

PROJECT MANAGER'S ROLE ANALYSIS AS A PROJECT MANAGEMENT CONCEPT

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Original scientific paper

The focus of this paper is the project manager's role (PM's role). There is a number of earlier and recent researches of PM's role, which can be used as a framework for a project management concept. The paper analyzes the project managers' competences through the basics of PM's roles. Project Management competences can be structured into six basic project manager's roles: managing, organization, recruitment, planning, controlling and coordinating. The emphasis is on the managing role as a key to the project success. The project management knowledge is linked to the PM's roles. The scientific approach to linking the competences and the project managers' roles is given as well.

Keywords: *managing, project management, project manager's roles*

Analiza funkcija voditelja projekata kao koncept upravljanja projektima

Izvorni znanstveni članak

Funkcije voditelja projekata su u središtu razmatranja ovog rada. Postoje ranija i skorašnja istraživanja funkcija voditelja projekata, a čiji rezultati mogu biti okvir za koncept upravljanja projektima. Rad analizira potrebne sposobnosti voditelja projekata za uspješno upravljanje projektima preko osnovnih funkcija voditelja projekata. Sposobnosti voditelja projekata mogu se strukturirati u šest osnovnih funkcija voditelja projekata: vođenje, organiziranje, kadrovsko popunjavanje, planiranje, kontroliranje i koordiniranje. Naglasak je na vođenju kao ključnoj funkciji za uspješnost projekata. Dat je znanstveni pristup povezivanja sposobnosti i funkcija za upravljanje projektima, uz primjenu postojećih znanja i iskustva najbolje prakse u svijetu i Republici Hrvatskoj.

Ključne riječi: *funkcije voditelja projekata, upravljanje, upravljanje projektima*

1 Introduction Uvod

One of the most appropriate definitions of project management, which defines the essence of project management in general, is: Managing is the process of forming and maintaining an environment in which individuals, working together in groups, efficiently achieve desired outcomes [18]. Individuals are organized into teams to achieve synergy, and therefore results that cannot be achieved individually.

More demanding circumstances in which project managers work, along with management development as a systematic field, result in processes and features structuring. It enables clearly defined analysis of the PM's roles around which project management can be organized. The authors agree that the basic PM's roles are [6]: managing, organizing, recruitment, planning, controlling and coordinating. Alongside understanding these roles, project managers also need to have certain skills (competences) [21] such as: technical skills (defining methods, processes and procedures), skills for working with people (e.g. teamwork and motivating ability), skills for fast and good decision making, etc. Necessary project management competences are detailed in worldwide recognized standard for project management [11], which is the basic reference book for project management in Europe.

As a system, managing includes performing tasks within the organization, with the goal of designing the internal environment, as well as including effects of external environment – especially those with technological, economical, social and political features.

Project management contains elements of skills; best practice and science (see Fig. 1). Project managers need to develop special skills required for effective work. They need to track and improve management practices and seek

to apply as much scientific knowledge in their work as possible. Science, skills and practice of project management interfere for the sake of improvement.

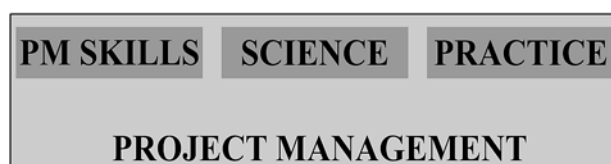


Figure 1 PM components
Slika 1. Komponente upravljanja projektima

2 On research O istraživanju

Project management practice is a relatively new term in Croatia, introduced in legislature as late as 2008 – Law on Architectural and Engineering Activities in the Physical Planning and Construction (Official Gazette 152/08); Regulations on Basic Knowledge in the Field of Project Management (Official Gazette 45/09).

Science of project management is evolving much faster than its practice, which is evident from (un)successful projects. There is extensive literature and training programs on project management. Recently, a system was established, IPMA REG [23], that provides the organizers of the project management training, with recognition and reference for the global standard of project management [11], that means it provides insight into improvement of the project managers' competence, which is the goal of education. There are many models and approaches to project management, but the access through the PM's roles still seems to be the most affordable and universal.

The hypothesis is: It is possible to include the previously defined PM's roles [6], management processes

Table 1 Research object and research method linkage
Tablica 1. Matrica predmeta i metoda istraživanja

Research object \ Research method	PM profession development	PM concept structure	PM competencies	PM's roles	PM processes
Systematic method	⊗	⊗	⊗	⊗	⊗
Generic method	⊗	⊗			
Inductive method			⊗	⊗	⊗
Analysis method		⊗	⊗	⊗	⊗
Synthesis method			⊗	⊗	⊗
Analytic hierarchy process			⊗	⊗	

[19] and the project managers' competences [11, 21] into the integral concept of project management.

Subject of the research is project management practice. Special attention is dedicated to researching the development of the project management profession, project management concept structure, PM's roles, project management competences and elements of project management processes.

System theory is the main research method. By restructuring the basic elements, it improves the function of the entity, not checking legality of every part of it [18, 20]. The research is not oriented towards the final determination of the legality of the entity, since the division is done at a lower level until the solution is found and will improve the function of the entity.

In addition to the system theory, the following scientific methods are applied (see Tab. 1):

- Generic method which enables understanding of project management profession development and facilitates realization of the logical structure and management model
- Inductive method that takes individual cases of project management as a ground for general conclusions
- Analysis method which breaks down the global project management function into separated parts
- The method of synthesis which arranges the project management competences to a higher level model (to the PM's roles)
- Analytic Hierarchy Process by which the project management competences are drawn into PM's roles.

3 Previously conducted research

Prethodno provedena istraživanja

Scientific approach to PM's roles study has created instructions that define the basic PM's roles in the process of project management: managing, organizing, recruitment, planning, controlling and coordinating.

PM's roles structure has been explored for years, but most of the new understanding can be incorporated into that basic structure. For purposes of this research, the basic division of PM's roles was taken: Managing, organizing, recruitment, planning, controlling and coordinating (see

Fig. 2).

Research shows that the managing is the most important PM's role (see Fig. 2). A successful team leader will set the organizational scheme in a way which enables him to elaborate the plan and achieve the goal [22]. By constantly controlling execution of the tasks, coordinating, and interacting with the environment, the project can be successfully brought to its ending [2]. For this reason, the research will focus on the function of managing.

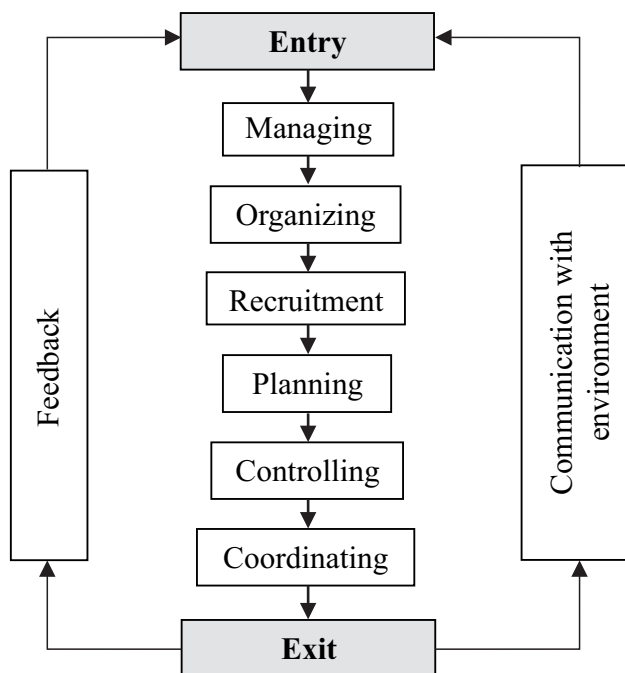


Figure 2 PM's roles
Slika 2. Uloge voditelja projekata

3.1 Managing Upravljanje

The term "Managing" means to have an impact on the team members so that they contribute to the organization and common goals. The project manager is occupied primarily with interpersonal aspects of management.

Managing is the ability to influence the group in terms of achieving goals [12]. By definition, it involves followers, and people who tend to pursue those who offer ways to meet their own needs and ideas. There are different approaches and styles to management and specific methods and theories of motivation related to it.

The most popular management theories are: the theory of traits, behavioural theories, contingency (contingency models) and the modern theory of traits - charismatic leadership.

One of the oldest theories is the theory of traits (characteristics) that was formed to investigate and monitor the behaviour of the leaders. Studies have shown some personal characteristic lines of leaders that can be allocated. There are five main traits (characteristics): intelligence, dominance, confidence, high energy level and knowledge which are important for carrying out the tasks.

Continuing research has led to the behavioural theory (behaviour and leadership styles, which may be linked to performance at work) [2]. Research on Ohio University is based on leaders' behaviour description, given by their subordinates. The results were analysed in two dimensions of behaviour: initiating the structure of leaders and subordinate role and understanding for the inferiors. The University of Michigan study, conducted at the same time as the one on the Ohio University, aimed to locate the behavioural characteristics of leaders which can be associated with measuring the effectiveness of the work. The Michigan group also came up with two dimensions of leadership behaviour: focus on worker and focus on production.

A third study, built on two-dimensional view of leadership style, is a control network [2]. It is a graphical representation of the previous two dimensions of leadership: care for people and concern for production. The network has nine possible positions in two directions, which makes 81 different positions, and the best performance is in the position 9.9 [12].

Further research led to the creation of contingency theory which shows the relationship between leadership style and effectiveness. Best known models are: the concept of a continuum of leadership, the Fiedler model, the theory of 'the way to the goal', and management-participation model.

The authors of the concept of a continuum of leadership, Tannenbaum and Schmidt [16] observed a mixture of different leadership styles. The suitability of a leadership style depends on the leaders, followers and situation. Later, the theory has been modified to show the impact of organizational and social environment.

The Fiedler model [3] is the first comprehensive contingency model. It uses a questionnaire, a simple psychological test, with 16 opposing adjectives for the least desirable associates (as pleasant-unpleasant, efficient-inefficient, etc.) and assigns points 1-8.

The results showed three critical dimensions of management situations: the leader-team members relation, task structure and power of position.

The *way to the goal* theory is one of the most respected management approaches developed by R. House [5]. The essence of the theory is that business leaders help team members to easily find their way to success and assist team members by giving necessary instructions and support, so that their goals are compatible with the general objectives of the group, organization or team.

One of the latest contingency approach updates is

manage-participate model, developed by V. Vroom and P. Yetton [17] from the University of Pittsburgh. Their model is normative because it provides a continuous set of rules to be followed in determining the design and scope of participation in decision-making, according to different situation types.

Lately, charismatic leadership theory with five characteristics of a skilled leader is more present. Those characteristics are: self-confidence, vision, strong belief in the vision, unusual behaviour (unconventional and contrary to the norms), and creating radical changes.

3.1.1

Motivation

Motivacija

Motivation is a complex process, since there is a project management task with the imperative of realizing the objectives of the project and, on the other hand, members who want to realize their needs, demands and desires [15]. In short, motivation is the process of meeting team members' needs in achieving project objectives. Otherwise, there is a tension and potential conflict, which may impair the achievement of project objectives. Scientific approach resulted in many theories on people's behaviour in the organization and motivation. Below we give a brief overview of some of them.

In two sets of assumptions on the vision of human nature, known as the theory of X and Y, D. McGregor [9] gave one of the perceptions of human behaviour in the organization. Theory X is a set of traditional assumptions on human nature, it is pessimistic, static and rigid, while Theory Y is optimistic, dynamic and flexible [10].

The most common motivation theory is a theory of hierarchical needs. Maslow A. [7] observed human needs in a hierarchy. C. P. Alderfer [1] presented variation of basic human needs according to Maslow A., in the order of importance: physiological needs, security needs, the need for connection and acceptance, the need for respect and the need for self-affirmation.

In later studies, F. Herzberg [4], together with his colleagues, modified the Maslow needs access and converted it into a theory of motivators and maintaining factors. According to their theory, motivators are: challenging work, achievement, responsibility, advancement and recognition. The corresponding factors are: status, interpersonal relationships, quality of supervision, company policy and administration, working conditions, job security and wages.

Furthermore, theory of expectation has been developed, based on a belief that people will be motivated into action of achieving the goal if they believe in the value of it, and if they can see that their work helps its achievement [17].

Many of the comprehensive models based on the theory of expectation were applied to managers. They all identified that amount of effort depends on the award value plus the amount of energy that an individual considers necessary for the probability of receiving the award.

McClelland [8] and his associates did significant research on the need for achievement and gave great contribution to understanding the motivation through three types of basic motivation needs: the need for power, the need for connectedness and the need for achievement.

After this brief overview of the theory of motivation, one can say that the main or special motivational techniques

are: money, participation (involvement in decisions) and the quality of working environment.

3.2 Organizing Organiziranje

Organizing means that team members who work together to achieve some goals must have defined roles or tasks that have to be performed. The concept of the task means that team members are doing an exactly determined work with the purpose and objective and that they have the necessary information, authority and equipment to perform the tasks.

Organizing is the part of management that defines and establishes the task structure for team members within the organization. In other words, all tasks necessary for the fulfilment of the objectives are assigned to the people who are best for their accomplishment. Still, organizational structure is only the means for creating an environment in which to place certain activities, and is not an aim in itself. Traditional organizational structures are linear and functional. Bureaucratic model is a specific hierarchical model (applied in the civil administration, army, etc.), and is suitable for routine processes. Modern organizational structures are functional (team), project and matrix ones.

3.3 Recruitment Zapošljavanje

Recruitment is defined as the completion and maintenance of populated places in the organizational structure [18]. To be able to determine the need for personnel in the selected organizational structure of a particular project, a systematic approach is required, and the first step is the creation of detailed descriptions of every job in concern.

The first step is very important because all the other requirements for a particular workplace derive from it, such as qualifications, necessary experience, knowledge of techniques and tools, and so on.

The second step is equally important, and this is the choice of people for certain jobs. Selection can be done within the existing organization if it has the necessary personnel, which is favourable, or through a competition that requires more time and risk. It often happens that people in some functions overestimate their abilities and that they are dissatisfied or simply want to change the environment.

That is when systematic approach and ability to maintain occupancy of the organizational structure comes to the fore.

To have a systematic approach means to have an overview of available people for certain jobs in the environment, or selecting, placing, promoting, training and otherwise developing candidates and those already employed, to perform tasks effectively.

3.4 Planning Planiranje

Planning is, by definition, selection of tasks, objectives and ways in which they could be accomplished, and it requires making decisions and choosing among the possible alternatives.

There are different types of planning, from global purpose and goals to detailed actions to be taken. Without control, planning will not provide adequate results, so it is logical that the control is actually a continuation of planning.

The well-known software tools in Croatia, which are widely used in project management in the planning and monitoring, based on a database and web technologies are Primavera Project Planner and MS Office Project. Primavera Project Planner is a software package for managing highly complex projects and it includes planning time and resources, cost control and graphics. The program supports Gantt chart, CPM, PERT and PDM methods of time planning and a WBS structure of division of work. MS Project is a leading software tool for project management for individual users, small and medium projects. The program allows planning activities and their duration, resource and cost management, monitoring the project with various forms of display (Table of activities, costs and time), Gantt chart, PERT chart, calendar view and different reporting possibilities.

3.5 Controlling Kontroliranje

Controlling, simply put, is evaluating the efficiency of projects with respect to plans, and it facilitates their completion. Control activities are focused on monitoring and measuring achievement, and are embodied in different types of reports for various indicators, such as time, resources, timelines, project budgets, reports on lost work hours, inspection records and so on.

Each of these reports show if plans are being carried out, or how big are resulting deviations.

If discrepancies continue, it is necessary to focus on the events as they fit into realization of the plans which means to determine the person(s) responsible for deviations, and take the necessary steps to minimize them.

This way, the results of individuals and groups are monitored by controlling what they have done. It must be noted, people or groups who do not finish their tasks on time, are usually responsible for the delay.

The basic control system consists of four steps: setting indicators, measuring performance using indicators, reporting on what is done and eliminating deviations from plans.

3.6 Coordinating Koordiniranje

Coordinating is the PM's role that should establish harmony between the individual efforts of team members to achieve previously set goals of the entire team. Performance of any of the foregoing roles contributes significantly to the coordination. The reason is that team members often interpret similar interests in different ways and their efforts towards common goals do not automatically fit into the efforts of others. For these reasons, the main task of project managers is to harmonize differences in access and to control and align individual objectives to contribute to the overall organization.

4 PM's roles and NCB (National Competence Baseline) linkage

Veza uloga voditelja projekata i Nacionalnog vodiča za upravljanje projektima (NCB)

Assigning NCB (National Competence Baseline, [11]) elements to PM's roles depends on the type of project. It is possible to link the PM's roles [6] and the project managers' competences to the integral concept of project management so that choosing the appropriate project manager can be made by optimal decisions, depending on the knowledge and experience of project manager.

The structure of PM's roles to manage the entire projects of building construction is provided, as a result of the construction projects database. Analytic Hierarchy Process ("Expert Choice" software) is used as a tool for mathematical objective analysis.

4.1 Analytic Hierarchy Process (AHP) and Expert Choice

Analitičko-hijerarhijski proces i "Expert Choice"

The AHP is a tool that can be used for analyzing different kinds of social, economic and technological problems, and it uses both qualitative and quantitative variables.

The fundamental principle of the analysis is the possibility of connecting information, based on knowledge, to make decisions or predictions; the knowledge can be taken from experience or derived from the application of other tools. Among the different contexts in which the AHP can be applied, mention can be made of the creation of a list of priorities, the choice of the best policy, the optimal allocation of resources, the prediction of results and temporal dependencies, the assessment of risks and planning [13].

- The steps used in AHP and EC are:
- to brainstorm and structure a decision as a hierarchical model
 - to pairwise compare the objectives and sub-objectives for their importance in the decision
 - to pairwise compare the alternatives for their preference with respect to the objectives, or assess them using one of the following:
 - utility curves, ratings or step function, or enter priorities directly
 - synthesizing to determinate the best alternative
 - performing sensitivity analysis.

The "structuring" consists of subdividing the problem into simple clusters represented at different levels in a hierarchal structure. The decomposition is carried out from the top to the bottom, starting from the objectives, to criteria, sub-criteria and alternatives.

The "pairwise comparison" consists of giving a rate to each cluster to measure the importance of each level in the hierarchy. Each single element is evaluated using a pairwise comparison. The comparisons are made on a 9-point scale, so-called "fundamental scale of Saaty", which is represented below (see Tab. 2 and Tab. 3).

The numerical judgments established at each level of the hierarchy make up pair matrices.

Let n be the number of objective (criteria) at a certain level of the hierarchy and m the number of the alternatives. There are therefore n matrices with m lines and m columns at that level (see Tab. 4).

All the pairwise comparison matrices have two fundamental properties:

- the principal diagonal is always composed of values that are equal to one (each criterion is compared to itself)
- the matrices are reciprocal (in assigning a value from 1-9, so

$$i_a j_b = \frac{1}{i_b j_a}; \quad k_c l_d = \frac{1}{k_d l_c}.$$

Table 2 Saaty's fundamental scale
Tablica 2. Saaty-jeva skala

Value ($i_a j_b; k_c l_d$)	Explanation
1	Objective i and j are of equal importance
3	Objective i is slightly more important than j
5	Objective i is largely more important than j
7	Objective i is a lot more important than j
9	Objective i is absolutely most important compared to j
2,4,6,8	Intermediate values
$a, b = (1, 2, 3, \dots n = \text{number of objectives})$	
$c, d = (1, 2, 3, \dots m = \text{number of alternatives})$	

Table 3 Pairwise comparison of the objectives and sub-objectives in relationship to their importance in the decision
Tablica 3. Usporedba parova kriterija u odnosu na njihovu važnost u odlučivanju

$j \backslash i$	Objective 1	Objective 2	Objective 3	Objective 4	...	Objective n
Objective 1	1	$i_1 j_2$	$i_1 j_3$	$i_1 j_4$...	$i_1 j_n$
Objective 2	$i_2 j_1$	1	$i_2 j_3$	$i_2 j_4$...	$i_2 j_n$
Objective 3	$i_3 j_1$	$i_3 j_2$	1	$i_3 j_4$...	$i_3 j_n$
Objective 4	$i_4 j_1$	$i_4 j_2$	$i_4 j_3$	1	...	$i_4 j_n$
...
Objective n		$i_n j_2$	$i_n j_3$	$i_n j_4$		$i_n j_n$
$i_a j_b: (a = 1, \dots n; b = 1, \dots n) = \text{value (see Tab. 2)}$						

Table 4 Pairwise comparison of the alternatives in relationship to set criteria
Tablica 4. Usporedba alternativa u odnosu na postavljene kriterije

Objective i ($i \rightarrow 1, 2, \dots, n$)					
$l \backslash k$	Alternative 1	Alternative 2	Alternative 3	...	Alternative m
Alternative 1	1	i_{1j_2}	i_{1j_3}	...	i_{1j_n}
Alternative 2	i_{2j_1}	1	i_{2j_3}	...	i_{2j_n}
Alternative 3	i_{3j_1}	i_{3j_2}	1	...	i_{3j_n}
Alternative 4	i_{4j_1}	i_{4j_2}	i_{4j_3}	...	i_{4j_n}
...
Alternative m		i_{mj_2}	i_{mj_3}		i_{mj_n}

$k, l, j, d: (c = 1, \dots, m; d = 1, \dots, m) = \text{value (see Tab. 2)}$

When the judgment matrix of criteria comparison with respect to the goal is available, the local priorities of criteria are obtained and the consistency of the judgements is determined. It has been generally agreed [14] that criteria priorities can be estimated by finding the principal eigenvector w of the matrix A , and that is:

$$Aw = \lambda_{\max} \cdot w.$$

When the vector w is normalised, it becomes the vector of criteria priorities with respect to the goal. λ_{\max} is the largest eigenvalue of the matrix A and the corresponding eigenvector w contains only positive values. The consistency of the judgement matrix can be determined by a measure called the consistency ratio (CR) which is defined as:

$$CR = \frac{CI}{RI},$$

where:
 CI - consistency index, RI - random index.

$$CI = \frac{\lambda_{\max} - n}{n - 1}.$$

RI is the consistency index of a randomly generated reciprocal matrix from the 9-point scale, with forced reciprocals. Saaty has provided average consistencies (RI values) of randomly generated matrices (up to 11×11 size) for a sample size of 500. If the CR of the matrix is high, it means that the input judgements are not consistent and hence are not reliable. In general, a consistency ratio of 0,10

or less is considered acceptable. If the value is higher, the judgements are not reliable and have to be elicited again.

Using a similar procedure, the local priorities of alternatives with respect to each criterion can be estimated.

The last step of the procedure consists of an aggregation of the local priorities of elements of different levels in order to obtain final priorities of the alternatives. The final list, obtained by summing all the eigenvectors, is a vector that provides the measure of the part played by each alternative in reaching the initial goal.

4.2 Analysis and results Analiza i rezultati

The Expert Choice model has objectives (criteria) on the left side and alternatives on the right side of the sheet (see Fig. 3).

Each node of competence type (technical, behavioural and contextual) contains all the competences of the NCB (see Fig. 4 [11]).

All competences have equal importance. The importance of each competence is compared in relationship to the specific PM's role.

Sensitivity analysis from the Goal (PM's role structure) node will show the sensitivity of the alternatives with respect to all the objectives below the goal.

There are five types of sensitivity analysis: Dynamic, Performance, Gradient, Head to Head and Two-Dimensional (2D plot).

The synthesis (distributive mode) distributes the weight of each covering objective to the alternatives in direct proportion to the alternative priorities under each covering objective (see Fig. 5).

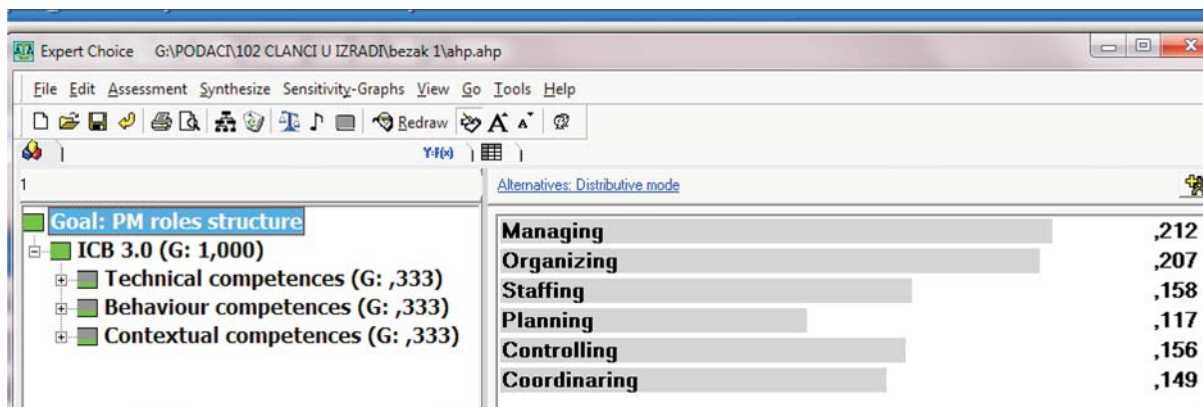


Figure 3 Expert Choice model
Slika 3. Model u "Expert Choice-u"



Figure 4 Project manager's competences [13]

Slika 4. Sposobnosti voditelja projekta [13]

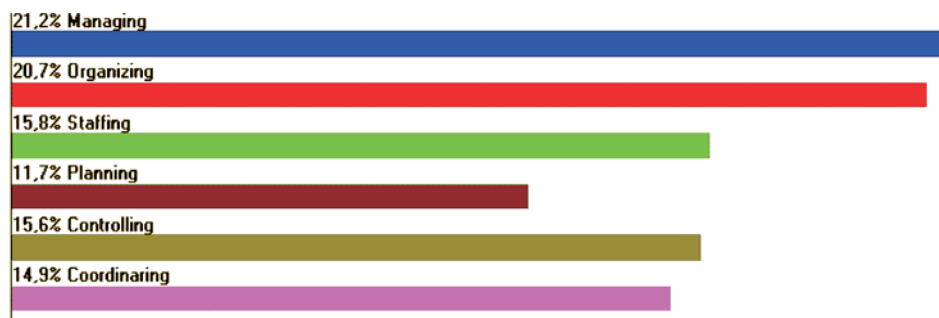


Figure 5 Dynamic sensitivity for PM's roles structure

Slika 5. Dinamička osjetljivost strukture uloga voditelja projekta

Dynamic sensitivity shows the ratio of participation of each PM's role in the overall structure of PM's roles, on the basis of each role in a particular competency.

5

Conclusion

Zaključak

Project management is a skill derived from practical and scientific approach. It is possible, on the basis of the PM's roles: managing, organizing, recruitment, planning, controlling and coordinating [6] on one hand, and the project managers' competences [11] on the other, to make the integral concept of project management (see 4.2.).

For certain type of project, the extent of necessary PM's roles can be defined as well.

The presented approach also provides a measure of every project manager's competence needed for particular PM's role. This review provides a detailed analysis and understanding of concepts related to PM's roles and competences, which are crucial for the projects' success in general.

6

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