BUSINESS, MANAGEMENT AND EDUCATION
ISSN 2029-7491 print / ISSN 2029-6169 online
2013, 11(1): 168–187
doi:10.3846/bme.2013.10

MODEL OF METHOD SELECTION FOR MANAGERIAL PROBLEM SOLVING IN AN ORGANIZATION

Marek Szarucki

Cracow University of Economics, Rakowicka str. 27, 31-510 Krakow, Poland
E-mail: saruckim@uek.krakow.pl

Received 17 May 2013; accepted 4 June 2013

Abstract. Managers at all levels must make various decisions while solving problems of their organizations. It is very important to select an appropriate method to solve a particular managerial problem. The purpose of this paper is to develop a model of method selection of managerial problem solving in an organization. In the beginning the theoretical background regarding managerial problems' classification and methodological aspects of method selection for their solution are discussed. Further, the paper concentrates on the criteria of method evaluation and building a model helping at selecting the best method to solve the corresponding problem. It also makes an attempt to evaluate the perceived efficiency of the model as well as to provide potential dilemmas to its construction. Finally, some suggestions for future research are provided.

Keywords: managers, managerial problems, problem solving, method selection.

Reference to this paper should be made as follows: Szarucki, M. 2013. Model of method selection for managerial problem solving in an organization, *Business, Management and Education* 11(1): 168–187. http://dx.doi.org/10.3846/bme.2013.10

JEL Classification: M0, M00, M1, M10, M19.

1. Introduction

Modern organizations must struggle with negative effects of globalization that have caused a lot of uncertainty affecting development and implementation of strategies in rapidly changing business environments (Oliver, Roos 2005). Managers at all levels must make various decisions while solving problems of their organizations. There are many different tools to solve problems arising in organizations but the question of 'how to select an appropriate method' remains. The key goal is to quickly find a suitable tool or a group of tools to solve the managerial problem. Decision-making based on the experience of what was successful or unsuccessful in the past limits selection and diminishes the possibility to recognize better solutions (Sloane 2003). Consulting companies based on observations of tools used by companies in particular circumstances, and the results of their use, are trying to help them make superior choices in selecting, implementing and integrating the methods to improve organizations' performance (Rigby, Bilodeau 2011: 9).

The research field of problem solving in management suffers from an absence of theory capable of explaining the process of method selection for solving different

problems in an organization. Methodological issues that are at least partly responsible for the above shortcoming are explored in this paper. The key argument is that, in spite of efforts to resolve these issues, many methodological troubles continue to resist the proposals offered by researchers. Thus it is important to improve the perception of a process of method selection related to problem solving by managers.

This paper is theory-based and aims at developing a framework of method selection for managerial problem solving in an organization. Using the method of critical literature review, qualitative analysis and method of modelling, it attempts at providing the model of method selection for managerial problem solving in an organization. As a result, a theoretical model of method selection is proposed.

In order to achieve the aforementioned aim, the following structure is proposed. In the beginning, theoretical aspects of managerial problems in organizations are discussed. Next section presents methodological issues related to classification and selection of methods for problem solving. The following section concentrates on building a model of method selection for managerial problem solving. The last section provides final conclusions and suggestions for further research.

2. Theoretical aspects of managerial problems in an organization

The notion of an 'organizational problem' is essential in the business and management studies literature (Landry 1995). Managers of contemporary organizations despite their place in the organizational hierarchy deal with a greater number and diversity of problems than ever before. In other words, they have to solve these problems by taking part in the decision-making process. Nevertheless, very often it is not so easy to do due to different reasons, e.g. difficulties with an appropriate problem definition, inadequate method selection or its application, lack of knowledge or other external and internal constraints (Brooks 1994; Hagemeyer *et al*. 2006; Jun *et al*. 2011; Lowy 2008; Potocan *et al*. 2012; Taylor 1975). Moreover, the process of decision-making in organizations is often led by uncertainty, vagueness, and political behavior.

Usually the word "problem" is related to the dissimilarity between some existing and desired situation (Pounds 1969). Later, scientists enhanced the traditional definition of a problem as a discrepancy or a gap, adding the notion that a problem is a discrepancy that is hard to close and that guarantees a place on its perceiver's agenda (Smith 1988). This definition eliminates issues which are unimportant and considered not possible to manage. Therefore, a managerial problem will be related to the difference defined by a manager comparing what is perceived to the desired output. Such problematic gaps or disparities can moreover include anything where a decision-maker might have preferences, including external environment, internal states-of-knowledge, and one's own preferences.

There is a need for managerial problems solving in all organizations. Even organizational decision making is formally defined as the process of identifying and solving problems (Daft 2001). Usually this process consists of two main phases: problem

identification and problem solution. In the problem identification phase, information about environmental and organizational conditions is analyzed to determine if performance is satisfactory and to diagnose the reason for shortcomings. In the problem solution phase, alternative courses of action are taken into account and one option is selected.

The problem identification phase is of high importance and requires a decision-maker to have good knowledge of potential managerial problems in an organization. It is important to break down the management problem into sub-problems so that the methods could be matched against a specific managerial problem that they help to solve (Holland, Dawson 2011). It is not so easy to do in practice due to the lack of an appropriate and exhaustive classification of the managerial problems. It is hardly possible to find any comprehensive classifications of problems encountered by managers in organizations. The methodological issues regarding the process of organizational problem recognition and categorization are scarce and need to be developed. Nevertheless it is possible to make several assumptions (Szarucki 2010: 1104):

- there are universal criteria for organizational problem categorization;
- organizational problems may be divided into different categories in accordance to their characteristics;
- different levels of relationships exist between the defined categories.

Research to date has attempted to provide various dimensions and classification frameworks to help to shed light on the categorical relationships between organizational problems. For example, the theory related to problem solving has pointed out that problems can be programmed and non-programmed (Simon 1973) or well-structured and ill-structured (Simon 1997). On the other hand, Blake and Mouton (1964) discovered problems related to human relations and technical matters. Other problems are pertained to strategic or operational matters of an organization (Drucker 1954). Going beyond defining particular dimensions, other authors have suggested problem classification frameworks (Cowan 1991; Dearborn, Simon 1958; Maier, Hoffman 1964; Nadler 1983; Smith 1988; Taylor 1974; Walsh 1988). For example, Cowan (1991) developed an understandable and empirically tested framework of organizational problems, introducing the categories of their classification such as: human resources, strategy, operations, marketing, production, management, MIS-data processing, external-environmental, communications, customer, and accounting. This classification structure provides categorical expansion and development, the application of managers' natural language, and the specification of structural relationships among the existing problem categories. Nevertheless, it seems that other problem categories may be identified, since contemporary managers encounter a growing mix of problem concepts and related terms and the complex relationships among them.

Based on the extensive literature analysis in the area of organizational studies, and particularly problem-solving (Cowan 1991; Jones 1998; Landry 1995; Mankelwicz, Kitahara 2005; Targalski 1986), some other criteria for organizational problem categorization could be identified. Organizational problems are divided according to the key criteria into different categories (see Table 1).

Table 1. Classification criteria for organizational problems (Source: Szarucki 2010)

Main criteria	Categories
Source of problem initiation	Top management, Middle management, Lower management
Cause	Regulatory, Directing, Innovative, Reparatory
Conditions	Stable environment, Changing environment, Turbulent environment
Quantifiability	Possible to quantify, Impossible to quantify
Decision options	Closed (problems of assessment), Open (problems of research and development)
Level of involvement	Individual, Individual with a collective impact, Collective
Management functions	Planning, Organizing, Motivating, Controlling
Complexity	Programmed, Non-programmed
Organizational level	Strategic, Operational

The organizational problems' classification presented in the table above is neither full nor exhaustive and needs further development. Nevertheless, it provides a good starting point for categorizing managerial problems encountered in different organizations. Depending on the needs of a decision-maker other criteria relevant for managerial problems categorization may be applied. Grouping problems into appropriate categories is helpful when a manager is trying to find a suitable method for their solving in the second phase of the mentioned earlier process of decision-making.

Managers are supposed to identify a broad variety of problems and be familiar with the right problem-solving tool for every application. Therefore, it is important to develop an appropriate classification of managerial problems encountered in organizations based on criteria that make it possible for decision-makers to select a suitable method for its solution, or at least reduce the uncertainty related to tool selection. The next section of the paper concentrates on the methodological issues of classifying and selecting of methods for problem solving in an organization.

3. Classification and selection of methods for problem solving – methodological issues

Managers and decision-makers in an organization need to select a method[1] to use for any given problem and problem environment. As it was mentioned, the literature on classification of management methods and their selection for problem solving in organizations is scarce. Therefore, below there is a brief review of some methodological proposals that seem to be appropriate to apply for selecting methods for problem solving in organizations.

Holland and Dawson (2011) have developed two interesting approaches to selection of tools for quality knowledge management. Their first model is based on the "house of

[1] In this paper terms 'method', 'tool' and 'instrument' are used interchangeably.

quality matrix" that is rooted in quality function deployment (Akao 1983; QFD 2013), a tool for helping managers in decision-making when selecting product options. The model consists of five main areas: problem requirements, tool connections, tools and techniques, relationships and totals as well as barrier basement (see Fig. 1).

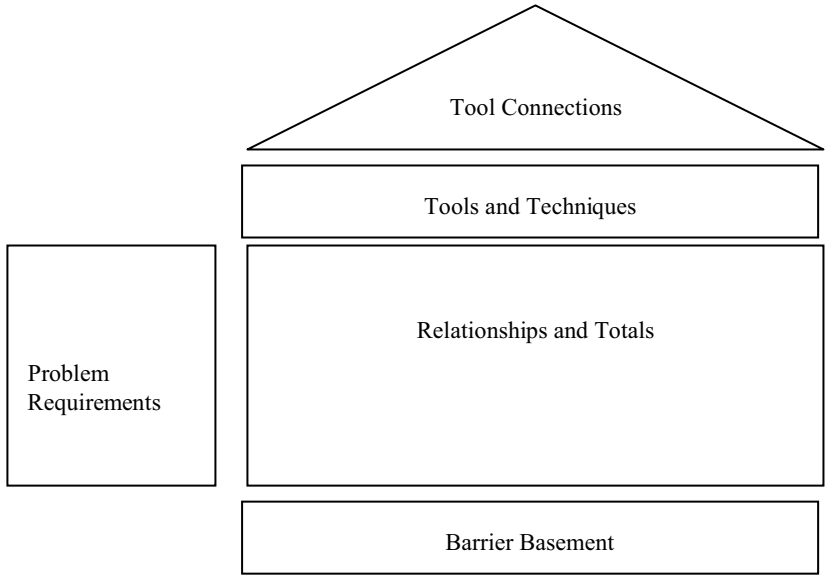

Fig. 1. The house of knowledge management tool selection
(Source: Holland and Dawson 2011)

The house of knowledge management tool selection presented in Figure 1 seems to be a simple graphic instrument enabling managers to assess the available management tools to solve a specific problem with regard to their organization's environment. According to the pilot study conducted by Holland and Dawson (2011) the model may be used to consistently evaluate the potential methods to solve a knowledge management problem. In spite of the fact that more research is needed to explore the use of the model in different conditions and by different users, it seems to be a good basis for further development in the context of selecting management methods for problem solving in an organization.

Moreover, Holland and Dawson (2011) have proposed another methodological approach of method selection for problem solving in quality knowledge management called the knowledge management problem-tool classification grid. This model gives a clear picture of tools appropriate for every type of knowledge problem, and proposes the manager alternatives to choose from, including four categories of methods: IT tools, non-IT tools, recent tools and tools that are not always related to knowledge management problems. In order to operationalize the model, the knowledge management problems were divided into ten main types and the tools were assessed based on three criteria referring to dividing knowledge areas into three levels (see Table 2).

Table 2. Knowledge management tool grid (Source: adapted from Holland and Dawson 2011)

		Type of knowledge problem									
		Source signposting	Search	Creation/ innovation	Validation	Storage	Transfer/ distribution	Collaboration/ sharing	Tacit to explicit	Decision making	Representation/ analysis
Levels / Criteria for tool evaluation	Main purpose of the tool										
	Added bonus										
	Not a guaranteed outcome										

The grid presented in Table 2 is filled with the tools using several brainstorming sessions. The tools may potentially be moved to various levels and to different problem types on the grid depending on who was filling it and the organization that was participating. This grid is helpful in tools selection, although it should not be used blindly but by assessing the instruments and categories to guarantee that they are in the appropriate place for the reason they are being utilised in the circumstances of the organization where they will be applied.

Another interesting proposal of the model of method selection for problem solving in health care management is provided by Jun *et al*. (2011). There is a growing recognition of modelling and simulation in assisting the process of developing health care policies, strategies and operations (Dangerfield 1999; Fone *et al.* 2003; Sinreich, Marmor 2005). The authors have stressed the existing dilemma of what kind and when to use appropriate methods in problem solving (Jun *et al*. 2011). Thus, their main goal was to provide a methodology for decision makers in health services planning and management that would enable comparing a wide collection of modelling and simulation methods in order to improve their selection and utilisation. First, they suggest starting with characterizing of methods from x_1 to x_y by their application area and project life cycle (see Table 3).

The second step is to align the methods by the type of output (just some insight, trend analysis, system interaction, complete behaviour and exact/very accurate) and the level of insight (policy, strategy, managerial, operational, detailed) using 5×5 matrix in the same way as in Table 3. In the third step Jun *et al*. (2011) have suggested to evaluate the methods by four various input resource parameters such as money, time, knowledge and data. Finally, after filtering the available methods by defining a common set in terms of project life cycle stage and application area (see Table 3) and level of insight and type of output a limited group of methods is acquired that are compared in terms of the resources required. The described process of assessment and selection enables the

choice of methods best suited to the needs and limitations of the given decision process in health care management.

Table 3. Method characterisation matrix by application area and project life cycle stage (Source: adapted from Jun *et al.* 2011)

Application area	Project life cycle stage							
	Needs and issues identification	New service development	Demand forecasting	Resource allocation	Implementation plan	Performance criteria development	Performance management	Performance evaluation
Policy and strategy	x_1, x_2, x_y	x_1, x_2, x_5, x_6, x_{12}, x_y	x_2, x_y	x_3, x_6, x_y	x_1, x_2, x_y	x_1, x_2, x_5, x_y	x_2, x_y	x_3, x_6, x_y
Quality management	x_1, x_2, x_y	x_1, x_2, x_5, x_6, x_{12}, x_y	x_2, x_4, x_y	x_3, x_8, x_y	x_1, x_4, x_y	x_1, x_y	x_2, x_4, x_y	x_3, x_6, x_y
Risk management	x_1, x_5, x_y	x_1, x_2, x_5, x_6, x_{12}, x_y	x_2, x_5, x_7, x_{15}, x_y	x_5, x_6, x_y	x_1, x_3, x_y	x_1, x_2, x_y	x_5, x_7, x_{15}, x_y	x_3, x_6, x_y
Financial management	x_1, x_2, x_5, x_y	x_1, x_2, x_5, x_6, x_{12}, x_y	x_7, x_y	x_2, x_6, x_y	x_1, x_2, x_y	x_1, x_y	x_2, x_y	x_3, x_6, x_y
Facility planning	x_1, x_2, x_y	x_1, x_2, x_5, x_6, x_{12}, x_y	x_2, x_9, x_y	x_6, x_y	x_1, x_5, x_y	x_1, x_y	x_5, x_7, x_{15}, x_y	x_3, x_6, x_y
Personnel management	x_1, x_3, x_y	x_1, x_2, x_5, x_6, x_{12}, x_y	x_{10}, x_y	x_3, x_6, x_y	x_1, x_7, x_y	x_6, x_{12}, x_y	x_5, x_7, x_{15}, x_y	x_{17}, x_y
Technology management	x_1, x_4, x_y	x_1, x_2, x_5, x_6, x_{12}, x_y	x_9, x_{11}, x_y	x_3, x_7, x_y	x_2, x_4, x_y	x_1, x_2, x_y	x_{13}, x_y	x_{18}, x_y
Information/ material management	x_1, x_2, x_3, x_4, x_7, x_9, x_{11}, x_{21}, x_y	x_1, x_2, x_5, x_6, x_{12}, x_y	x_4, x_8, x_y	x_3, x_6, x_y	x_2, x_3, x_y	x_1, x_y	x_2, x_4, x_y	x_{28}, x_y

Table 4. Six sigma tools matrix (Source: own elaboration based on (Hagemeyer *et al.* 2006)

Quality tool	Categorizations				Inputs to tool			Outputs of tool			
	Tool origin	Six sigma phase	Type of tool	Skill of user	What is needed for tool use	Quality tools needed prior to using this tool	What the tool works with	Tool function	Tool classification	Physical outcome	What the tool does with the information
Thought process map	Six sigma	Define	Clerical	Novice	Process knowledge	None	Ideas	Generates/ groups/ decides/ implements	Document	Matrix	Organizes
Check sheet	Basic quality tool	Define/ measure	Analytical	Novice	Data collection	None	Numbers	Counts	Tool	Matrix	Organizes/ classifies/ prioritizes
FMEA	Six sigma	Define/ measure/ improve	Analytical	Advanced	Process knowledge	Control plan/ C&E matrix/ process map	Ideas	Generates/ groups/ decides	Technique	Matrix	Organizes/ classifies/ prioritizes
Capability analysis	Six sigma	Measure/ analyze/ improve	Statistical	Intermediate	Data collection	Control charts	Numbers	Measures/ counts	Tool	Numerical analysis	Organizes/ classifies/ prioritizes
Histogram	Basic quality tool/ six sigma	Measure/ analyze	Statistical	Novice	Data collection	Control charts	Numbers	Measures/ counts	Tool	Diagram	Organizes/ provides status

A slightly different methodology of problem-solving and method selection is proposed by Hagemeyer *et al.* (2006) within the area of quality management. Their approach is based on the assessment of methods included in the six sigma tools matrix (see Table 4)[2]. The proposed classification design for problem-solving tools allows the decision-maker to identify and select the proper tool at the right time in the problem-solving process. Main features of the developed approach in the form of a matrix are identification, organization and definition of tools of the six sigma problem-solving process. Its main practical implication is enabling organizations to better "match" the methods necessary to solve real-life business problems.

From the above literature review and some detailed analysis of the selected approaches of method selection for problem solving several conclusions should be drawn. Firstly, there is a variety of problems faced by companies and plenty of tools to solve them. This situation leads to dilemmas related to selecting the correct method for problem-solving. Secondly, it is hardly possible to find a unified approach suitable for problem solving in different organizational settings. Moreover, the methodology of method selection present in the literature is scarce and ambiguous. Therefore, there is a need for developing a general model of method selection for management problem solving in organization.

4. Building a model of method selection for managerial problem solving

4.1. Proposal of a model of method selection for problem solving

Developing a model of method selection for solving problems faced by managers in various organizations is perceived as a very important contribution to the development of both: management science methodology as well as improving the process of problem solving in an organization. Thus, based on the critical literature review, a model of management method selection for problem solving in an organization will be proposed. The process of method selection takes place in two phases:

1) determining and evaluating of a problem situation (problem to be solved),
2) selection of a method for problem solving.

The first of the two phases mentioned above will consist of the following research steps:

1) identifying a problem to solve,
2) problem analysis (structural and process),
3) evaluation of problem importance,
4) determining conditions of problem solving.

[2] Only five quality tools are described in the table: thought process map, check sheet, FMEA, capability analysis and histogram. For more, see Hagemeyer *et al*. 2006.

The second phase of the research methodology proposed for application is related to the procedure of method selection from the available set of methods in accordance with the chosen assessment criteria, and covers the following research steps:

1) defining the set of problem solving methods,
2) identifying the methods' assessment criteria and their verification,
3) assessment of the methods with regard to the selected criteria,
4) selecting an appropriate method.

Due to the editorial limitations of this paper, we will skip the description of the first phase related to determining and evaluating a problem situation. Assuming that a management problem is identified, defined, correctly evaluated and the conditions of its solution have been determined, below we only concentrate on the second phase i.e. methodology of method selection for managerial problem solving.

In the above structure of the process of method selection model construction for problem solving, the first task is to define the set of problem solving methods and determine their main attributes. The main goal is to identify available methods, i.e. those comprising the main instrumental arsenal of management typical for a specific organization. Determining the key attributes of the methods enables their classification according to the selected division criteria. The final solution of this research step will be definition of classess, groups or families of methods fulfilling specific criteria (Budzanowska 1967; Chauvet 1997; Drevet 1971; Martyniak 1976b; Mikolajczyk 1976; Mouchot, Moles 1971). This task is very demanding and requires from a decision-maker appropriate theoretical and methodological knowledge related to problem solving methods, their construction, main characteristics or limitations of their use. There are various approaches to classify methods from the area of management and organization. Moreover, management methods are constantly evolving, undergoing more or less important changes, as well as differing in terms of the level of their description details (Jagoda, Lichtarski 2003; Ćwiklicki 2011).

The second step of the proposed methodology is the identification of the methods' assessment criteria and their verification. Methods' assessment aims at determining their efficiency with regard to conducting their main functions. While solving a particular problem of management a decision-maker may take into account different criteria, and based on the defined priorities and opportunities regarding the use of a specific method. Some potential parameters for method evaluation are as follows: financial costs related to method application, time, required level of knowledge of a decision-maker, type of data used, area of application in an organization, level of management involved or organizational limitations.

This step begins with identification of an initial set of assessment criteria. It is important to concentrate only on such parameters of a method that have the most important evaluative meaning (Lisiński 1992: 115). The main substantive premise to decide about the initial set of assessment criteria is rooted in the results of a diagnosis and nature of the conditions for problem solving. The main goal of this step is to verify the initial set

of the criteria of methods' assessment and assigning weights or ranks to all criteria. As a result, only the criteria that satisfy the expectations of the decision-maker related to the specifics of the problem being solved will be left.

The third step concentrates on the assessment of the methods with regard to the selected criteria. The evaluation process is based on determining and assigning scores to all methods with regard to the defined set of criteria. There are different ways to deliver this task by applying appropriate methods of evaluation. In practice, assessment methods used most often are, for instance: comparative analysis, ordinal method and scoring method (Lisiński 1992: 118). It seems that a weighted-score method works best to achieve that goal (Slack *et al*. 2007: 161). The procedure involves, first of all, identifying the criteria which will be used to evaluate the various methods. Sometimes the experts' knowledge is used to determine the appropriate criteria (Jun *et al*. 2011). Secondly, it involves establishing the relative importance of each criterion and giving weighting factors to them with help of the expert method. Third, it means rating each method according to each criterion. The scale of the score is arbitrary. Thus, assuming that a scale range is from 1 to 5, where 1 represents the worst possible score and 5 the best one, a method assessment matrix is proposed (see Table 5).

Table 5. Method assessment matrix (Source: own research)

No.	Criterion (k_i)	Weight (w_i)	Score (z_i, 1–5)	Weighted score ($w_i \times z_i$)
1	k_1	w_1	z_1	$w_1 \times z_1$
2	k_2	w_2	z_2	$w_2 \times z_2$
…	...	…	…	…
x	k_x	w_x	z_x	$w_x \times z_x$
		Total = 1	$\sum z_i$	$\sum w_i \times z_i$

The fourth and the last step of the described procedure is selecting an appropriate method. The selection is based on the results of the method assessment conducted in the previous step of the research procedure. A ranking of the assessed methods is made based on their total weighted score. Generally, a decision-maker will have a limited number of the best scored methods[3] from the perspective of the specific problem solution. Finally, a decision-maker has to take into account external (opportunities and threats) and internal conditions (strengths and weaknesses) of an organization with regard to correct application of an appropriate method and based on that, makes a final decision[4].

[3] Depending on the assessment scale, there can be methods that have the highest weighted score or highest rank.

[4] Method selection may require its adaptation and detailed description.

4.2. Example of method selection for management problem solving

Below based on a hypothetical example of an organization XYZ the model of method selection for problem solving will be tested. Preceding that, two assumptions were made. First, there are nine general categories of management problems (from P1 to P9) being met in the organization XYZ. Second, there are 20 different methods (from m_1 to m_{20}) of managerial-problem solving used in the mentioned organization that were sorted based on their practical applicability in solving the problems belonging to the nine specific categories (see Table 6)[5].

Table 6. Problem category and possible to apply management methods (Source: own research)

Problem category	Methods to apply
P1	$m_1, m_2, m_3, m_4, m_{11}, m_{13}$
P2	m_1, m_2, m_6, m_7, m_9
P3	$m_5, m_8, m_{12}, m_{15}, m_{16}$
P4	$m_1, m_2, m_3, m_{17}, m_{18}$
P5	m_3, m_{10}, m_{18}
P6	$m_5, m_8, m_{11}, m_{13}, m_{14}, m_{17}, m_{18}, m_{19}$
P7	$m_4, m_{11}, m_{13}, m_{14}, m_{17}$
P8	m_{12}, m_{15}, m_{19}
P9	m_{19}, m_{20}

Due to the editorial limitations, below the methodology of method selection for solving a problem that belongs to the third category (P3) and five methods ($m_5, m_8, m_{12}, m_{15}, m_{16}$)[6] that are available at the enterprise and suitable for that purpose have been presented. These methods will be analysed and evaluated according to the nine criteria (k_1, k_2, k_3, k_4, k_5, k_6, k_7, k_8, k_9) identified by means of the expert method and according to the assessment procedure presented in Table 5. Using the expert method appropriate weights were assigned to each of the criteria (the total of weights equals 1). Continuing using the expert method, the assessed methods were assigned scores from 1 to 5 on each of the given criteria. After calculating the weighted score for each criterion a total for all weighted scores of the assessed method is calculated.

In the beginning method m_5 will be evaluated (see Table 7).

[5] Based on the organization's experience in problem solving analysis, the problem categories and number of methods typical for that organization were identified. Some methods may be applied to more than one problem category. This methodological issue is too extensive to describe in detail in this paper.

6 These methods fulfil the basic criteria of the problems belonging to problem category P3.

Table 7. Method m_5 assessment according to the specific criteria (Source: own research)

No.	Criterion (k_i)	Weight (w_i)	Score (z_i, 1–5)	Weighted score ($w_i \times z_i$)
1	k_1	0.15	1	0.15
2	k_2	0.05	3	0.15
3	K_3	0.1	4	0.4
4	K_4	0.15	2	0.3
5	K_5	0.05	5	0.25
6	K_6	0.15	5	0.75
7	K_7	0.1	3	0.3
8	k_8	0.1	4	0.4
9	k_9	0.15	2	0.3
	Total	1	29	**3.0**

The total weighted score for method m_5 is 3.0. In the next step method m_8 will be assessed (see Table 8).

Table 8. Method m_8 assessment according to the specific criteria (Source: own research)

No.	Criterion (k_i)	Weight (w_i)	Score (z_i, 1–5)	Weighted score ($w_i \times z_i$)
1	k_1	0.15	5	0.75
2	k_2	0.05	4	0.2
3	k_3	0.1	5	0.5
4	k_4	0.15	3	0.45
5	k_5	0.05	2	0.1
6	k_6	0.15	1	0.15
7	k_7	0.1	1	0.1
8	k_8	0.1	3	0.3
9	k_9	0.15	4	0.6
	Total	1	28	**3.15**

The total weighted score for method m_8 is 3.15. Table 9 presents the assessment of method m_{12}.

Table 9. Method m_{12} assessment according to the specific criteria (Source: own research)

No.	Criterion (k_i)	Weight (w_i)	Score (z_i, 1–5)	Weighted score ($w_i \times z_i$)
1	k_1	0.15	3	0.45
2	k_2	0.05	3	0.15
3	k_3	0.1	1	0.1
4	k_4	0.15	1	0.15
5	k_5	0.05	2	0.1
6	k_6	0.15	5	0.75
7	k_7	0.1	3	0.3
8	k_8	0.1	1	0.1
9	k_9	0.15	2	0.3
	Total	1	21	**2.4**

The total weighted score for method m_{12} is 2.4. Calculations related to the assessment of method m_{15} are presented below (see Table 10).

Table 10. Method m_{15} assessment according to the specific criteria (Source: own research)

No.	Criterion (k_i)	Weight (w_i)	Score (z_i, 1–5)	Weighted score ($w_i \times z_i$)
1	k_1	0.15	4	0.6
2	k_2	0.05	2	0.1
3	k_3	0.1	5	0.5
4	k_4	0.15	5	0.75
5	k_5	0.05	4	0.2
6	k_6	0.15	3	0.45
7	k_7	0.1	3	0.3
8	k_8	0.1	5	0.5
9	k_9	0.15	2	0.3
	Total	1	33	**3.7**

The total weighted score for method m_{15} is 3.7. Finally the last method m_{16} was assessed and received the highest score among the all five evaluated methods, 4.05 (see Table 11).

Table 11. Method m_{16} assessment according to the specific criteria (Source: own research)

No.	Criterion (k_i)	Weight (w_i)	Score (z_i, 1–5)	Weighted score ($w_i \times z_i$)
1	k_1	0.15	5	0.75
2	k_2	0.05	4	0.2
3	k_3	0.1	4	0.4
4	k_4	0.15	5	0.75
5	k_5	0.05	5	0.25
6	k_6	0.15	5	0.75
7	k_7	0.1	3	0.3
8	k_8	0.1	2	0.2
9	k_9	0.15	3	0.45
	Total	1	36	**4.05**

Based on the calculations related to the assessment of the five methods according to the selected evaluation criteria a methods' ranking was built, where the best method was m_{16} and the worst m_{12} (see Table 12).

Table 12. Ranking of method effectiveness for problem P3 solving (Source: own research)

Rank	Method	Total weighted score
1	m_{16}	4.05
2	m_{15}	3.7
3	m_8	3.15
4	m_5	3.0
5	m_{12}	2.4

In spite of the above calculations, in order to make a final selection of the method among those five available, it is important to take into account organizational constraints related to the use of the methods. In order to do that the methods assessed above will be evaluated with accordance to organizational limitations identified with a help of expert method (l_1, l_2, l_3, l_4, l_5). Each limitation may score from 1 (weak limitation) to 3 (strong limitation). For the assessment the same procedure as in the previous step for method evaluation was applied.

First, method m_5 is evaluated (see Table 13).

Table 13. Method m_5 assessment according to the limitations (Source: own research)

No.	Limitation (l_i)	Weight (w_i)	Score (z_i, 1-3)	Weighted score ($w_i \times z_i$)
1	l_1	0.2	1	0.2
2	l_2	0.25	3	0.75
3	l_3	0.25	2	0.5
4	l_4	0.15	2	0.3
5	l_5	0.15	3	0.45
	Total	1	11	**2.2**

Next, method m_8 is evaluated with regard to limitations (see Table 14).

Table 14. Method m_8 assessment according to the limitations (Source: own research)

No.	Limitation (l_i)	Weight (w_i)	Score (z_i, 1-3)	Weighted score ($w_i \times z_i$)
1	l_1	0.2	2	0.4
2	l_2	0.25	3	0.75
3	l_3	0.25	3	0.75
4	l_4	0.15	2	0.3
5	l_5	0.15	1	0.15
	Total	1	11	**2.35**

Table (see Table 15) below presents evaluation of method m_{12} with regard to its application within the organizational context.

Table 15. Method m_{12} assessment according to the limitations (Source: own research)

No.	Limitation (l_i)	Weight (w_i)	Score (z_i, 1–3)	Weighted score ($w_i \times z_i$)
1	l_1	0.2	3	0.6
2	l_2	0.25	3	0.75
3	l_3	0.25	3	0.75
4	l_4	0.15	2	0.3
5	l_5	0.15	1	0.15
	Total	1	12	**2.55**

Consequently, method m_{15} is assessed in the table below (see Table 16).

Table 16. Method m_{15} assessment according to the limitations (Source: own research)

No.	Limitation (l_i)	Weight (w_i)	Score (z_i, 1–3)	Weighted score ($w_i \times z_i$)
1	l_1	0.2	3	0.6
2	l_2	0.25	2	0.5
3	l_3	0.25	3	0.75
4	l_4	0.15	2	0.3
5	l_5	0.15	2	0.3
	Total	1	12	**2.45**

Finally, the last method m_{16} was evaluated in terms of limitations of its use in the organization (see Table 17).

Table 17. Method m_{16} assessment according to the limitations (Source: own research)

No.	Limitation (l_i)	Weight (w_i)	Score (z_i, 1–3)	Weighted score ($w_i \times z_i$)
1	l_1	0.2	3	0.6
2	l_2	0.25	3	0.75
3	l_3	0.25	3	0.75
4	l_4	0.15	2	0.3
5	l_5	0.15	2	0.3
	Total	1	13	**2.7**

Based on the calculations related to assessment of the five methods with regard to organizational constraints a ranking of methods was constructed, where the best scored (lowest score) method was m_5 and the worst one (highest score) – m_{16} (see Table 18).

Table 18. Ranking of methods for problem P3 solving with regards to organizational limitations (Source: own research)

Rank	Method	Total weighted score
1	m_5	2.2
2	m_8	2.35
3	m_{15}	2.45
4	m_{12}	2.55
5	m_{16}	2.7

Summing up, taking into account method effectiveness, the best method for problem belonging to category P3 solving is method m_{16}, although from the point of view of the limitations in method application the best method is m_5. It seems that due to the organizational constraints it is better to select method m_5.

The above presented application of the model of method selection for managerial problem solving could be regarded as a good starting point for its further development and testing in real-life organizational conditions.

5. Conclusions

The main goal of this paper was to explore the methodological gap of method selection for managerial problem solving in an organization and to provide an appropriate model. Based on the extensive literature analysis in the field or management science, the model of method selection was developed. The proposed methodological approach enables managers to compare and select methods most suited to the needs and limitations of the particular decision problem. In particular it addresses the issue of the method most suitable for a specific group of managerial problems in an organization, of what the user might expect from the tool, and of the restrictions to methods' application.

The proposed model should not be treated as a final one and needs to be further developed and tested in practice. Nevertheless, it makes a contribution in two ways. The first is filling a research gap in the methodology of management science related to managerial problem solving. The second contribution is that development of the model has also pointed out important gaps in knowledge that could be filled. Building a model is challenging due to the lack of an appropriate problem classification on one hand, and classification of methods of managerial problem solving on the other.

Based on the above research, several conclusions can be drawn that may address future research. Firstly, it would be useful to explore other criteria for problems encountered in organizations and methods classification. Secondly, more in-depth and longitudinal qualitative studies of the methods application in problem solving in real-life organizations are needed. Thirdly, the model's applicability should be tested in different organizations and on various levels of decision-making. Fourthly, it is important to search for more precise methods' ranking and scoring techniques. Finally, the issues of method selection with regard to problem solving should be closely discussed with organizations' executives.

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Marek SZARUCKI is an Assistant Professor in the Department of Strategic Analysis at Cracow University of Economics. His scientific interests focus on the methodology of management science, strategic management, business start up motivations. He is the author and co-author of more than 60 scientific papers and book chapters that have been published in refereed journals and books. He holds a PhD in Economics with major in management from Cracow University of Economics.