

Is Project Manager's Age like a Wine? A Case Study in Petrochemical Industry in EU Countries

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Abstract – The essential of presented paper is to analyze the impact of the project manager's age on the preference of key competences in the project practice regarding the petrochemical industry in EU countries. The primary method of data acquisition was electronic questioning. We used the International Competence Baseline version 4 as the theoretical basis for the analysis. The research sample of the respondents was intentional, 78 respondents working as project managers in the petrochemical industry in EU countries were addressed. We also used linear and regression analysis to analyse the correlation of the key competence elements preference and the project manager's age. We concluded that the preference of the key competence elements of project managers in the petrochemical industry of EU countries did not change with age.

Keywords – Competence element, key competence, petrochemical industry in EU countries, project manager.

1. Introduction

As a result of a globalization, the classic organization management models are retreating, and modern management tools such as project management come into their place.

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This phenomenon of recent times, irrespective of the size or focus of organizations, is inflected across them, and a management discipline has become an important part of our lives.

Its applicability is very wide and for the organizations it serves as an effective and efficient tool for planning and organizing processes, for crisis management or time management. Since projects need to be managed in some way, it is also necessary to put a suitable project manager at the top of the imaginary project management pyramid. It is completely wrong to assume that any person can hold this position. On the contrary, a person qualified for this activity is needed, as evidenced by the fact that the profession of project manager is also defined for example by the National System of Occupations, which is administered by the Ministry of Labour and Social Affairs of the Czech Republic or by the appropriate legislation in Slovakia.

Inappropriate selection of the project manager can subsequently influence the course of the entire project. He is, therefore, a key person and specific requirements are placed on organizations to make the right choice of project manager. He must have appropriate knowledge, skills and attitudes. This allows him to realize the tasks and to achieve the desired goals.

The output of this paper is to find out if the age of project manager has some correlation with project manager's key competences preference, whether the competences change with age and how.

The starting base for identifying the key competences is the International Project Management Competence Baseline version 4, which defines competencies as follows: "Project manager competence is understood as the application of knowledge, skills and abilities to achieve the desired results" [27]. Knowledge is a set of information that the project manager knows. Skills are specific technical capabilities that allow a project manager to perform a task. Capabilities represent the effective use of knowledge and skills in certain context. The competences listed in the International Project Management Competence Baseline are derived from

a series of reference documents describing the behaviour of project managers in praxis, and in version 4.0 the standard also addresses the competences of teams and organizations, while addressing competences for managing programs and program portfolios.

For the purposes of this paper, we perceive competences as the use of knowledge, skills and abilities that have to be used to achieve the desired goals. The International Project Management Competence Baseline divides competences into three groups and uses the so-called competency eye, which graphically illustrates the importance of competences from all these areas for the performance of the profession not only of the project manager. He should have a comprehensive set of competences. Each of the three areas of competences contains several constituents that the International Project Management Competence Baseline defines as elements and these are further described using the necessary knowledge and experience. Areas of competences according to International Project Management Competence Baseline are perspective, people and practice competences.

This analysis is carried out with a focus on project managers operating in the petrochemical industry in Czech and Slovak Republic as the EU members.

2. Problem Formulation and Methodology

The essential of presented paper is to analyse the correlation of project manager's key competences elements preference with the age of project managers. The paper presents a case study in petrochemical industry of two EU member countries, Czech Republic and Slovakia. This will be achieved by synthesising the outputs of the sub-objectives, which are defined as follows:

1. To analyse the information sources focused on competences of project managers, their application, development and age-related context.
2. To identify the key competences of project managers operating in the petrochemical industry of Czech and Slovak Republic by means of electronic questioning, in which the starting base of the competence elements definition is the International Project Management Competence Baseline version 4.
3. To evaluate the identified outputs and key issues.

The presented paper has a classical structuring of the research work consisting of a theoretical and an analytical part. The theoretical part is focused on the description of the current state of the problem with the use of research literature and analysis of documents, in this case professional-literary and

electronic resources with the topic of project manager competences. The study of these literary sources demonstrates the current level of knowledge of the problem, which is the absolute basis of any further research. Content-causal analysis was used.

In the analytical part data are processed from the questionnaire survey and using general and statistical methods (linear analysis and regression analysis). They are used to search the answers to key questions and analysed information led to the achievement of the paper's essential. Outputs of analyses in the form of graphs are presented, and correlations among respondents' answers are assessed. Methods of analysis, abstraction, identification, questioning, comparison, evaluation and synthesis were used.

Electronic questioning using self-designed questionnaire was chosen as the primary method of data acquisition in the context of identification the key competences of a project manager. A final series of questions was created to identify the key competences of a project manager in the petrochemical industry. As a starting theoretical basis, we used the International Project Management Competence Baseline version 4, by gradually listing the defined 29 competence elements that we created finding closed questions in which respondents subjectively evaluated the preference of importance and usability of individual competence elements on a 0-100 scale. The questionnaire also contains questions that characterize individual respondents and enable us to answer the following key questions by analysing the outputs of the questionnaire survey:

1. KQ1: Which competences of project manager are the key competences in the petrochemical industry?
2. KQ2: How do key competences change with project manager's age?

The reasons for this quantitative approach are mainly the speed of data acquisition, elimination of the interviewer's influence on respondents and their time independence.

Furthermore, the evaluation of the data obtained by questioning will be carried out and the outputs will be compared with the theoretical assumptions resulting from the analysis of information sources.

The research sample of the respondents was intentional, 78 respondents working as a project manager in the petrochemical industry in Czech and Slovak Republic were addressed. During the two weeks from 19 August 2019 for the collection of replies, 61 persons filled in the questionnaire, which is 78% of the total number of respondents. A total of 6 women and 55 men completed the questionnaire. From this it can be concluded that at present the position of a project manager in the analysed sector is mostly held by men.

Table 1. Distribution of respondents by age

	n_i	p_i	kn_i	kp_i
18 – 25 years	0	0 %	0	0 %
26 – 30 years	3	4,92 %	3	4,92 %
31 – 35 years	6	9,83 %	9	14,75 %
36 – 40 years	16	26,23 %	25	40,98 %
41 – 45 years	10	16,39 %	35	57,37 %
46 – 50 years	10	16,39 %	45	73,76 %
51 – 55 years	10	16,39 %	55	90,15 %
56 and more years	6	9,85 %	61	100 %
Total	61	100 %	x	x

Source: own solution

Table 1 shows the distribution of respondents into age groups. The age scale will be further used in the analytical part of this paper to analyse the correlation between age and key competences preference of project managers.

3. Overview of the Current State of the Issue

There are many definitions of a project manager, such as cited in [5], [16], [18] or [19]. One of them is that the project manager is the project management link. He is responsible for managing the project, coordinating team members, negotiating and deciding, having authority and accountability. He is a leader, planner, organizer, coordinator, supervisor and negotiator in one person [14], [23].

The project manager and his team are responsible for project management. The work of the project manager varies according to the project. He is responsible for defining the work, planning it, identifying the resources needed and procuring them, performing tasks and solving problems which will not delay the project [16].

The project manager has to manage the organization of people so that the material resources are used properly. However, this results in various difficulties and problems which he has to subsequently resolve. He has to meet the requirements of the client as well, respect the time schedule and budget of the project. The most difficult thing about managing a project is managing people who are not subordinate to it. Every project manager should be able to cope with unexpected problems, gain the respect of their members, understand them and be a good leader and speaker. He should be creative, resourceful, assertive, confident and able to adapt [18].

As reported in [21], the project manager is a person who has the necessary competence, authority, responsibility, personality characteristics; he organizes and coordinates in such manner that all project objectives are met. His main tasks include controlling the implementation of the tasks, monitoring the project, responding to any deviations (expected and unexpected), planning resource

requirements, prioritizing activities, actively addressing project relationships, knowing and correctly applying project management principles, communication not only about material, but also objective project matters and information transfer management. *“Project managers have two responsibilities in project management: the technical capability of the project: plans, budgets, statistical analysis, and monitoring in different processes. The second competency is to lead people so that the team is motivated to successfully complete the project goals. This means that project managers are currently looking more at people who will implement corporate strategies and goals than just determine the state of business disasters”* [11], [15]. Thus, the role of project managers is much more demanding than that of typical managers, because apart from working in a functional and organizational structure, the project manager also has other tasks [3]. In contrast, [9] concludes that there are no significant differences between the perception of line management styles and project managers in terms of their transformational management behaviour.

The project manager ensures the redistribution of work among individual team members (synergy). So, their combined outcome is greater than when they worked alone and without organization [6], [12].

[8] states that every manager should be interested not only in the achieved result, but also in how it will be achieved. If the manager is only interested in the outcome and not in the progress of the employees, he cannot give them feedback in the event of failure in order to meet the target next time. If the manager is interested in results and how goals are being met, he can help influence the entire process to meet the goals.

[26] wrote that the responsibility of a project manager is limited by the project timeframe, but that competences in the long term of the project are not included.

The project manager plays a very important role in the management of human resources, especially in organizations that are project oriented. However, the role of the project manager is not clear [10], [13]. Successful project manager, according to some authors like [7] or [25], *“use formal and informal communication and interact with each other”*.

[28] exhaustively identifies 7 key competencies needed for a successful project manager. These are: Goal leadership, effective communication, risk management, cost control, negotiation skills, Tech Savvy, critical thinking. Similarly, [1] approaches the identification of project manager competencies, which in addition speaks of the importance of planning and time management.

[2] analyses in detail how project management competencies change within the project management

career model in large Chinese construction companies. He found the following:

1. A project management career model for Chinese large contractors is developed.
2. The change of project management competency in the proposed career model is analysed.
3. The importance of project management competency increases first, then decrease.
4. Project management competency reaches the peak at the project manager level.
5. Human skills are the most important at all project management levels.

The vast majority of available information sources only address the identification of project manager’s competences in different sectors or situations, for example [4], [20] or [29], unfortunately, almost no current source solves the issue of level and development of competences in the context of burnout, i.e. in the context of age or length of practice, or length of the profession in one company. In this regard, the present paper brings new knowledge.

4. Results and Discussion

The respondents' gradual evaluation of the preference of all 29 elements of perspective, people and practice competences was in detail assessed by a 0-100 scale evaluation.

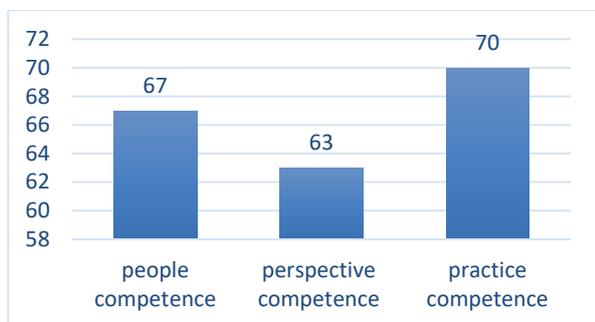


Figure 1. Preference of competences (Source: own solution)

As the key competences in the practice of a project manager in the petrochemical industry can be considered that such competences and those elements were rated by respondents with the highest preference (see Figure 1), i.e. the highest number of points as the most important and most frequently used. Contrary to current theory, for example [17], [22] or [24], which as key competences denote primarily people competences, the questionnaire survey found that in the petrochemical industry the practice competences are the key competences. This suggests that the analysed project managers emphasize methods, tools and techniques for achieving the project's goals in front of soft skills and communication tools. Below in Table 2 we provide a

partial evaluation of the individual elements of practice competences.

Table 2. Evaluation of preference of individual elements of practice competences

Practice competence element	Preference
Design	79
Plan and control	51
Risks and opportunity	34
Stakeholders	33
Change and transformation	17
Select and balance	20
Goals, objectives and benefits	90
Scope	79
Time	70
Organization and information	64
Quality	64
Finance	64
Resources	54
Procurement	32

Source: own solution

Furthermore, we assessed in detail the correlation between the key, i.e. practice competences and the age of the analysed project managers. We used linear analysis because both, the age of respondents and the preference of individual practice competence elements as variables, are continuous variables. Using regression analysis, we were looking for a free one-sided correlation, in which the dependent variable - in our case the values of the preference of a practice competence element, against the independent variable, the age of respondents. We have a total of 61 responses on the rating scale from 0 to a maximum of 100 points, which individual respondents could assign to an appropriate practice competence element according to their own preferences. Thus, in Figure 2, 61 points are entered and may overlap due to a predetermined scale. We have gradually analysed all 14 elements of practice competence. Due to the limited scope of the paper, we will evaluate the element Goals, objectives and benefit in detail, as these are evaluated by the project managers as the most preferred, e.g. they are used and they are important in the practice regarding the project managers in the petrochemical industry.

We will enter all points into the Excel graph using the trend line function and selecting the linear trend type, then using the estimation of the forward and backward estimation, i.e. extrapolating the values to 5 five years. It is known that the correlation of two variables described by linear regression can also be written as an equation: $y_i = a \cdot x_i + b$. The function in Excel automatically completes the equation of the regression line. The recorded points were interlaced with a straight line (red in Figure 2), which approximates the entered values. It is clear from the

graph that there is no strong linear correlation between the variables, which is confirmed by the value of the coefficient of determination R². In our case we get R² = 0.0003. This means that the given regression model explains only 0.03% of the variance of the dependent variable (popularity values of the selected competence element).

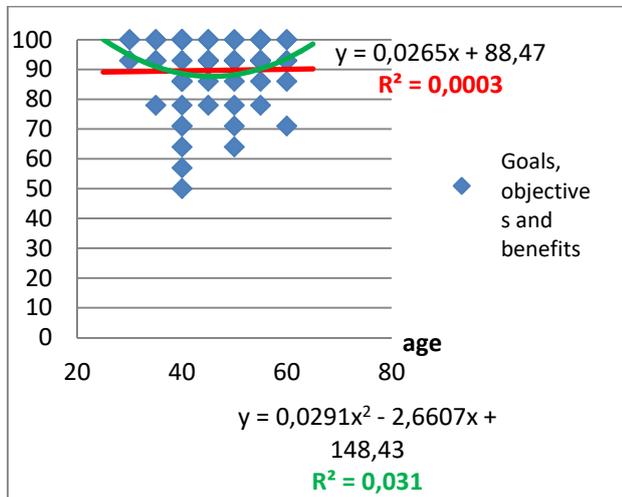


Figure 2. Regression analysis of correlation of practice competence element Goals, objectives and benefits on the age of the project managers (Source: own solution)

To confirm this finding, we will perform a regression analysis using the MS Excel data analysis add-in. We leave all the predefined parameters of the analysis tool, including the confidence level. If we wanted accurate and reliable results, we would increase the value up to a maximum of 99%. In the case of insufficient data, it would be advisable to decrease the value. However, it is clear from the previous text that such a setting is meaningless.

From Figure 3 we can read the value of multiple R = 0.018, i.e. the correlation coefficient. This generally takes values in the range <-1; 1> and the closer we are to these extreme values, the better the model. However, in our case R is close to zero and there is no linear correlation for the range <-0.3; 0.3>. As we mentioned above, variability of the element preference is only 0.03% described by the quantity age. We would have to look elsewhere for a description of the rest, 99.97%.

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0,018610923							
R Square	0,000346366							
Adjusted R Square	-0,016596915							
Standard Error	12,06487148							
Observations	61							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	2,975662654	2,975663	0,020442702	0,886794759			
Residual	59	8588,106305	145,5611					
Total	60	8591,081967						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	88,47041707	8,65845946	10,2178	1,14008E-14	71,14487971	105,796	71,1448797	105,795954
X Variable 1	0,026537342	0,185604406	0,142978	0,886794759	-0,344856215	0,397931	-0,34485622	0,3979309

Figure 3. Regression analysis of correlation of practice competence element Goals, objectives and benefit on the age of the project manager (Source: own solution)

The model cannot be considered statistically significant because the Significance F = 0.887 is greater than the Significance Level 0.05 (in addition to the 95% confidence level we choose).

We say that these two quantities from our measurements are not linearly dependent. However, this does not preclude the existence of other functional correlations. We will verify this again using Excel and plot the second-degree polynomial model (green in Figure 2), and we can see that the coefficient of determination R² is higher than in the case of linear regression. If we were to experiment in this way up to level 6, for example, we would probably achieve a more optimal model that would better describe the correlation of the two analysed quantities.

We found out that none of the 14 cases are linearly dependent variables. The practice competence elements are not linearly dependent on the age of respondents, i.e. project managers.

If we want to generalize these correlation findings and to extend it further to people and perspective competences and at the same time to make the approach more effective, we will create graphs of the correlation of other elements on age. For the sake of clarity of the presented paper, we have selected three elements from each group of competences, namely the ones that received the most and the least points in rating of the preference and then the one that is among them. This achieves optimal distribution and clarity in the graph.

In the figures below (Figure 4, Figure 5, Figure 6), line graphs denoting mean values of preference among selected competences according to age of respondents are drawn.

In the bellow cited graphs, in neither case there is a strong trend curve that would indicate a possible linear correlation. On the contrary, the graphs show fluctuations of the dependent variables in both directions on the Y axis. Based on this and previous findings as well as experience in analyzing the correlations of variables, we can confirm the independence of the preference of competences on the age of respondents.

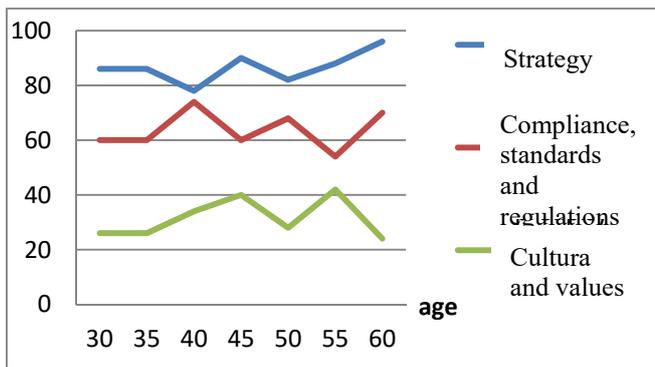


Figure 4. Graph of correlation of perspective competence elements on age (Source: own solution)

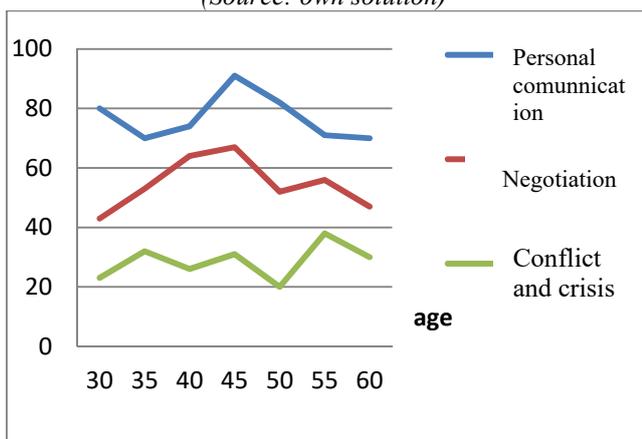


Figure 5. Graph of correlation of people competence elements on age (Source: own solution)

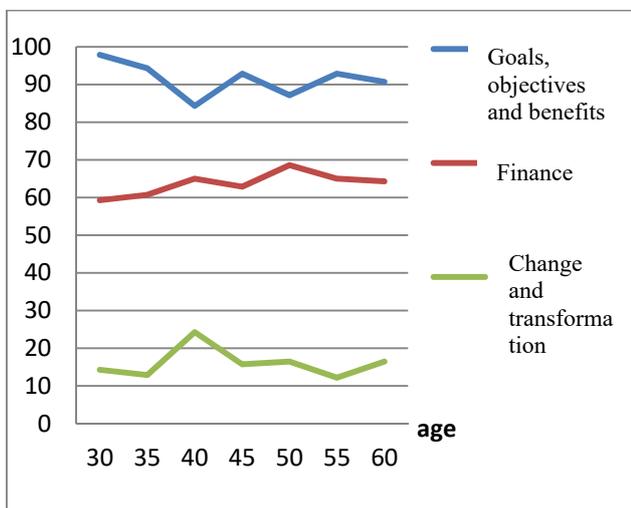


Figure 6. Graph of correlation of practice competence elements on age (Source: own solution)

5. Conclusions

Using a questionnaire survey, we gathered data from 61 project managers working in the petrochemical industry and subjected them to our analyse which explored the impact of age and the preference of specific key elements of competences

as defined by the International Project Management Competence Baseline.

From the data we were able to identify competences that are crucial for the analysed project managers, and in practice they consider them the most important and most used (preferred) in comparison with others. These are elements of practice competence, i.e. in the petrochemical industry the project managers mostly prefer the practice competence elements. Subsequently, using statistical methods and calculations, we verified that there is no linear dependence between the preference of practice competence elements and the age of respondents, and then we applied this simplified approach to the remaining competences stating, that their preference is independent on the age of project managers. The above, therefore, provides the answers to the formulated key questions.

In the context of fulfilling the essential of presented paper, we can state that the preferences of competencies regarding the project managers in the petrochemical industry of Czech and Slovak Republic do not change with age.

References

- [1] Aston, B. (2019). 7 Essential Project Management Skills for 2019. Retrieved from: <https://thedigitalprojectmanager.com/project-management-skills/> [accessed: 12 September 2020].
- [2] Chen, T., Fu, M., Liu, R., Xu, X., Zhou, S., & Liu, B. (2019). How do project management competencies change within the project management career model in large Chinese construction companies?. *International Journal of Project Management*, 37(3), 485-500.
- [3] Cleland, D. I. (1995). Leadership and the project-management body of knowledge. *International Journal of Project Management*, 13(2), 83-88.
- [4] Crawford, L., & Nahmias, A. H. (2010). Competencies for managing change. *International journal of project management*, 28(4), 405-412.
- [5] Doležal, J., Máchal, P. & Lacko, B. (2012). *Projektový management podle IPMA*. Praha: Grada.
- [6] Fiala, P. (2004). *Projektové řízení – modely, metody, analýzy*. Praha: Professional Publishing.
- [7] Hällgren, M., & Maaninen-Olsson, E. (2005). Deviations, ambiguity and uncertainty in a project-intensive organization. *Project Management Journal*, 36(3), 17-26.
- [8] Hronik, F. et al. (2008). *Kompetenční modely*. Brno: MotivPress.
- [9] Keegan, A. E., & Den Hartog, D. N. (2004). Transformational leadership in a project-based environment: a comparative study of the leadership styles of project managers and line managers. *International journal of project management*, 22(8), 609-617.

- [10] Keegan, A., Huemann, M., & Turner, J. R. (2012). Beyond the line: exploring the HRM responsibilities of line managers, project managers and the HRM department in four project-oriented companies in the Netherlands, Austria, the UK and the USA. *The International Journal of Human Resource Management*, 23(15), 3085-3104.
- [11] Kloppenborg, T. J., & Opfer, W. A. (2002). The current state of project management research: trends, interpretations, and predictions. *Project Management Journal*, 33(2), 5-18.
- [12] Marek, D. & Kantor, T. (2007). *Příprava a řízení projektů strukturálních fondů Evropské unie*. Brno: Společnost pro odbornou literaturu - Barrister & Principal.
- [13] Medina, R., & Medina, A. (2014). The project manager and the organisation's long-term competence goal. *International Journal of Project Management*, 32(8), 1459-1470.
- [14] Němec, V. (2002). *Projektový management*. Praha: Grada.
- [15] Neuhauser, C. (2007). Project manager leadership behaviors and frequency of use by female project managers. *Project Management Journal*, 38(1), 21-31.
- [16] Newton, R. (2008). *Úspěšný projektový manažer: jak se stát mistrem projektového managementu*. Praha: Grada.
- [17] Pandya, K. D. (2014). The key competencies of project leader beyond the essential technical capabilities. *IUP Journal of Knowledge Management*. 12(4). pp. 39.
- [18] Ramazani, J., & Jergeas, G. (2015). Project managers and the journey from good to great: The benefits of investment in project management training and education. *International Journal of Project Management*, 33(1), 41-52.
- [19] Rosenau, M. D. (2007). *Řízení projektů*. Brno: Computer Press.
- [20] Gilbert, A. J., & Ron, J. S. (2014). Sustainability in Project Management Competencies: Analyzing the Competence Gap of Project Managers. *Journal of Human Resource and Sustainability Studies*, 2(4), 40-58.
- [21] Skalický, J., Jermář, M. & Svoboda, J. (2010). *Projektový management a potřebné kompetence*. Plzeň: Západočeská univerzita v Plzni.
- [22] Stevenson, D. H. & Starkweather, J. A. (2010). PM critical competency index: IT execs prefer soft skills. *International Journal of Project Management*, 28(7), 663-671.
- [23] Svozilová, A. (2011). *Projektový management*. Praha: Grada.
- [24] Taylor, H., & Woelfer, J. P. (2012). Critical behavioral competencies for IT project managers: What are they? How are they learned?. In *Project Management Techniques and Innovations in Information Technology* (pp. 165-184). IGI Global.
- [25] Thomas, J. & Mengel, T. (2008). Preparing Project Managers to Deal with Complexity - Advanced Project Management Education. *International Journal of Project Management*. 26(3), 304-315.
- [26] Turner, J. R., & Müller, R. (2005). The project manager's leadership style as a success factor on projects: A literature review. *Project management journal*, 36(2), 49-61.
- [27] Vukomanović, M., Young, M., & Huynink, S. (2016). IPMA ICB 4.0—A global standard for project, programme and portfolio management competences. *International Journal of Project Management*, 34(8), 1703-1705.
- [28] Wins, M. (2018). *7 key competencies needed to be a successful Project Manager*. Retrieved from: <https://www.procurement-academy.com/7-key-competencies-needed-to-be-a-successful-project-manager/> [accessed: 12 September 2020].
- [29] Zadeh, M. T., Dehghan, R., Ruwanpura, J. Y. & Jergeas, G. (2016). An index to assess project management competencies in managing design changes. *International Journal of Construction Engineering and Management*, 5(1), 11-24.