & Globerson, 2006). Over 90% of the project manager's time is spent on communications and the project manager should focus on project

CONTACT Mohammad Khalilzadeh khalilzadeh@pucp.edu.pe

communications and must be skilled at communicating with various stakeholders such as top management, customers, project team, and the other project managers (PMBOK 6th Edition).

Undoubtedly, communication is the most valuable skill that any manager can have. It is their ability to communicate that relates people to each other in organisations and societies. Wherever humans are concerned, psychological principles and practices are also presented in relation to humans. The project manager, as the person responding to the stakeholders, should have a good understanding of issues related to psychology and the labour force, because the project is a temporary organisation and does not provide people with much time for long-term communications.

With the start of the 21st century, a new dimension called Emotional Intelligence was added to human intelligence, which is considered by many as being responsible for human success in life (Katyal & Awasthi, 2005). The researchers define Emotional Intelligence as self-management and self-awareness as well as relationship management in a way that one can identify these feelings and their changes in individuals' verbal and non-verbal expression, and control them (Mayer et al., 2000). Psychologists and researchers believe that most people react to different situations on the basis of their habits. Therefore, feelings can be better controlled, and emotions can be better managed by attending to behavioural habits and focusing on feelings and emotions created in us in different situations.

Although a great deal of research has been carried out in the area of project communications and project planning, unfortunately there is no specific research on the application of psychology to project communications planning. Hence, in order to achieve project success, it is of the utmost importance to identify the effective factors in face-to-face communications (interpersonal processes) from a psychological perspective, and identify the effect of these factors on each other and on individuals' perceptions and feelings. Also, the project manager's perception of the parties involved, and her/his understanding of various communication situations inside and outside the organisation are deemed to be of importance in this regard.

In this study, our general objective is to identify and analyse the interpersonal factors affecting face-to-face communications in the project, as well as to answer the following key questions in order to better understand these factors and assist project managers in face-to-face communications planning in different situations.

1. What are the most important factors affecting face-to-face communications from experts' point of view?
2. How are these factors prioritised in terms of the extent and the level of their effect on face-to-face communications?
3. What is the intensity of the influence these factors have in relation to each other?
4. Does the weight of these factors change in different situations with different stakeholders, and to what extent?

This study was conducted in Iran in collaboration with different psychologists and the project managers of several oil and gas megaprojects. To achieve the objectives of this study, first, the interpersonal factors affecting human communications from a

psychological point of view were identified by literature surveys and interviewing experts; then, different communication situations were identified by interviews with project managers. Subsequently, the hybrid FDEMATEL-ISM method was applied to analyse these factors. Subsequently, the weight of each of these factors was examined in different scenarios by using the BWM method.

2. Literature review

2.1. Project success and the role of communication in project success

In 2000, the PA Advisory Group reported that 70% of organisations were constantly failing to deliver their projects (Mascia, 2016). These results were disappointing and, since then, many researchers have carried out several studies on the causes of project success and failure. Van Den Hooff and De Ridder (2004) stated that project success heavily depends on communication and cooperation between stakeholders, so that project managers spend most of their times on effective communication with team members and other stakeholders. Maylor et al. (2006) defined project success in successful project delivery, successful communication, understanding the needs of stakeholders and success of the organisation by achieving project benefits.

Hyvari (2007) expressed that project managers' experience in managing changes and their communication capabilities are crucial for project success. Good communication between key stakeholders is essential for the success of any construction project (Zavadskas et al., 2010). Sivasubramaniam et al. (2012) denoted internal and external communication as one of the factors affecting project success. Yong and Mustaffa (2013) indicated effective communication as the factor influencing the success of construction projects in Malaysia. In addition, Montequin et al. (2014) defined continuous and effective communication with all stakeholders as one of the project success factors. Cserhati and Szabo (2014) stated that communication, cooperation and leadership are more relevant to the success of projects than other criteria. Ninety per cent of a project manager's time is spent on project communications (PMI, 2017).

Past studies show that communication is an important factor in project success (Anantatmula, 2015). Liu and Cross (2016) emphasised the essential role of effective internal and external communication in project success. Each project has stakeholders who are influenced by the project or can positively or negatively influence the project. The ability of the project manager and team to correctly identify and involve stakeholders reflects the difference between project success and failure. Active stakeholder engagement focuses on continuous communication with stakeholders (PMI, 2017). Aligning the different goals, interests and expectations of stakeholders is directly attributed to the success of the project (Aaltonen, 2011). One of the main objectives of project stakeholder management is to increase the project management team's understanding of diverse stakeholders and their ability to involve stakeholders in order to maintain their support and align their goals with the project's goals (Yang et al., 2014).

Communicating with stakeholders yields effective engagement of different stakeholders and conflicts resolution, and plays a key role in managing project

stakeholders (Aladpoosh et al., 2012; De Oliveira & Rabechini, 2019; Welch & Jackson, 2007). Without stakeholders' engagement, a project will not achieve its goals. Therefore, different communication needs in the project life cycle must be identified (Lohikoski et al., 2005).

The project communication process is managed by the project team using different project tools and techniques. The multidisciplinary feature of operational groups and stakeholders, long project life cycle and complex organisational structure make communication more complicated. In addition, it should be noted that the geographical distribution of the project team and stakeholders and the lack of a common language are important issues in effective communication (Senaratne & Ruwanpura, 2016). Communication specifications, communication tools, project manager's viewpoint on communication habits and how to communicate with others, and introduce project's goals and objectives to stakeholders can be considered as factors influencing project communication management (Berggreen & Kampf, 2015). Effective communication links the various stakeholders involved in the project such as management, project team, and customers (Pheng, 2018).

Many studies have been conducted on the critical success factors of projects. However, very little research has been done on the soft factors affecting project success. Project performance is affected by the internal and external factors, and soft factors, which are mostly related to teamwork and interpersonal skills (Jeng, 2011), are often overlooked

Critical success factors are broadly categorised into manpower/organisational, technical, and economic groups. Although each of these factors is important, there is growing consensus among researchers that the human factor is more important for project success than technical and economic factors (Ju et al., 2016). Louw and Plooy-Cilliers (2014) explain that awareness and perception have a profound effect on communication since they determine how we see other people and their behaviour; therefore the direction in which we need to respond to people and their behaviours is important. Yap et al. (2017) stated that effective communication is considered as the competence of a project manager and a prerequisite for successful project management,which is vital for controlling project schedule and cost.

Challenges in large-scale projects are largely related to human skill and competence rather than technical issues (Müller & Jugdev, 2012; Rezvani et al., 2016). The project manager must have a variety of skills, including interpersonal skills, technical skills and the ability to understand stakeholders' power and influence to successfully manage the project (Pant & Baroudi, 2008). Rezvani et al. (2016) showed how behavioural skills competence, i.e., the capability of managing and understanding emotions in oneself and others, can affect outcomes. They also indicated that managers with high levels of emotional intelligence were more motivated to communicate effectively and do complex tasks creatively, thus increasing the chances of success in large projects.

Hendon et al. (2017) examined the effect of positive emotional intelligence on the effectiveness of communication. Rezvani et al. (2018) discovered that there are no studies on multilevel analysis of emotional intelligence in the literature of project

management and revealed that there is a significant relationship between emotional intelligence and project team performance.

2.2. Emotions in interactions

There is a growing consensus that emotions play an important role in regulating social interactions (Morris & Keltner, 2000; Oatley & Jenkins, 1992; Van Kleef et al., 2004). Effective communication in the negotiations depends on how much we can motivate others, and it requires that we really understand the audience and take their personal goals and aspirations seriously. We need to understand what motivates them and what encourages them. For this purpose, we have to ask ourselves what we should not do to aggravate the discomfort (Peleckis et al., 2015).

Considering the information value of emotions in the negotiations, it is important to pay attention to the difference between the intrapersonal and interpersonal effects of emotions (Morris & Keltner, 2000). Intrapersonal models mainly focus on side-effects (mood states), whereas interpersonal models mainly focus on emotions arising from social interactions and are related to the situation (Van Kleef et al., 2004).

2.3. Identification of factors

'The analysis of the purpose can be performed by the criteria of effectiveness, which have different dimensions, different significances' (Zavadskas et al., 2008).

2.3.1. Verbal: voice, and tone of voice

Verbal communications make up 7% of an individual's communications, and tone of voice makes up 38% of verbal communications. In verbal communication, the goal is to influence the others' behaviour (Mehrabian, 1971). The auditory aspects of communication are as important as the message itself, and include features like loudness, tone of voice, the effect of pronunciation on how the message is understood, etc. (Linneman, 2013). Listening carefully to what is being said in words is one of the ways to decode communication signals (Navarro,2013).

In human communication, not only information transmitted by the content of the words is important, but how to say words and the nuances of voice used is also important (Peleckis et al., 2015). In negotiations, the emphasis on the meaning of a word is accompanied by a change in sound, such as a resonance, loudness, or repetition of words (Lieberman, 1999; Peleckis et al., 2015).

2.3.2. Body language

Messages that your body sends are non-verbal communications such as eye movements, facial expressions, body postures, gestures, and body movements, which are used more or less consciously or unconsciously, effectively or ineffectively in daily life (Goman, 2011).

In addition to managing personal interaction, non-verbal behaviour may also exhibit a subtle sign of emotions. The use of non-verbal communication to express emotions and attitudes, and to build and maintain relationships is a recognised social

skill (Gabbott & Hogg, 2001). The body language of the respondent reflects his or her physical and emotional state and indicates the extent to which the negotiation, by which one can enhance or supplement oral language (Peleckis et al., 2015) is effective.

'A good negotiator must consciously manage his non-verbal language, to understand what he is demonstrating for his opponent as well as to know how to understand the opponent's body language' (Pease & Pease,2012). A good negotiator must manage his or her non-verbal language and know and understand the body language of the target audience. These considerations are very important and can change the negotiation process and the final outcome of the negotiations. The ability to understand the body language of the other party, how he or she thinks and feels and responds is very important in negotiations and communication and developing this ability requires much effort (Peleckis et al., 2015).

The difference between verbal and body language causes distrust. For example, when you say you support an idea, but when you say this, your hands on your chest are defensive and your chin is down, indicating your inner opposition to that statement. Non-verbal signs are about five times more effective than verbal signs (Pease & Pease, 2012). It should be noted, however, that body language must be assessed in environmental terms. For example, hands tied on the chest in winter can be used to keep the body warm (Messinger,2013).

Fortunately, the decoding skills and knowledge of body language signs can be learned and developed (Peleckis et al., 2015). This behaviour must be conscious, and conscious behaviour requires constant effort, energy, focus and practice (Navarro, 2013).

2.3.3. Colour

Colours are one of the main visual stimuli, helping us not only with recognition but also with idealisation. Almost the most widespread usage of colour is to stimulate emotions. Depending on the situation, the inherent ability of colour to send different messages can be used to control and manage individual and collective behaviours, and to target the level of unconscious reactions in non-verbal communications (Jaberi Rad & Farajpahlou, 2012).

2.3.4. Reflection

When we trust or like some people and feel comfortable with them, we unconsciously reflect their body language. When we reflect someone's body language, we unconsciously convey a positive, friendly feeling to him or her This phenomenon is called reflection, which is not limited only to gestures, and includes the tone of voice and the speed of the conversation (Mascia, 2016).

2.3.5. Proxemics

Proxemics refers to the use of personal space in establishing communication. Space and distance between individuals influence interpersonal communication (Andersen et al., 2010). Violation of personal space is identified as a threat to communication (Bonaccio et al., 2016). Proxemics is the most useful thing you need to have in communication strategy, especially when there are important messages to convey. You

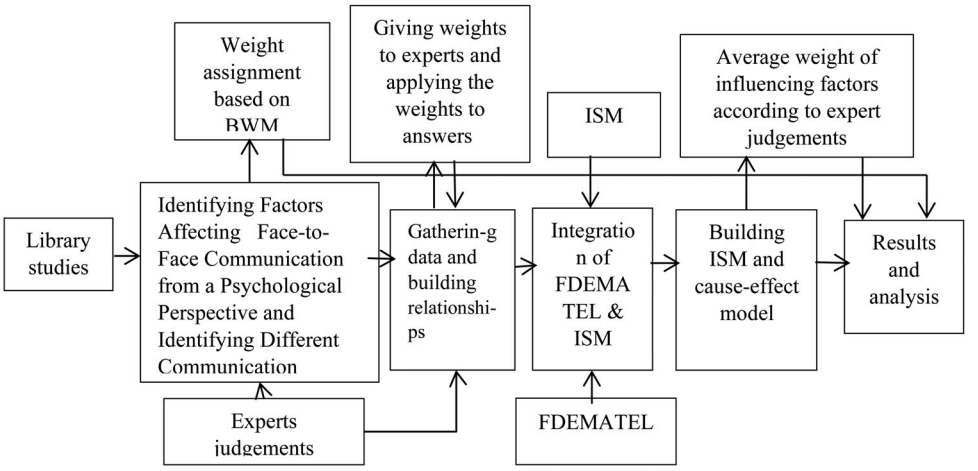

Figure 1. Flowchart of the research steps.
Source: Authors.

should choose a place where your audience feels comfortable, and any potential stress is minimised. You need to pay attention to what message you send while standing; this should be taken very seriously. When you talk to others at a similar height, they are more willing to collaborate with you (Mascia, 2016).

If your negotiator increases the distance between herself or himself and you in the negotiations, it means that he or she does not like anything. (Navarro, 2013). Posture or violation of personal space can be associated with hatred or hostility. Failure to observe it can prevent concentration, alertness, or objective thinking (Pease & Pease,2012).

2.3.6. Clothing

Personal appearance plays an important role in the immediate stereotyping of individuals and conveys information to the recipient of the communication, If we want to dominate people and make them feel good, there are certain factors that we need to consider in our calculations, like how to dress, what colours to wear in different situations to look warm and decisive, or to have a bit of self-defence and regret (Mascia, 2016).

3. Research methodology

This section discusses the data collection process, the panel of experts, and the analysis tools, namely the hybrid FDEMATEL-ISM and BWM methods. The flowchart of these research steps is shown in Figure 1.

Two expert groups were identified and chosen for this study: a group of 12 experts in psychology with a Ph.D. degree in psychology with at least 10 years of relevant work experience, and a group of project managers with at least 10 years of relevant work experience and a willingness to participate in the study (Figure 1, Tables 1 and 2).

3.1. Data collection and analysis

Data collection was carried out by library research and field study. In this research, various situations in communications with stakeholders were identified and

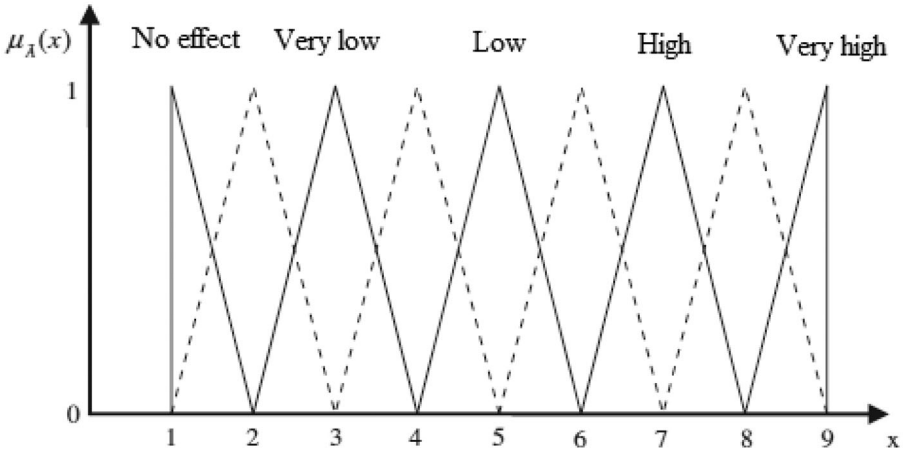

Figure 2. Membership functions of triangular fuzzy numbers.
Source: Authors.

Table 1. Demographic information related to experts in the field of psychology.

Gender			Experience		
Male	Female	Education level	10–15	15–20	>20
8	4	PhD in Psychology	8	2	2

Source: Authors.

Table 2. Demographic information related to experts in the field of project management.

Gender		Education level				Experience		
Male	Female	Bachelors	Masters	PhD	PMP certificate	10–15	15–20	>20
8	2	2	7	1	4	6	3	1

Source: Authors.

categorised by open one-to-one interviews with project managers (Table 3) and the final classification was reviewed by psychology experts. The factors affecting face-to-face communication were first identified by conducting library research and interviews with experts. Then, the intensity of these factors' effects and their levels of influence were determined by using the hybrid Fuzzy DEMATEL and ISM methods. Subsequently, the weight of each of these identified factors affecting face-to-face communication in different scenarios was identified by using the BWM technique.

3.2. Hybrid Fuzzy FDEMATEL-ISM method

Theoretically, communication is considered to be a very complex system that incorporates a set of interdependent elements. As a result, a model that is unable to account for these relationships cannot be appropriate for analysis.

Wu (2008) reports in his study that the Analytical Network Process (ANP) has been used in numerous studies, but is not ideal and accurate for analysing interactive relationships. ISM and DEMATEL methods appear to be suitable techniques for

Table 3. Various communication scenarios.

Scenario number	Explanation of scenario
1	**The project manager is in a position of power in relation to their audience, and although the other party is relatively in a weak position, his/her organisational position, role and responsibility in the project is higher than the project manager (When the other party failed to fulfil his/her contractual and business obligations)**
2	**The project manager is in a position of power and the other party has the same organisational or social position, or the same role and responsibility in the project.**
3	**The project manager is in a position of power and the other party's organisational or social position, or role and responsibility in the project is lower than the project manager; however, the project manager is generally satisfied with the audience, even when he or she has made a mistake or neglected a duty, such as a project team member has misconducted some duties.**
4	**The project manager is in a position of power and the other party's organisational or social position, or role and responsibility in the project is lower than the project manager, and the project manager is not generally satisfied with the audience.**
5	**The project manager is in a weak position in relation to the other party (like when the project manager has failed to fulfil the commitments on time). Also, when the audience is in a higher organisational or social position, or with more role and responsibility in the project.**
6	**The project manager is in a weak position and the other party has the same organisational or social position, or the same role and responsibility in the project.**
7	**The project manager is in a weak position (like when he/she has failed to fulfil the commitments such as providing the staff with recognition and rewards, or when the project manager encourages an individual to work overtime so that the project progresses faster, or when the project manager rejects a request for leave, etc.) but the other party's organisational or social position, or role and responsibility in the project is lower than the project manager.**

Source: Authors.

empowering hierarchical structures, and both methods provide a clear display of the relationships within the system (Wang et al., 2018).

In this study, we apply a hybrid Fuzzy FDEMATEL-ISM model; ISM is used to prioritise factors and DEMATEL is applied to determine the priority and intensity of quantified relationships among factors. The reason for using both approaches is that ISM only determines the level of influence of the factors on each other, and helps to identify the interrelationships among the factors, and it is an appropriate technique to analyse the impact of one factor on other factors, and it helps to prioritise and determine the level of factors in a system, but it does not quantify the intensity of interactions and relationships among the factors, a deficiency which is resolved when ISM is combined with DEMATEL.

On the other hand, the disadvantage of DEMATEL is decision making under uncertainty, which can be overcome by using the Fuzzy DEMATEL technique. The Fuzzy DEMATEL method uses fuzzy linguistic variables to facilitate decision making under uncertainty. This technique is applied to the fields of production, organisation management, information systems, and social sciences (Zhou et al., 2011). The hybrid Fuzzy ISM-DEMATEL approach provides relationships among the criteria in the best possible way (Chuang et al., 2013).

Implementation steps of the hybrid Fuzzy FDEMATEL-ISM method

Step 1: Designing Fuzzy Verbal Scale (Baykasoğlu et al., 2013)

To tackle ambiguity which always exists in decision making processes, fuzzy sets have been introduced by Zadeh in 1965 (Zadeh, 1965) as an extension of the classical sets. Therefore, fuzzy numbers should be used to express the inherent ambiguity of

Table 4. Verbal phrases used in the research and their equivalent values.

Fuzzy number	Fuzzy value	Verbal phrase
$\tilde{1}$	(1 ,1 ,1)	No effect
$\tilde{2}$	(2 ,3 ,4)	Very low effect
$\tilde{3}$	(4 ,5 ,6)	Low effect
$\tilde{4}$	(6 ,7 ,8)	High effect
$\tilde{5}$	(8 ,9 ,9)	Very high effect

Source: Authors.

experts' opinions in decision making processes and solve complex decision making problems (Herrera-Viedma et al., 2014; Kahraman, 2008; Liu et al., 2020). Fuzzy numbers such as triangular fuzzy numbers are used to deal with fuzzy multi-criteria decision making problems (Gani & Assarudeen, 2012).

Fuzzy sets, triangular fuzzy numbers and linguistic terms

To measure experts' opinions on the severity of the effects of communication factors on each other, in pairwise comparisons, five linguistic variables of 'No effect', 'Very low effect', 'Low effect', 'High effect' and 'Very high effect' were used, which are a function of membership.

'In the present study, the following fuzzy triangular numbers were used,$\tilde{1};\tilde{3};\tilde{5};\tilde{7};\tilde{9}$, in assigning weights. The spread of these numbers is defined as follows (1, 1, 1), (2, 3, 4), (4, 5, 6), (6, 7, 8), (8, 9, 9)' (Baykasoğlu et al., 2011) Figure 2.

The names of these verbal phrases and their equivalent fuzzy values are shown in Table 4.

Step 2: The incompatibility rate of the matrix of responses

Response incompatibility in the matrices of pairwise comparisons was calculated by the method proposed by Jeng (2015)

Step 3: Forming judgement matrix

After constructing the matrices of pairwise comparisons by integrating the views using the geometric mean of the comments with the equation (1), the ideal decision matrix or the judgement matrix is formed.

$$\tilde{g}_{ij} = (\tilde{d}_{ij}^{1}, \tilde{d}_{ij}^{2}, \ldots\ldots\ldots, \tilde{d}_{ij}^{k})^{\frac{1}{k}} \tag{1}$$

k denotes the number of experts.

Step 4: Normalising the judgement matrix

The equations (2) and (3) are applied to normalise the obtained matrix (Lin & Wu, 2008).

$$\tilde{H}_{ij} = \frac{\tilde{z}_{ij}}{r} = \left(\frac{l_{ij}^{'}}{r}, \frac{m_{ij}^{'}}{r}, \frac{u_{ij}^{'}}{r}\right) = \left(l_{ij}^{''}, m_{ij}^{''}, u_{ij}^{''}\right) \tag{2}$$

And r is obtained by the following equation:

$$r = \max_{1\le i\le n}\left(\sum_{j=1}^{n} u_{ij}\right) \tag{3}$$

Step 5: Forming the aggregation matrix of fuzzy relations

Subsequently, the aggregation matrix of fuzzy relations is obtained by the equations (4–7).

$$T = \lim_{k\to+\infty}(\tilde{H}^1 \oplus \tilde{H}^2 \oplus \ldots \oplus \tilde{H}^k) \tag{4}$$

Each element of the matrix is a fuzzy number $\tilde{t}_{ij} = (l_{ij}^t, m_{ij}^t, u_{ij}^t)$ and is calculated as follows:

$$[l_{ij}^t] = H_l \times (I - H_l)^{-1} \tag{5}$$

$$[m_{ij}^t] = H_m \times (I - H_m)^{-1} \tag{6}$$

$$[u_{ij}^t] = H_u \times (I - H_u)^{-1} \tag{7}$$

In the above equations, l is an identity matrix, H_l, H_m, and H_u are an $n \times n$ matrix whose elements consist of the low numbers, the middle numbers, and the high numbers of the triangular fuzzy numbers in Matrix H (Lin & Wu, 2008).

Step 6: Defuzzification

The fuzzy numbers obtained in the previous step are defuzzied by using the equation (8).

$$B = \frac{(a_1 + a_3 + 2 \times a_2)}{4} \tag{8}$$

B is the defuzzied form of $\tilde{A} = (a_1, a_2, a_3)$.

Step 7: Calculating the sum of rows and columns of the matrix

The sum of rows and columns of the matrix $\tilde{T}$ is obtained by the equations (9) and (10).

$$\tilde{D} = (\tilde{D}_i)_{n\times 1} = \left[\sum_{j=1}^{n} \tilde{T}_{ij}\right]_{n\times 1} \tag{9}$$

$$\tilde{R} = (\tilde{R}_i\ )_{1\times n} = \left[\sum_{i=1}^{n} \tilde{T}_{ij}\right]_{1\times n} \tag{10}$$

In which $\tilde{D}$ and $\tilde{R}$ are $n \times 1$ and $1 \times n$ matrices respectively.

In the next stage, the importance of the indices $(\tilde{D}_i + \tilde{R}_i)$ and the relationships among the criteria $(\tilde{D}_i - \tilde{R}_i)$ are determined.

If $\tilde{D}_i - \tilde{R}_i > 0$, the criterion is affecting, and if $\tilde{D}_i - \tilde{R}_i < 0$, the criterion is affected.

Influence weights of the criteria were calculated and normalised by using the equation

$$w_j = \left[(D_i + R_i)^2 + (D_i - R_i)^2\right]^{\frac{1}{2}}$$

$$\overline{W}_j = \frac{w_j}{\sum_{j=1}^{n} w_j} \tag{11}$$

Step 8: calculating the threshold limit and forming the influence matrix

Decision makers need to set a threshold limit for filtering minor effects. The threshold value (γ) is obtained by expert judgement or the mean of the numbers in the total influence matrix (H) (Fu et al., 2017).

$$H = Tc + I = \left[h_{ij}\right]_{n\times n} \tag{12}$$

In the above equation, l is the identity or unit matrix, and Tc is the total relation matrix.

The influence matrix (K) is obtained by the following equation:

$$K = [K_{ij}]_{n\times n}$$

$$\begin{cases} K_{ij} = 1, \ \ if\ \ h_{ij} > \gamma\ \ (i,j = 1,2,\ldots,n) \\ K_{ij} = 0, \ \ if\ \ h_{ij} \le \gamma\ \ (i,j = 1,2,\ldots,n) \end{cases} \tag{13}$$

Step 9: Forming total influence matrix

The total influence matrix (H) must be raised to the power of $M + 1$, to achieve a stable state: $K^M = K^{M+1}$.

Step 10: Determining the level of the criteria

To determine the level of the criteria, two sets are defined: available or reachable set (Rci), and antecedent set (Aci). Then the commonalities between the two sets are obtained. Thus, the available set for each element is a set in which the rows of the

total influence matrix appear as one; and the antecedent set is a set in which the columns appear as one. By obtaining the commonalities between these two sets, a common set ($R_{ci} \cap A_{ci}$) is found. Elements in which the common set is the same as the available set, are assigned the first level of priority. By eliminating these elements and repeating this step for the other elements, the levels of all elements are determined (Fu et al., 2017).

Step 11: Creating the Interpretive Structural Model (ISM)

The model is developed based on the identified levels. Relationships among variables are also determined by the influence matrix (Fu et al., 2017).

Step 12: MICMAC Analysis

The purpose of this step is to draw a graph of the drive-dependence power of factors, and to analyse them. A criterion, along with the number of criteria that are affected, represents the drive power of that criterion. On the other hand, the number of criteria that affect that criterion indicates its dependence power. MICMAC analysis uses the drive and dependence powers in clustering factors; the factors are divided into four clusters: autonomous, dependent, linkage, and independent by using the overall effect matrix.

The first cluster includes autonomous factors that have weak drive and dependence power. These factors are separate from the system and have little relationship with the other system elements. The second cluster includes dependent factors that have weak drive power and strong dependence power. The third cluster includes linkage factors that have strong drive and dependence powers. The fourth cluster includes independent criteria that have strong drive power and weak dependence power. In this method, a criterion with strong drive power is called a key criterion which falls into the cluster of independence and linkage factors based on the afore-mentioned clustering method.

3.3. Best Worst Method (BWM)

The Best Worst Method (BWM) was used to address multi-criteria decision making problems. In a multi-criteria decision making problem, a number of alternatives are analysed in relation to a number of criteria in order to choose the best alternative (Rezaei, 2015). After identifying different scenarios, BWM was applied to determine the weight of each factor affecting face-to-face communication using Lingo software version 11.

The steps of BWM (Asadabadi et al., 2020)

Step 1: Determine the best (highest priority) and the worst (lowest priority) components among the total of existing components.

Step 2: Determine the preference of the best component over all other components using a 1 to 9 scale, where 1 is the best preference and 9 is the least preference.

This results a vector $A_B = (a_{B1}, a_{B2} \ldots, a_{Bn})$ where the preference of the best component, B, over component j is shown by a_{Bj}.

Step 3: Determine the preference of all the components over the worst component using the same scale.

This results in a vector, $A_W = (a_{1W}, a_{2W}, a_{nW})^T$, where the preference of the component over the worst component, W, is shown by a_{jW}.

Step 4: Compute the optimal weights $(w_1, w_2, \ldots, w_n)$.

The perfect comparisons, which result in the perfect weights for the components, happen where for each pair of w_B/w_j and w_j/w_W, the following equations are true: $w_B/w_j = a_{Bj}$ and $w_j/w_W = a_{jW}$. However, a perfect comparison is unlikely when the number of components goes beyond 4 or 5. The weights of the components can be computed where the maximum absolute differences: $\left|\frac{W_B}{W_j} - a_{Bj}\right|$ and $\left|\frac{W_j}{W_w} - ajw\right|$ for all j, are minimised.

$$\left.\begin{array}{c} \left|\dfrac{\mathbf{W_B}}{\mathbf{W_j}} - \mathbf{a_{Bj}}\right| \le \varepsilon \ , \ for \ all \ j \\ \left|\dfrac{\mathbf{W_j}}{\mathbf{W_W}} - \mathbf{ajw}\right| \le \varepsilon, \ for \ all \ j \\ \sum_j w_j = 1 \\ w_j \ge 0 \ for \ all \ j \end{array}\right\} \tag{14}$$

The letter ε denotes the inconsistency of comparisons.

By solving the above equation, the optimal values of $(\mathbf{W}_1^*, \mathbf{W}_2^*, \ldots \mathbf{W}^{\star}_{\mathbf{n}})$, and the value of $\boldsymbol{\varepsilon}^*$ are obtained.

Then, a compatibility rate is introduced by using $\boldsymbol{\varepsilon}^*$. It is found that greater values for $\boldsymbol{\varepsilon}^*$, lead to greater compatibility rate and smaller reliability of comparisons.

This compatibility rate is in the range [0 1] and the closer it is to zero, the more compatible and consistent the comparisons are, and the closer it is to one, the less compatible and consistent the comparisons are.

$$\text{Compatibility rate} = \frac{\boldsymbol{\varepsilon}*}{\text{compatibility index}} \tag{15}$$

4. Results

In this study, seven factors were selected as effective factors on face-to-face communication and seven communication situations by research literature and specialised interviews. The next step was to identify the causal relationship between them. Experts' judgements have been used to understand the internal relationships among the factors. In the Fuzzy DEMATEL-ISM technique, experts are able to express their opinions on the effects (direction and intensity of effects) among the factors. Then, the weight of each factor was calculated by using BWM regarding the different situations. Finally, the collected data were analysed.

Table 5. Response matrix of expert 1.

	A	B	C	D	E	F	G
A	0	L	VH	H	L	VH	VH
B	L	0	L	NO	NO	L	NO
C	H	L	0	NO	L	H	H
D	VH	L	NO	0	L	H	VH
E	L	NO	L	L	0	H	H
F	VH	L	H	H	L	0	VH
G	VH	NO	L	H	L	L	VH

A = Body language; B = Clothing colour; C = clothing; D = reflection; E = proxemics; F = Verbal communication; G = Active listening.
Source: Authors.

Implementation: The questionnaire was given to 12 experts and analysed after completion by them. In this methodology, in pair-wise comparison matrix, indicators were compared two by two and respondents should use codes of verbal expressions (Table 5). The names of these verbal phrases and their equivalent fuzzy values are shown in Table 4.

4.1. Compatibility of the response matrix

After distributing and collecting the pairwise comparisons questionnaires, the incompatibility rate was between 0.003 and 0.044. Since the obtained numbers are less than 5%, the response matrix is appropriately compatible.

4.2. Hybrid FDEMATEL-ISM

Using the pairwise comparisons questionnaires, the experts were asked to determine the intensity of the factors affecting face-to-face communication on the basis of the verbal. The matrix of experts' aggregate judgements was compiled (Table 6).

Fuzzy Decision making trial and evaluation laboratory technique

1. First, forming weighted judgement matrix; after constructing the matrices of pairwise comparisons by integrating the views using the geometric mean of the comments with the Eq. 1, the ideal decision matrix or the weighted judgement matrix is formed.
2. Then, normalising the weighted judgement matrix; the Eqs. 2 and 3 are applied to normalise the obtained matrix (Table 7)
3. In the next step, the total relation matrix (T) is computed using the Eqs.4–7 (Table 8). Total relation matrix can reflect the comprehensive direct and indirect influence among the factors.
4. Defuzzification; The fuzzy numbers obtained in the previous step are defuzzied by using the Eq. 8 (Table 9)
5. Calculating the sum of rows and columns of the matrix. The sum of rows and columns of the matrix T is obtained by the Eqs. 9 and 10 (Table 9)
6. The assumptions of FDEMATEL technique should be applied as follows to determine the relationship between factors:

Table 6. The judgement fuzzy matrix.

	A	B	C	D	E	F	G
A	(0, 0, 0)	(2.34,2.55,2.72)	(3.43,4.15,4.74)	(6.11,7.19,7.82)	(4.22,5.28,6.33)	(6.32,7.25,8.04)	(6.11,7.15,7.82)
B	(3.1, 3.96,4.78)	(0, 0, 0)	(5.24,6.26,7.27)	(3.43,4.30,5.14)	(4.51,5.35,6.11)	(4.62,5.43,6.17)	(2.46,3.2,3.85)
C	(4.22, 5.28,6.32)	(3.21,4.10,4.9)	(0, 0, 0)	(3.24,4.13,4.97)	(5.07,6.08,7.1)	(4.51,5.59,6.63)	(3.13,4.24,5.26)
D	(6.20,7.29,7.79)	(2.07,2.42,2.73)	(2.24,2.96,3.63)	(0,0,0)	(3.6,4.65,5.69)	(4.83,5.63,6.41)	(5.77,6.56,6.97)
E	(4.04,5.07,6.09)	(3.85,4.69,5.5)	(3.48,4.53,5.55)	(3.94,4.99,6.03)	(0, 0, 0)	(5.55,6.61,7.52)	(4.62,5.67,6.7)
F	(6.09,7.10,7.97)	(2.09,2.33,2.54)	(2.48,2.92,3.33)	(4.83,5.91,6.96)	(4.22,5.32,6.33)	(0, 0, 0)	(5.37,6.39,7.34)
G	(6.23,7.25,8.04)	(1.55,1.77,1.99)	(2.02,2.17,2.26)	(6.93,7.94,8.49)	(3.32,4.04,4.62)	(6.76,7.77,8.4)	(0, 0, 0)

Source: Authors.

Table 7. The normalised the weighted judgement fuzzy matrix.

	A	B	C	D	E	F	G
A	(0, 0, 0)	(0.06,0.07,0.07)	(0.09,0.11,0.13)	(0.16,0.19,0.21)	(0.11,0.14,0.17)	(0.17,0.19,0.21)	(0.16,0.19,0.21)
B	(0.08,0.11,0.13)	(0, 0, 0)	(0.14,0.17,0.19)	(0.09,0.11,0.14)	(0.12,0.14,0.16)	(0.12,0.15,0.16)	(0.07,0.09,0.1)
C	(0.11,0.14,0.17)	(0.09,0.11,0.13)	(0, 0, 0)	(0.09,0.11,0.14)	(0.14,0.16,0.19)	(0.12,0.15,0.18)	(0.08,0.11,0.14)
D	(0.17,0.19,0.21)	(0.06,0.06,0.07)	(0.06,0.08,0.1)	(0,0,0)	(0.1,0.12,0.15)	(0.13,0.15,0.17)	(0.15,0.18,0.19)
E	(0.11,0.14,0.16)	(0.1,0.13,0.15)	(0.09,0.12,0.15)	(0.11,0.13,0.16)	(0, 0, 0)	(0.15,0.18,0.2)	(0.12,0.15,0.18)
F	(0.16,0.19,0.21)	(0.06,0.06,0.07)	(0.07,0.08,0.09)	(0.13,0.16,0.19)	(0.11,0.14,0.17)	(0, 0, 0)	(0.14,0.17,0.2)
G	(0.17,0.19,0.21)	(0.04,0.05,0.05)	(0.05,0.06,0.06)	(0.18,0.21,0.23)	(0.09,0.11,0.12)	(0.18,0.21,0.22)	(0, 0, 0)

Source: Authors.

Table 8. The Total relation fuzzy matrix. (T).

	A	B	C	D	E	F	G
A	(0.29,0.71,2.45)	(0.2,0.41,1.3)	(0.26,0.53,1.66)	(0.42,0.84,2.55)	(0.33,0.7,2.26)	(0.45,0.89,2.7)	(0.42,0.83,2.49)
B	(0.31,0.69,2.32)	(0.12,0.3,1.12)	(0.27,0.52,1.58)	(0.31,0.68,2.26)	(0.3,0.63,2.06)	(0.36,0.75,2.42)	(0.28,0.64,2.19)
C	(0.34,0.74,2.47)	(0.2,0.41,1.29)	(0.15,0.39,1.48)	(0.31,0.7,2.27)	(0.31,0.66,2.17)	(0.36,0.77,2.55)	(0.3,0.69,2.32)
D	(0.4,0.8,2.39)	(0.18,0.37,1.18)	(0.21,0.46,1.49)	(0.25,0.61,2.15)	(0.29,0.63,2.05)	(0.39,0.79,2.43)	(0.38,0.75,2.26)
E	(0.36,0.78,2.58)	(0.22,0.44,1.36)	(0.24,0.52,1.68)	(0.34,0.76,2.5)	(0.21,0.55,2.11)	(0.4,0.84,2.68)	(0.35,0.75,2.46)
F	(0.4,0.8,2.47)	(0.18,0.37,1.21)	(0.22,0.46,1.53)	(0.37,0.76,2.38)	(0.31,0.65,2.12)	(0.28,0.66,2.35)	(0.37,0.75,2.33)
G	(0.43,0.83,2.43)	(0.18,0.37,1.17)	(0.22,0.46,1.48)	(0.43,0.82,2.37)	(0.3,0.64,2.05)	(0.45,0.85,2.49)	(0.27,0.63,2.13)

Source: Authors.

Table 9. Matrix TC.

Deffuzifiation of Matrix TC	A	B	C	D	E	F	G	D
A	1.04	0.58	0.74	1.16	1.00	1.23	1.14	6.9
B	1.01	0.46	0.72	0.98	0.90	1.07	0.99	6.08
C	1.07	0.58	0.60	1.02	0.95	1.11	1.00	6.33
D	1.1	0.53	0.66	0.91	0.90	1.1	1.03	6.22
E	1.12	0.61	0.74	1.09	0.86	1.19	1.08	6.69
F	1.12	0.54	0.67	1.06	0.93	0.99	1.05	6.36
G	1.13	0.52	0.65	1.11	0.91	1.16	0.91	6.39
R	7.58	3.82	4.78	7.33	6.45	7.85	7.16	
WJ	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
D + R	14.48	9.90	11.12	13.55	13.15	14.21	13.55	
D-R	−0.69 influenced	2.26 influencing	1.56 influencing	−1.11 influenced	0.24 influencing	−1.49 influenced	−0.77 influenced	
D ranking	1	7	5	6	2	4	3	
R ranking	2	7	6	3	5	1	4	
D + R ranking	1	6	5	3	4	2	3	
D-R ranking	4	1	2	6	3	7	5	

A = Body language; B = Clothing colour; C = clothing; D = reflection; E = proxemics; F = Verbal communication.
G = Active listening.
G = Active listening.
Source: Authors.

Table 10. Levels of the criteria.

criteria	Availability set R_{ci}	Prerequisite set A_{ci}	Common set $R_{ci} \cap A_{ci}$	level
A	A, D, F, G	A, B, C, D, E, F, G	A, D, F, G	1
B	A, B, D, F, G	B	B	2
C	A, C, D, F, G	C	C	2
D	A, D, F, G	A, B, C, D, E, F, G	A, D, F, G	1
E	A, D, E, F, G	E	E	2
F	A, D, F, G	A, B, C, D, E, F, G	A, D, F, G	1
G	A, D, F, G	A, B, C, D, E, F, G	A, D, F, G	1

Source: Authors.

7. If Di _ Rj < 0 and Di + Rj = M (M is a large number), i is the main problem of the situation and should be solved.
8. If Di _ Rj > 0 and Di + Rj = M (M is a large number), i solves the main problem of the situation and it should be prioritised.
9. If Di _ Rj< 0 and Di + Rj = S (S is a small number), i is a dependent factor and affected by other factors.
10. If Di _ Rj > 0 and Di + Rj = S (S is a small number), i is an independent factor and affects a small number of factors (Mousavizade & Shakibazad, 2019)

The highest sum of rows in total relation matrix. (Di) shows the order of elements that have a strong impact on other elements (the factor of Body language) (Table 9).

The highest sum of the columns (Rj) represents the order of the elements influenced (the factor of Verbal communication) (Table 9).

The cause group has positive Di-Rj value and other factors are in the effect group. Di + Rj, represents the sum of the intensity of an element both in terms of influencing and being influenced.

Based on the FDEMATEL results, the factors of clothing colour, clothing, proxemics, have the positive Di-Rj value and can be classified as the cause group and other factors are in the effect group because the Di -Rj of these factors is negative.

Clothing colour is an independent factor and affects a small number of factors. Body language and verbal communication are the main problem of the situation and should be solved.

4.3. Structural interpretive diagram

4.3.1. The hybrid Fuzzy FDEMATEL-ISM

The Initial reachability matrix; the threshold limit should be calculated and the influence matrix should be formed. (The threshold limit is 1.06).

The threshold value was obtained by expert judgement or the mean of the numbers in the total influence matrix (H) by using the Eqs. 12 and 13. The values below the threshold are of minor importance and not displayed.

The Final reachability matrix; The total influence matrix (H) must be raised to the power of M + 1, to achieve a stable state: $K^M = K^{M+1}$ (Bernoulli multiplication and addition are used here, so that $(1 = 1 \oplus 1,\ 1 = 1 \otimes 1)$

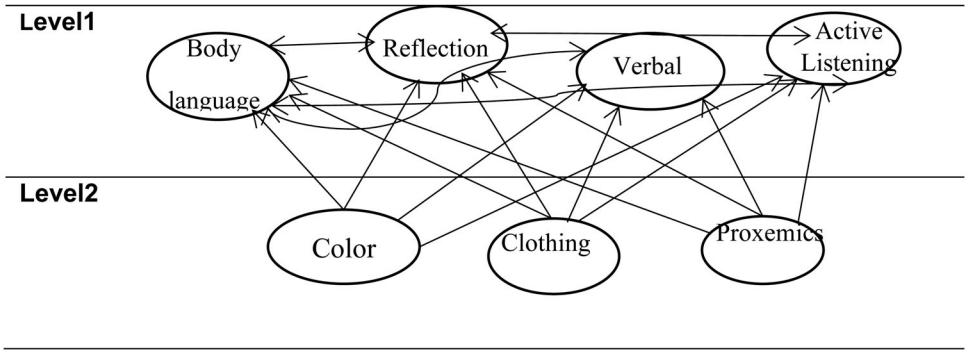

Figure 3. Structural interpretive diagram.
Source: Authors.

4.3.2. Determining the level of the criteria

From the final reachability matrix, the number of 1s in each matrix row is the accessible or output set (RC), and the number of 1s in each matrix column is the predecessor or input set (AC). After determining the input and output sets, the intersection of the two sets was determined for each factor. Factors in which the output set and joint set were exactly the same are at the highest level of the hierarchy of the Interpretive Structural Model (as shown in Table 10 (Figure 3). After the first repetition, the highest actions were eliminated from others. This step was repeated until the level of all factors was determined. In this study, two replications were performed as in Table 10.

After determining the level of all the factors affecting face-to-face communications, the research ISM is depicted as in Figure 3. As seen in Figure 3, colour, clothing and proxemics at Level 2 have the highest effect on other factors. Body language, reflection, verbal communication and active listening of the communication plan are located at Level 1, which indicates that these factors are affected by other factors.

4.4. MICMAC analysis

Based on the MICMAC analysis, and the overall effect matrix shown in Figure 4 was plotted, which demonstrates the factors affecting face-to-face communication based on the amount of drive and dependence power. Factors were categorised into four sectors as follows: (Mousavizade & Shakibazad, 2019)

1. Autonomous: These are the factors with a weak driving power and a weak dependence power.
2. Dependent: These are the factors with a weak driving power but a strong dependence power.
3. Linkage: These are the factors with strong driving and dependence power.
4. Drive: These are the factors with a strong driving power but weak dependence power

Body language, reflection, active listening and verbal communication are in Linkage factors of MICMAC chart (Figure 4). Clothing colour, proxemics and clothing are in Drive factors of MICMAC chart.

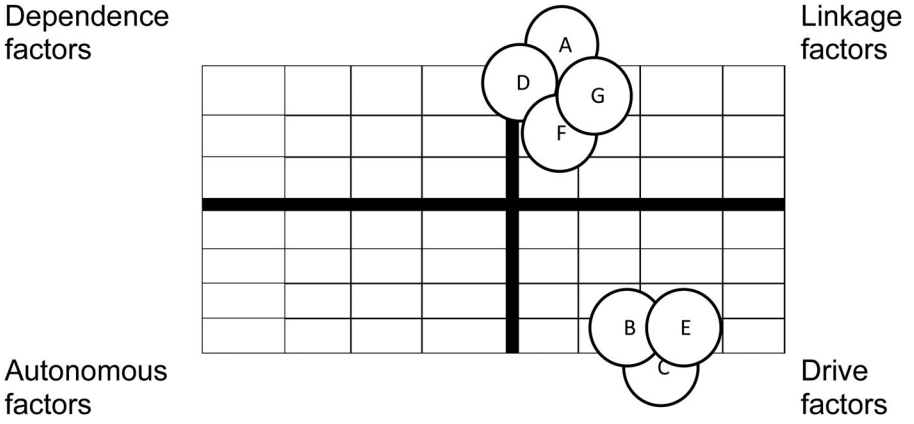

Figure 4. MICMAC analysis.
Source: Authors.

4.5. Determining the mean weights of the criteria in different situations using BWM and influence weights of the criteria

The weights of each of the factors affecting face-to-face communication were determined by using the Lingo software version 11 according to the scenarios in Table 3, along with the mean influence weights of the criteria, as presented in Table 11.

4.6. Managerial discussions

According to Figures 3 and 4 and Tables 3, 9 and 11, the following recommendations are provided in order to improve effective communication (face to face communication) between project managers and stakeholders:

Situation 1: Project manager must pay attention to body language as well as words, pitch, pace and tone, and try to keep the movements of the head and hands brief, dignified and calm (as close to the body as possible), which can show his self-confidence and authority. Project manager should speak calmly with clear voice and dignity. Since the most important stimuli in this situation are proxima and the colour of the clothes, project manager should be careful in making physical contact and maintaining distance, and ask the audience to seat on his right to attract cooperation (A. Pease & Pease,2012; O'Rourke, 2015).

Situation 2: Ch5anges in organisations, including changes in the annual budget, priorities of the organisation, authorities and responsibilities, adjustment of manpower, etc. can lead to conflict or competition between personnel with the same authorities and responsibility. Using the right words with honesty and frankness can be effective in successful negotiation. Proxima can play an important role in creating an atmosphere of friendship and cooperation. Project manager should adjust the height of his chair to the same level as his audience, and actively listen to understand what is going on in the audience's mind and find out the cause of the problem. Also, they should seek agreement on small issues first, because when they work together on an agreed alternative, they change the communication ambiance towards friendship and cooperation (O'Rourke, 2015).

Table 11. Weights of criteria based on BWM and influence weights.

		criteria							
		A	B	C	D	E	F	G	Compatibility rate
Situation1	*	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
	**	0.27	0.12	0.07	0.12	0.10	0.22	0.1	0.29
	***	0.21	0.12	0.10	0.13	0.12	0.19	0.12	
Situation2	*	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
	**	0.21	0.05	0.06	0.12	0.08	0.26	0.18	0.32
	***	0.18	0.08	0.09	0.15	0.11	0.21	0.17	
Situation3	*	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
	**	0.25	0.06	0.07	0.07	0.11	0.27	0.16	0.34
	***	0.20	0.09	0.10	0.11	0.13	0.22	0.16	
Situation4	*	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
	**	0.28	0.07	0.07	0.12	0.09	0.26	0.11	0.31
	***	0.22	0.09	0.10	0.14	0.12	0.21	0.13	
Situation5	*	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
	**	0.29	0.13	0.08	0.12	0.09	0.12	0.19	0.29
	***	0.22	0.12	0.10	0.13	0.12	0.14	0.17	
Situation6	*	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
	**	0.27	0.08	0.07	0.10	0.08	0.25	0.15	0.3
	***	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
Situation7	*	0.16	0.11	0.12	0.15	0.15	0.16	0.15	
	**	0.20	0.07	0.06	0.12	0.07	0.25	0.24	0.28
	***	0.18	0.09	0.09	0.13	0.11	0.20	0.20	

*Influence weights of criteria.
**BWM.
***mean.
Source: Authors.

Situation 3: The way of expressing and choosing words plays a decisive role in meeting and negotiation. Proxima also has a higher weight than other stimuli. In this situation, a slight difference in sitting height and being at a higher level and sitting in front of the audience can remind the audience of the position of project manager.

Situation 4: Body language is the most influential factor. The project manager can induce his seriousness and dissatisfaction to the audience to some extent by pulling his eyebrows down and staring between the audience's eyebrows. Proxima has the highest weight of stimulants. In this situation, a slight difference in sitting height and being on a higher level and sitting in front of the audience can indicate the position of project manager to the audience (Pease & Pease, 2012).

Situation 5: In this situation, body language can have the highest impact. It is better to place the palms of the hands up when talking and try to look at between the eyes and the mouth of the audience. In this situation, the project manager should not use a closed position, such as locking hands on chest or throwing legs together. In this situation, the project manager should ask the audience to seat on his right to gain the trust of the audience. In addition, the project manager should pay enough attention to the colour of his clothes and wear clothes with neutral colours such as grey. (A. Pease & Pease, 2012).

Situation 6: The body language and the way words are expressed can be effective in attracting the cooperation of the audience and creating effective communication. In this situation, Proxima is also one of the most important motivating factors.

Situation 7: The way words are spoken and active listening play an important role in effective communication. The project manager should listen carefully to what the

audience is saying to find out what is going on in the audience's mind and ask the audience what he is thinking and feeling, understand the audience's feelings and empathise with them, restrain his emotions and prepare himself for a logical and emotional response based on real information that fits the tone of the audience, sometimes ask questions to make sure he understands what the audience means, tries to see the problems from the audience's pint of view in order to receive the audience's message. In this situation, proxima is also the most effective stimulus.

It is recommended that project managers improve their knowledge of verbal and non-verbal communication skills to understand possible situations and approaches.

The Video Neuroadvertising Recommender System (ViNeRS) system (http://iti3.vgtu.lt/viners/) improved by applying the above research results. Level 1 (body language, reflection, verbal communication, and active listening) and Level 2 (color, clothing, and proxemics) factors affected face-to-face communications included in the ViNeRS system. ViNeRS comprises two principal subsystems:

- ViNeRS1, an examination and valuation subsystem for the influence of advertisements (incomplete advertisement content), evaluated the effectiveness of ads at each phase of their development, establish their gains and weaknesses, and enrich them until the most excellent attractive alternative is attained;
- ViNeRS2, an intuitional advertisement subsystem (ended advertisement content), proposed a combined analysis of neurobiological watcher reaction and real-time choice of the most incredible advertisement alternative.

5. Discussion and Conclusion

In this section, the results of qualitative and quantitative evaluation of factors affecting face-to-face communication under uncertainty are discussed.

Past studies have repeatedly identified communication as an important factor for project success, and have considered effective communication as an essential prerequisite for successful project management. Effective communications require understanding stakeholders' behaviour, feelings, and reactions to interpersonal and intrapersonal factors affecting face-to-face communications. Some project managers respond appropriately in different situations due to their high emotional intelligence. Unfortunately, many project managers are not aware of these factors and their high impact in establishing effective relationships.

According to the conducted research, interviews, and calculations it is essential that successful project managers pay sufficient attention to soft dimensions of communication, especially face-to-face communication in line with the organisations' short-term and long-term benefits. Also, they should develop their communication planning according to different situations and people, and with care and knowledge, to achieve the desired results in the meetings. Therefore, we conducted this research in order to identify these factors and analyse them in different situations of the project manager's face-to-face communications with different stakeholders.

According to surveys and numerous interviews with experts in this study, seven main interpersonal factors affecting face-to-face communication were identified: 1.

Verbal communication 2. Body language 3. Clothing 4. Colour 5. Proxemics 6. Active listening 7. Reflection. Some of these factors are influenced by the others.

Factors which receive influence include: reflection, body language, verbal communication, and active listening. The aspects which influence the afore-mentioned factors are: proxemics, clothing, and colour. These relationships are shown in Figure 3 According to the obtained results in Table 9, Proxima has the greatest influencing on other factors. Also body language has the most influence on other factors. According to Figure 4, proxemics, colour, and clothing are identified as drive factors and body language, verbal communication, reflection and active listening are recognised as linkage factors. We do not have autonomous and dependence factors; therefore all identified factors are of great importance, especially independent ones.

In this study, weight of factors was calculated in two ways. The first method was to calculate the influence power of these factors and extract their weights, and the second method was to determine the weights using the Best-Worst technique on the basis of the experts' judgements. After calculating the mean of the weights, the results were shown in Table 11. According to the results obtained in different situations, the weight and importance of each of these factors are different.

According to the results, a project manager must first pay close attention to the conversation environment. He/she must provide the right environment for his/her meetings and negotiations, and if they are to attend a meeting, they should pay close attention to their seating locations, their level and height relative to others, their distance to the audience, etc. Neglect of any of these factors directly affects other factors such as body language or tone of conversation, and can lead to undesirable interpretations or results. It may even create a defensive state in the audience that may affect other conversation topics.

Body language and verbal communication were recognised as the most influenced factors, in that they are directly influenced by all the factors that govern communication, and are manifested in the tone of conversation, and the reaction of the body, face, eyes, hands, and feet. According to Figure 3, people are unconsciously influenced by colour, clothing, and proxemics. However, they respond, either consciously or unconsciously with their body language or tone of conversation, and this will certainly affect the outcome of the negotiation.

Another issue to consider is the weights of these criteria in different communication situations, and according to the studies, seven different situations have been considered in communication designs. As shown in Table 11, the weight and the effect of these factors vary in different situations.

It should be noted that the findings must be interpreted with caution, as the study is limited to the purposive population of selected project managers. As such, it is recommended that further research should be conducted with other project managers in different industries and countries, if the results are to be expanded to the project manager's world. Nevertheless, we believe that the results of the current study could still serve as a reflection of what might be expected at a more general level for face-to-face communications to support good communications planning.

We agree with Bonaccio et al. (2016) that project management researchers need to pay attention to non-verbal communication as much as or even more than verbal

ones. We also agree with Henderson (2008) that soft skills training, specially communications skills and issues related to psychology should be given more value in order to increase the competence of project managers. The market and hedonic values of the examined projects can be calculated based on this research results, multi-criteria analysis methods (Zavadskas et al. 2017, 2019), and neuro decision matrices (Kaklauskas 2019a, b).

6. Limitations and suggestion

The size and type of project may raise the number of scenarios, but the impact of factors on each other regarding the scenarios based on the opinions of others has been generally considered by the psychologists. Certainly, project managers should obtain information about each of the factors according to the type of conditions. For example, social distancing or some signs in body language induces different meanings in different cultures which can be considered as a suggestion in future research. We also know that intrapersonal factors such as stereotyping, halo effect, and horn effect, are important and influential factors in face-to-face communication. In this study, we ignored the intrapersonal factors and examined only the interpersonal factors identified in the study.

Acknowledgment

This project has received funding from European Regional Development Fund (project No 01.2.2-LMT-K-718-01-0073) under grant agreement with the Research Council of Lithuania (LMTLT).

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Aaltonen, K. (2011). Project stakeholder analysis as an environmental interpretation process. *International Journal of Project Management*, *29*(2), 165–183. https://doi.org/][10.1016/j.ijproman.2010.02.001

Aladpoosh, H., Shaharoun, A. M., & Saman, M. Z. b. M. (2012). Critical features for project stakeholder management: A systematic literature review. *International Journal of Applied Systemic Studies*, *4*(3), 150–167. https://doi.org/10.1504/IJASS.2012.051130

Anantatmula, V. S. (2015). Strategies for enhancing project performance. *Journal of Management in Engineering*, *31*(6), 04015013. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000369

Andersen, P., Gannon, J., & Kalchik, J. (2010). 11 Proxemic and haptic interaction: The closeness continuum. In *Nonverbal communication* (6th ed.). De Gruyter. https://doi.org/10.1515/9783110238150.295

Asadabadi, M. R., Chang, E., Zwikael, O., Saberi, M., & Sharpe, K. (2020). Hidden fuzzy information: Requirement specification and measurement of project provider performance using the best worst method. *Fuzzy Sets and Systems*, *383*, 127–145. https://doi.org/10.1016/j.fss.2019.06.017

Baykasoğlu, A., Göçken, T., & Kaplanoğlu, V. (2011). A practical approach to prioritize project activities through fuzzy ranking. *Cybernetics and Systems*, *42*(3), 165–179. https://doi.org/10.1080/01969722.2011.567892

Baykasoğlu, A., Kaplanoğlu, V., Durmuşoğlu, Z. D. U., & Şahin, C. (2013). Integrating fuzzy DEMATEL and fuzzy hierarchical TOPSIS methods for truck selection. *Expert Systems with Applications*, *40*(3), 899–907. https://doi.org/10.1016/j.eswa.2012.05.046

Berggreen, L., & Kampf, C. E. (2015). *Project management communication 2.0 — The socio-technical design of PM for professional communicators* [Paper presentation]. 2015 IEEE International Professional Communication Conference (IPCC), 1–9. https://doi.org/10.1109/IPCC.2015.7235842

Bonaccio, S., O'Reilly, J., O'Sullivan, S. L., & Chiocchio, F. (2016). Nonverbal behavior and communication in the workplace. *Journal of Management*, *42*(5), 1044–1074. https://doi.org/10.1177/0149206315621146

Chuang, H.-M., Lin, C.-K., Chen, D.-R., & Chen, Y.-S. (2013). Evolving MCDM applications using hybrid expert-based ISM and DEMATEL models: An example of sustainable ecotourism. TheScientificWorldJournal, *2013*, 751728–751718. https://doi.org/10.1155/2013/751728

Cserhati, G., & Szabo, L. (2014). The relationship between success criteria and success factors in organisational event projects. *International Journal of Project Management*, *32*(4), 613–624.

De Oliveira, G. F., & Rabechini, R. Jr. (2019). Stakeholder management influence on trust in a project: A quantitative study. *International Journal of Project Management*, *37*(1), 131–144. https://doi.org/10.1016/j.ijproman.2018.11.001

Fu, K., Xia, J., Zhang, X., & Shen, J. (2017). System structural analysis of communication networks based on DEMATEL-ISM and entropy. *Journal of Central South University*, *24*(7), 1594–1601. https://doi.org/10.1007/s11771-017-3564-z

Gabbott, M., & Hogg, G. (2001). The role of non-verbal communication in service encounters: A conceptual framework. *Journal of Marketing Management*, *17*(1–2), 5–26. https://doi.org/10.1362/0267257012571401

Gani, A. N., & Assarudeen, S. N. M. (2012). A new operation on triangular fuzzy number for solving fuzzy linear programming problem. *Applied Mathematical Sciences*, *6*(11), 523–532. https://doi.org/10.13140/2.1.3405.8881

Goman, C. K. (2011). *The silent language of leaders: How body language can help–or hurt–how you lead*. John Wiley & Sons.

Henderson, L. S. (2008). The impact of project managers' communication competencies: Validation and extension of a research model for virtuality, satisfaction, and productivity on project teams. *Project Management Journal*, *39*(2), 48–59. https://doi.org/10.1002/pmj.20044

Hendon, M., Powell, L., & Wimmer, H. (2017). Emotional intelligence and communication levels in information technology professionals. *Computers in Human Behavior*, *71*, 165–171. https://doi.org/10.1016/j.chb.2017.01.048

Herrera-Viedma, E., Cabrerizo, F. J., Kacprzyk, J., & Pedrycz, W. (2014). A review of soft consensus models in a fuzzy environment. *Information Fusion*, *17*, 4–13. https://doi.org/10.1016/j.inffus.2013.04.002

Hyvari, I. (2007). *Project management effectiveness in different organizational conditions.* Helsinki School of Economics. http://epub.lib.aalto.fi/pdf/diss/a290.pdf

Jaberi Rad, M., & Farajpahlou, H. (2012). Color position in non-verbal communication. *Studies in Library and Information Science*, *19*(3), 97–114.

Jeng, D. J.-F. (2015). Generating a causal model of supply chain collaboration using the fuzzy DEMATEL technique. *Computers & Industrial Engineering*, *87*, 283–295. https://doi.org/10.1016/j.cie.2015.05.007

Jeng, D. J. F. (2011). *Structural analysis on team internal soft factors to project success* [Paper presentation]. IEEE International Conference on Fuzzy Systems. https://doi.org/10.1109/FUZZY.2011.6007335

Ju, P.-H., Wei, H.-L., & Tsai, C.-C. (2016). Model of post-implementation user participation within ERP advice network. *Asia Pacific Management Review*, *21*(2), 92–101. https://doi.org/10.1016/j.apmrv.2015.11.001

Kahraman, C. (Ed.). (2008). *Fuzzy multi-criteria decision making: Theory and applications with recent developments.* Vol. 16. Springer Science & Business Media.

Kaklauskas, A., Zavadskas, E. K., Bardauskiene, D., Cerkauskas, J., Ubarte, I., Seniut, M., Dzemyda, G., Kaklauskaitė, M., Vinogradova, I., & Velykorusova, A. (2019a). An affect-based built environment video analytics. *Automation in Construction, 106*, 102888.

Kaklauskas, A., Jokubauskas, D., Cerkauskas, J., Dzemyda, G., Ubarte, I., Skirmantas, D., Podviezko, A., & Simkute, I. (2019b). Affective analytics of demonstration sites. *Engineering Applications of Artificial Intelligence, 81*, 346–372.

Katyal, S., & Awasthi, E. (2005). Gender differences in emotional intelligence among adolescents of Chandigarh. *Journal of Human Ecology*, *17*(2), 153–155. https://doi.org/10.1080/09709274.2005.11905771

Lieberman, D. J. (1999). *Never be lied to again: How to get the truth in 5 minutes or less in any conversation or situation*. Macmillan.

Lin, C.-J., & Wu, W.-W. (2008). A causal analytical method for group decision-making under fuzzy environment. *Expert Systems with Applications*, *34*(1), 205–213. https://doi.org/10.1016/j.eswa.2006.08.012

Linneman, T. J. (2013). Gender in Jeopardy!. *Gender & Society*, *27*(1), 82–105. https://doi.org/10.1177/0891243212464905

Liu, W.-H., & Cross, J. A. (2016). A comprehensive model of project team technical performance. *International Journal of Project Management*, *34*(7), 1150–1166. https://doi.org/10.1016/j.ijproman.2016.05.011

Liu, F., Huang, M. J., Pedrycz, W., & Zhao, H. (2020). *Group decision making based on flexibility degree of fuzzy numbers under a confidence level*. IEEE Transactions on Fuzzy Systems.

Lohikoski, P., Kujala, J., Härkönen, J., Haapasalo, H., & Muhos, M. (2005). Enhancing communication practices in virtual new product development projects. *International Journal of Innovation in the Digital Economy*, 6(4), 16–36. https://doi.org/10.4018/IJIDE.2015100102

Louw, M., & Plooy-Cilliers, F. (2014). *Let's talk about interpersonal communication*. 4th ed. Prentice Hall.

Mascia, S. d. (2016). Project psychology. *In Gender & Society*, *27*, 1. https://doi.org/10.4324/9781315602448

Mayer, J. D., Salovey, P., & Caruso, D. R. (2000). Emotional intelligence as zeitgeist, as personality, and as a mental ability. In *The handbook of emotional intelligence theory development assessment and application at home school and in the workplace*. Wiley.

Maylor, H., Brady, T., Cooke-Davies, T., & Hodgson, D. (2006). From projectification to programmification. *International Journal of Project Management*, *24*(8), 663–674. https://doi.org/10.1016/j.ijproman.2006.09.014

Mehrabian, A. (1971). How HR professionals can interview Like an investigator to avoid bad hires. In *Silent messages*. Wadsworth.

Messinger, J. (2013). *Slapti kūno pranešimai (Secret body reports).* Alma litera.

Montequin, V. R., Cousillas, S., Ortega, F., & Villanueva, J. (2014). Analysis of the success factors and failure causes in information & communication technology (ICT) projects in Spain. Procedia Technology, *16*, 992–999. https://doi.org/10.1016/j.protcy.2014.10.053

Morris, M. W., & Keltner, D. (2000). How emotions work: The social functions of emotional expression in negotiations. *Research in Organizational Behavior*, *22*, 1–50. https://doi.org/10.1016/s0191-3085(00)22002-9

Mousavizade, F., & Shakibazad, M. (2019). Identifying and ranking CSFs for KM implementation in urban water and sewage companies using ISM-DEMATEL technique. *Journal of Knowledge Management*, *23*(1), 200–218. https://doi.org/10.1108/JKM-05-2018-0321

Müller, R., & Jugdev, K. (2012). Critical success factors in projects: Pinto, Slevin, and Prescott – The elucidation of project success. *International Journal of Managing Projects in Business*, *5*(4), 757–775. https://doi.org/10.1108/17538371211269040

Navarro, J. (2013). *Kūno kalba (Body language).* Alma litera.

O'Rourke, J. (2015). Effective communication.

Oatley, K. M., & Jenkins, J. M. (1992). Human emotions: Function and dysfunction. *Annual Review Psychology*, *43*, 55–85.

Pant, I., & Baroudi, B. (2008). Project management education: The human skills imperative. *International Journal of Project Management*, *26*(2), 124–128. https://doi.org/10.1016/j.ijproman.2007.05.010

Pease, A., & Pease, B. (2012). *Kūno kalbos vadovas (Body Language Guide)*. Alma litera.

Peleckis, K., Peleckienė, V., & Peleckis, K. (2015). Nonverbal communication in business negotiations and business meetings. *International Letters of Social and Humanistic Sciences*, *62*, 62–72. https://doi.org/10.18052/www.scipress.com/ILSHS.62.62

Pheng, L. S. (2018). Project communication management. Chapter 10. In *Project management for the built environment* (pp. 978–981). Springer.

PMI. (2017). A guide to the project management body of knowledge (PMBOK Guide) (PMBOK Guide). In A guide to the project management body of knowledge (PMBOK Guide) (6th ed.). Project Management Institute.

Rezaei, J. (2015). Best-worst multi-criteria decision-making method. Omega, *53*, 49–57. https://doi.org/10.1016/j.omega.2014.11.009

Rezvani, A., Chang, A., Wiewiora, A., Ashkanasy, N. M., Jordan, P. J., & Zolin, R. (2016). Manager emotional intelligence and project success: The mediating role of job satisfaction and trust. *International Journal of Project Management*, *34*(7), 1112–1122. https://doi.org/10.1016/j.ijproman.2016.05.012

Rezvani, A., Khosravi, P., & Ashkanasy, N. M. (2018). Examining the interdependencies among emotional intelligence, trust, and performance in infrastructure projects: A multilevel study. *International Journal of Project Management*, *36*(8), 1034–1046. https://doi.org/10.1016/j.ijproman.2018.08.002

Senaratne, S., & Ruwanpura, M. (2016). Communication in construction: A management perspective through case studies in Sri Lanka. *Architectural Engineering and Design Management*, *12*(1), 3–18. https://doi.org/10.1080/17452007.2015.1056721

Sivasubramaniam, N., Liebowitz, S. J., & Lackman, C. L. (2012). Determinants of new product development team performance: A meta-analytic review. *Journal of Product Innovation Management*, *29*(5), 803–820. https://doi.org/10.1111/j.1540-5885.2012.00940.x

Van Den Hooff, B., & De Ridder, J. A. (2004). Knowledge sharing in context: the influence of organizational commitment, communication climate and CMC use on knowledge sharing. *Journal of Knowledge Management*, *8*(6), 117–130. https://doi.org/10.1108/13673270410567675

Van Kleef, G. A., De Dreu, C. K. W., & Manstead, A. S. R. (2004). The interpersonal effects of emotions in negotiations: A motivated information processing approach. *Journal of Personality and Social Psychology*, *87*(4), 510–528. https://doi.org/10.1037/0022-3514.87.4.510

Wang, L., Cao, Q., & Zhou, L. (2018). Research on the influencing factors in coal mine production safety based on the combination of DEMATEL and ISM. *Safety Science*, *103*, 51–61. https://doi.org/10.1016/j.ssci.2017.11.007

Welch, M., & Jackson, P. R. (2007). Rethinking internal communication: A stakeholder approach. *Corporate Communications: An International Journal*, *12*(2), 177–198. https://doi.org/10.1108/13563280710744847

Wu, W. W. (2008). Choosing knowledge management strategies by using a combined ANP and DEMATEL approach. *Expert Systems with Applications*, *35*(3), 828–835. https://doi.org/10.1016/j.eswa.2007.07.025

Yang, R. J., Wang, Y., & Jin, X. H. (2014). Stakeholders' attributes, behaviors, and decision-making strategies in construction projects: importance and correlations in practice. *Project Management Journal*, *45*(3), 74–90. https://doi.org/10.1002/pmj.21412

Yap, J. B. H., Abdul-Rahman, H., & Chen, W. (2017). Collaborative model: Managing design changes with reusable project experiences through project learning and effective communication. *International Journal of Project Management*, *35*(7), 1253–1271. https://doi.org/10.1016/j.ijproman.2017.04.010

Yong, Y. C., & Mustaffa, N. E. (2013). Critical success factors for Malaysian construction projects: An empirical assessment. *Construction Management and Economics*, *31*(9), 959–978. https://doi.org/10.1080/01446193.2013.828843

Zadeh, L. A. (1965). Fuzzy sets. Information and Control, *8*(3), 338–353.
Zavadskas, E. K., Bausys, R., Kaklauskas, A., Ubarte, I., Kuzminske, A., & Gudiene, N. (2017). Sustainable market valuation of buildings by the single-valued neutrosophic MAMVA method. *Applied Soft Computing, 57*, 74–87.
Zavadskas, E. K., Bausys, R., Kaklauskas, A., & Raslanas, S. (2019). Hedonic shopping rent valuation by one-to-one neuromarketing and neutrosophic PROMETHEE method. *Applied Soft Computing, 85*, 105832.
Zavadskas, E. K., Turskis, Z., & Tamošaitienė, J. (2008). Multicriteria selection of project managers by applying grey criteria/Projektų valdytojo parinkimo daugiatikslio vertinimo modelis. *Technological and Economic Development of Economy*, *14*(4), 462–477. https://doi.org/10.3846/1392-8619.2008.14.462-477
Zavadskas, E. K., Turskis, Z., & Tamošaitienė, J. (2010). Risk assessment of construction projects. *Journal of Civil Engineering and Management*, *16*(1), 33–46. https://doi.org/10.3846/jcem.2010.03
Zhou, Q., Huang, W., & Zhang, Y. (2011). Identifying critical success factors in emergency management using a fuzzy DEMATEL method. *Safety Science*, *49*(2), 243–252. https://doi.org/10.1016/j.ssci.2010.08.005
Zwikael, O., & Globerson, S. (2006). From critical success factors to critical success processes. *International Journal of Production Research*, *44*(17), 3433–3449. https://doi.org/10.1080/00207540500536921