

## SUCCESS OF THE PROJECT IMPLEMENTED IN A CONSORTIUM – ANALYSIS OF KEY FACTORS FROM THE ENTERPRISES POINT OF VIEW

Waldemar SZCZEPANIAK

Czestochowa University of Technology, Faculty of Management, Czestochowa;  
waldemar.szczepaniak@wz.pcz.pl, ORCID: 0000-0003-2608-1534

**Purpose:** identification and quantification of the factors influencing success of the joint project carried out by a scientific and industrial consortium.

**Design/methodology/approach:** this paper presents results of mixed research involving preliminary qualitative research in the form of unstructured interviews with project managers implemented as part of scientific and industrial consortia, and then quantitative research conducted with the use of a questionnaire among representatives of companies from the group of this type of consortia.

**Findings:** the result of conducted research is the identification of key factors for the success of initiatives carried out by scientific and industrial consortia from the point of view of enterprises.

**Research limitations/implications:** research results will be used to better understand the factors determining success of projects implemented as part of cooperation between private enterprises and public universities. The next stage of research should include assessment of factors from the point of view of public universities participating in the joint implementation of projects by scientific and industrial consortia.

**Practical implications:** research results will contribute to an increase in the absorption capacity of consortia consisting of private enterprises and public universities, additionally will increase the percentage of successful projects and may result in the intensification of work aimed at obtaining funds and joint implementation of projects.

**Social implications:** research results may contribute to greater interest in the implementation of research and development projects by scientific and industrial consortia, which will result in the transfer of modern solutions from the world of science to industry, allowing for specific economic and social benefits.

**Originality/value:** developing a map of key success factors for projects implemented by scientific and industrial consortia from the point of view of companies participating in their implementation.

**Keywords:** key success factors, projects, scientific and industrial consortia.

**Category of the paper:** Research paper.

## 1. Introduction

Development of innovative economies is supported by the transfer of modern solutions from the world of science to industry. It is possible thanks to the cooperation of universities with enterprises. This cooperation is also widely supported by external funds, including EU funds. The result of such cooperation is most often the joint implementation of projects as part of a scientific and industrial consortium. On the one hand, it allows for a synergy effect based on diversified resources and competences of the consortium members, and on the other hand, it is associated with an increased risk of failure. Hence, it is so important to conduct research aimed at determining the factors influencing the increase in the probability of a successful project implementation.

Public universities and private enterprises have actively participated in the joint implementation of projects within scientific and industrial consortia in recent years. Many of these projects ended with the achievement of expected results, but not all of them. It is a fact that implementation of research and development projects carries a high risk of failure, but there are factors that favor the successful implementation of projects.

Based on conducted literature studies and qualitative research, an attempt was made to identify and then quantify the key success factors of projects implemented within scientific and industrial consortia as part of quantitative research. Results of this research will be used to better understand factors determining the success of projects implemented as part of cooperation between public universities and private enterprises. Moreover, they will contribute to an increase in the absorption capacity of these entities and may contribute to the intensification of works aimed at obtaining funds and joint implementation of projects by these entities.

## 2. Scientific and industrial consortia

Implementation of complex projects requires involvement of significant resources, both human and financial, which are not available to individual entities. As a result it becomes necessary to establish a consortium within which various entities will cooperate in order to achieve a common goal. The implementation of projects by consortia, which includes both universities and enterprises, favors establishment, sharing and exchange of knowledge. The process of creating and collecting knowledge takes place both in the entities individually as well as within the entire consortium. Additionally, knowledge exchange takes place between selected members of the consortium and within the entire consortium. The greater the number of entities in the consortium, the greater the number of possible interactions related to the knowledge management process (Fakhar Manesh et al., 2021).

In consortia whose participants are universities or other scientific units, due to their specificity, they play an important role in the knowledge management process. Universities are perceived as intermediaries in the process of creating new knowledge and preserving existing knowledge, its analysis and evaluation, as well as in the process of its dissemination and transfer to other entities. This makes scientific entities particularly important partners in the implementation of projects by many entities (Ardito et al., 2019).

### 3. Key Project Success Factors

In a broader context, the project's success is defined as the completion of the project as expected. The literature (Al-Tmeemy et al., 2011; Wai et al., 2012; Nguyen et al., 2013; Mukhtar and Amirudin, 2016; Silva et al., 2016a) indicates three key criteria, i.e.: project according to the schedule (time), within the planned budget (costs) and with the assumed efficiency (quality). Defining the success of the project as the completion of a project in accordance with the budget and schedule and with the achievement of required quality, we will refer to the internal definition of success (Trocki, 2011, p. 17). Moreover, the literature indicates the following key success factors: top management support, effective communication in the project, clearly defined goals and tasks, project manager's competences (Lamprou, Vagiona, 2018, p. 282; Udechukwu et al., 2021, p. 915, Garbharran, Govender, & Msani, 2013, p. 105; Spalka, 2004, p. 99; Soroka, 2015, pp. 617-626), stakeholder engagement (Trzeciak and Liebert, 2016, pp. 205-215), competences of project team members, sufficient resources, adequate information support, appropriate mechanisms for managing and responding to deviations, sensitivity to the needs of recipients and invariability of the composition of the project team (Rusan and Voitenko, 2021, p.). Moreover, as Abylova and Salykova note, success factors may also be very specific factors relevant only for a particular project or organization (2019, p. 9).

A scientific and industrial consortium established for the joint implementation of the project is an example of a temporary network. Referring to the implementation of a project in the temporary network, M. Wirkus and K. Tubielewicz indicated a set of factors influencing the project success, which included: defining a real project strategy (goals, measures, results, project outline), proper planning of activities in the project, defining the structure organizational project (appointment of a project manager and a project management office), implementation of works in accordance with the current plan, constant monitoring and control of the project implementation, definition of quality and safety procedures, monitoring and analysis of risk in the project (2018, pp. 83-84).

When analyzing the key success factors, it can be noticed that a significant part of them are factors related to humans (Unterhitzberger and Bryde, 2019, p. 59; Tabish and Jha, 2012). They refer to the project manager together with the project team, the authorities of the entity implementing the project, as well as other project stakeholders.

#### **4. Research methodology**

The study uses an explanatory sequential model, including preliminary qualitative research, and then quantitative research on a larger sample. Unstructured interviews were carried out with five project managers of this type of collaboration to identify factors that could be key factors for the success of a project carried out in a consortium of public universities and private companies. These interviews were aimed at gathering empirical material based on the use of open-ended questions that allow the interlocutor to express themselves openly and freely. During the conducted unstructured interviews, factors influencing the successful implementation of joint projects of public universities and enterprises were identified. Obtained results were used to develop a questionnaire and conduct a survey among people managing, on the part of enterprises, projects implemented by consortia consisting of at least one public university and at least one private enterprise. The study was carried out using the mixed mode method combining the CATI and CAWI techniques. The study concerned one project.

A random selection of respondents was used in the research. First, a database containing a list of projects implemented since 2014 by consortia consisting of at least one public university and at least one private enterprise has been prepared. Then, an invitation to complete the survey was sent to 192 people, 120 fully completed surveys were obtained, which represents a 62.5% feedback rate.

One of the objectives of the study was the assessment of identified factors as potential key success factors for the project implemented in a consortium of public universities and enterprises. The criteria for success of the project implementation within the consortium identified during the qualitative research and assessed during the quantitative research included:

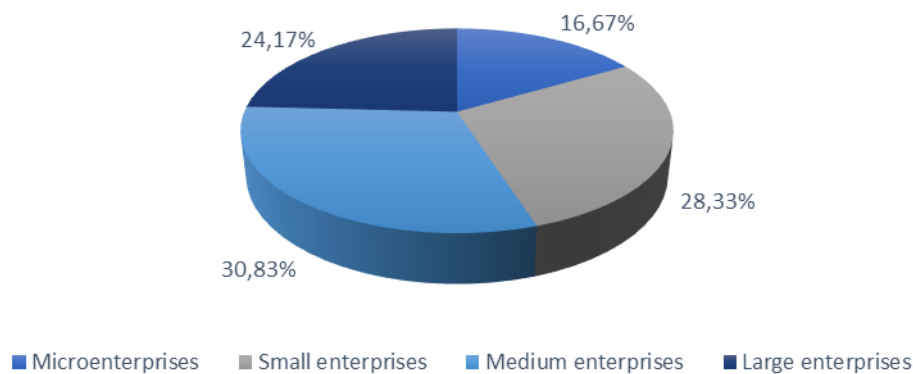
1. Support for the authorities of public universities.
2. Support of the company's authorities.
3. High competences of the project management.
4. The use of project management methods/methodologies.
5. The use of IT tools / systems for project management.
6. High level of formalization of activities.
7. Clearly defined division of tasks between consortium members.
8. Cyclical meetings of working teams within the consortium.
9. Periodic meetings of project managers within the consortium.

10. Assignment of specific objectives to be achieved by the individual members of the consortium.
11. Monitoring the progress of the work of individual consortium members by the Consortium Leader.

The question regarding the assessment of the given criteria for the success of project implementation within the consortium, which the respondents were asked, was of a rank type, in which the answers were based on a five-point Likert scale, where on opposite sides there were extreme answers, insignificant – very important. Due to the applied ordinal scale, such statistical measures as: median, mode, standard deviation were used.

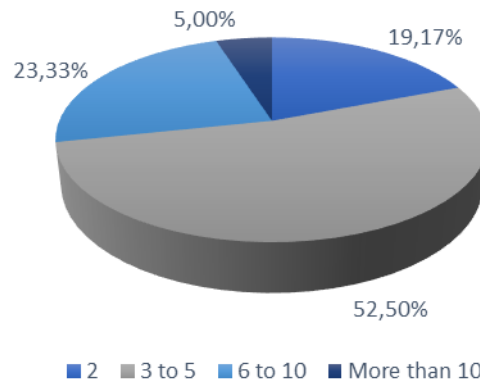
## 5. Characteristics of the studied population

The questionnaire survey was addressed to people managing enterprise's projects implemented by consortia consisting of at least one public university and at least one private enterprise. Among the respondents, 13.33% were people representing the Consortium Leader, while 86.67% were members of the consortium. Among the respondents, the largest group were people representing medium-sized enterprises – 30.83%. A detailed breakdown of respondents according to the size of the enterprise is shown in Figure 1.



**Figure 1.** Size of analysed enterprises. Source: own study based on the results of the survey, N = 120.

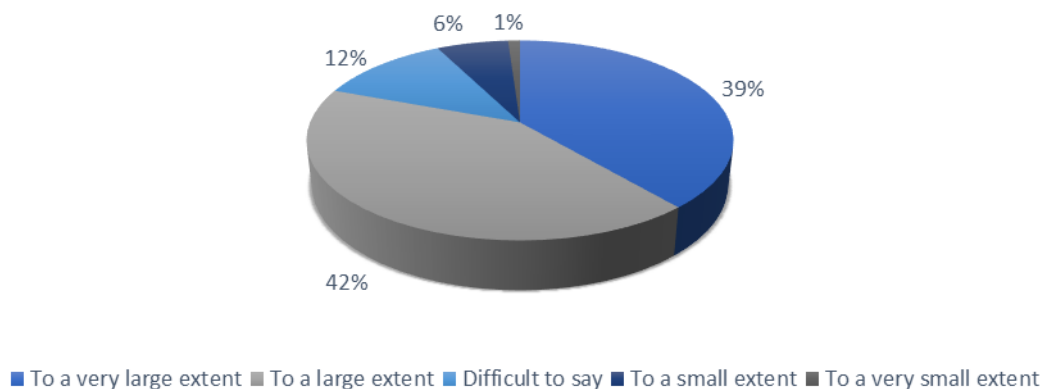
The number of entities representing the consortium has a significant impact on the implementation of projects within the consortium. Figure 2 presents the distribution of respondents according to the number of entities included in the consortium.



**Figure 2.** Number of entities included in the consortium. Source: own study based on the results of the survey, N = 120.

The largest part of the analysed projects were those implemented within consortia consisting of at least three but not more than five entities, so it can be assumed that these were medium-sized consortia established in order to jointly implement the project. Among the participants of the consortium, apart from public universities and private enterprises, there were also private universities and other types of entities.

When analyzing the success factors of a project, one should take into account the project results, i.e. its effects obtained after the end of the project. Among the examined projects, 77.50% were projects whose implementation had been completed. These respondents were asked to assess the extent to which the project objectives were achieved, the results are presented in Figure 3.



**Figure 3.** Assessment of the degree of achievement of the assumed project objectives. Source: own study based on the results of the survey, N = 93.

The vast majority of respondents stated that the goals set in the project were achieved to a very large extent (39% of responses) or to a high degree (42% of responses), which gives a total of 81% of all responses. Surprisingly, 12% of the respondents had difficulties to determine the level of success, which may indicate that not all assumed goals in the project were achieved. Only 6% were responses indicating a small degree of achievement of the assumed objectives and only 1% a very small degree of implementation of the planned project objectives.

## 6. Research results

In order to analyze data on the assessment of key success factors of projects implemented in consortia consisting of at least one public university and at least one private enterprise, the received responses were ranked. "Very important" answers were given 5 points, "important" answers 4 points, "average" answers 3 points, "little significance" answers 2 points and "insignificant" answers 1 point. On this basis, main statistical measures were calculated, such as: median, mode, standard deviation. The results, ranked by decreasing mean score, are shown in Table 1.

**Table 1.**

*Assessment of success factors for projects implemented in scientific and industrial consortia*

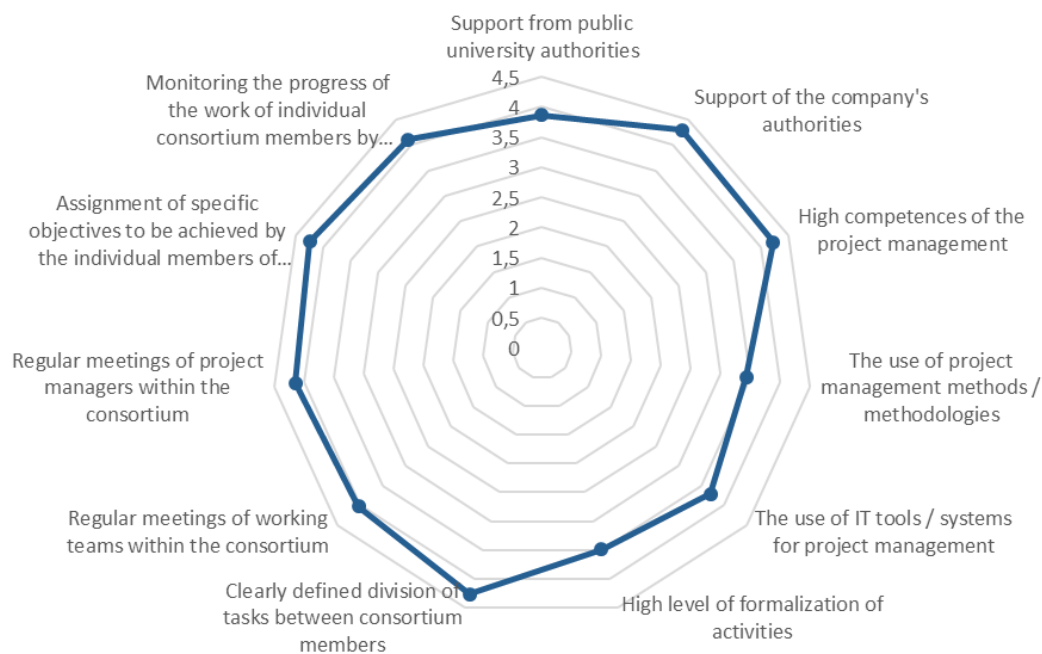
Specification	Mean	Median	Mode	Standard deviation
<b>Support of the company's authorities</b>	<b>4,30</b>	<b>4</b>	<b>5</b>	<b>0,74833</b>
<b>Clearly defined division of tasks between consortium members</b>	<b>4,26</b>	<b>4</b>	<b>5</b>	<b>0,77991</b>
<b>Assignment of specific objectives to be achieved by the individual members of the consortium</b>	<b>4,24</b>	<b>4</b>	<b>4</b>	<b>0,77455</b>
<b>High competences of the project management</b>	<b>4,23</b>	<b>4</b>	<b>5</b>	<b>0,91708</b>
<b>Regular meetings of project managers within the consortium</b>	<b>4,13</b>	<b>4</b>	<b>4</b>	<b>0,86538</b>
<b>Monitoring the progress of the work of individual consortium members by the Consortium Leader</b>	<b>4,11</b>	<b>4</b>	<b>4</b>	<b>0,78311</b>
<b>Regular meetings of working teams within the consortium</b>	<b>4,03</b>	<b>4</b>	<b>4</b>	<b>0,71254</b>
Support from public university authorities	3,87	4	4	0,99107
The use of IT tools / systems for project management	3,71	4	3	1,01157
High level of formalization of activities	3,49	4	4	1,04080
The use of project management methods/ methodologies	3,43	4	4	0,93686

Source: own study based on the results of the survey, N = 120.

Assuming the key factors with an average score of more than 4.0, based on the respondents' indications, seven key success factors for projects implemented in consortia consisting of at least one public university and at least one private enterprise can be identified. Respondents representing enterprises indicated support of enterprise's authorities as the most important (mean 4.30, median 4.0, mode 5.0 with the standard deviation 0.74833). Implementation of complex projects involving significant resources cannot be successful if it is not supported by the authorities of an entity. The next places ranked according to importance level are factors related to the organization of work in the project, i.e. *a clearly defined division of tasks between consortium members, assigning specific objectives to be achieved by individual members of the consortium, high competences of project managers, regular meetings of project managers*

within the consortium, monitoring of the work progress of individual consortium members by the Consortium Leader and regular meetings of working teams within the consortium.

Respondents representing enterprises assessed the *support of public university authorities* much lower, which of course is not of key importance from the point of view of implementation of works on the part of the enterprise, however, it may have a significant impact on the implementation and success of the entire project. What may be surprising, representatives of enterprises assessed the *use of project management methods/methodologies* as the lowest, this may indicate the lack of use or lack of awareness of the use of *project management methods/methodologies*. Also, the use of *IT tools/systems for project management* is not considered essential for the successful implementation of the project, nor is a high level of formalization of activities. The summary of the test results in a graphic form is presented in Figure 4.



**Figure 4.** Map of success factors for projects implemented in scientific and industrial consortia. Source: own study based on the results of the survey, N = 120.

The in-depth analysis of the survey results was extended to include the average assessment of the indicated success criteria in individual groups of enterprises. These data are presented in Table 2.



**Table 2.**

*Assessment of the success criteria of projects implemented in consortia depending on the size of the enterprise*

Specification	AVERAGE DEPENDING ON THE SIZE OF AN ENTERPRISE			
	Micro	Small	Medium	Large
Support of the company's authorities	4,30	<b>4,38</b>	<b>4,41</b>	4,07
Clearly defined division of tasks between consortium members	<b>4,35</b>	4,03	4,35	4,34
Assignment of specific objectives to be achieved by the individual members of the consortium	4,20	4,35	4,32	4,03
High competences of the project management	3,90	4,18	4,32	<b>4,38</b>
Regular meetings of project managers within the consortium	4,20	3,91	4,22	4,24
Monitoring the progress of the work of individual consortium members by the Consortium Leader	4,00	3,97	4,08	<b>4,38</b>
Regular meetings of working teams within the consortium	4,10	4,12	3,86	4,07
Support from public university authorities	3,85	4,15	4,05	3,31
The use of IT tools/systems for project management	3,40	3,65	4,00	3,62
High level of formalization of activities	3,00	3,26	3,95	3,52
The use of project management methods/methodologies	2,90	3,56	3,57	3,45
Total	<b>3,84</b>	<b>3,96</b>	<b>4,10</b>	<b>3,95</b>

Source: own study based on the results of the survey, N = 120.

The respondents representing micro-enterprises considered a *clearly defined division of tasks among consortium members* ( $\bar{x} = 4.35$ ) as the most important factor of the success of projects implemented in consortia. On the other hand, representatives of small and medium-sized enterprises indicated the *support of the company's authorities*, the average score was 4.38 among small enterprises and 4.41 among medium-sized enterprises, respectively. For respondents representing large enterprises, the key success factors for the projects implemented in the consortium were the equally *high competences of project managers* ( $\bar{x} = 4.38$ ) and the *monitoring of the progress of the work of individual consortium members by the Consortium Leader* ( $\bar{x} = 4.38$ ).

As the least important criterion for the success of the consortium, the respondents representing micro and medium-sized enterprises indicated the *use of project management methods/methodologies*, the average for micro-enterprises was 2.90, and 3.57 for medium-sized enterprises, respectively. Respondents from small enterprises pointed to the *high level of formalization of activities* ( $\bar{x} = 3.26$ ) and from large enterprises to *support the authorities of public universities* ( $\bar{x} = 3.31$ ) as factors having the least impact on the success of a project implemented as part of a scientific and industrial consortium.

## 7. Summary

Conducted research indicates seven key success factors of projects implemented in scientific and industrial consortia. The project managers on the part of the enterprises pointed to *the support of the enterprise's management* as the most important factor. This is not surprising, as the implementation of complex initiatives such as projects is burdened with many problems and significant risks. The project manager without the support of the entity's authorities would not be able to manage the project effectively. The second of the highest rated factors is the *clear division of tasks between consortium members*, it is extremely important not only from the point of view of deadlines for the work, but also financial settlements between consortium members. The podium ends with *assigning specific objectives to be achieved by individual members of the consortium*, this factor refers to the previous one and is associated with the settlement of substantive activities in the project, which also has consequences in financial settlements. Assigning tasks and dividing responsibility for individual goals between the members of the consortium allows, on the one hand, to better use the specialization and key competences of the consortium members, on the other hand, in the event of problems with project implementation, it is easier to identify the causes and indicate corrective actions. It is worth emphasizing that this factor was ranked first among the key success factors in the assessment of representatives of the smallest enterprises included in the group of micro-enterprises.

Another of the key factors are the *high competences of project managers*, which held the first place among the key success factors in the case of large enterprises. Project managers are primarily responsible for implementing the project according to the plan. Obtained results confirm the greater independence of project managers from enterprise owners in the case of large enterprises, where a dozen or more projects are often implemented simultaneously. In the case of smaller businesses, owners often pay more attention and get more involved in the implementation of the project.

Another two factors are also related to project management. The first indicates the *need for regular meetings between project managers in individual entities of the consortium*, while the second indicates the need for the *consortium leader to monitor the progress of the work of individual consortium members*.

The last of the key factors was the *cyclical meetings of working teams within the consortium*. Conducting research and development works within scientific and industrial consortia is primarily a research challenge, the implementation of which determines achievement of the goals set in the project. These projects, apart from the development of new solutions, are most often associated with their practical application (implementation) in the economy. Hence, an important factor is also organization of the work of substantive teams and the exchange of knowledge taking place within them.

Presented research results confirm the significant role of factors related to human capital among the key success factors, both on the part of the management of the company implementing the project, the project manager, and members of the project team. On the other hand, the second group of key success factors are factors related to the organization of work within the consortium (division of tasks and goals, cyclical meetings and monitoring of the work by the consortium leader).

## References

1. Al-Tmeemy, S.M.H.M., Abdul-Rahman, H., and Harun, Z. (2011). Future criteria for success of building projects in Malaysia. *International Journal of Project Management*, Vol. 29, Iss. 3, pp. 337-348. doi: 10.1016/j.ijproman.2010.03.003.
2. Ardito, L., Ferraris, A., Petruzzelli, A.M., Bresciani, S., and Del Giudice, M. (2019). The role of universities in the knowledge management of smart city projects. *Technological Forecasting and Social Change*, Vol. 142, pp. 312-321. doi: 10.1016/j.techfore.2018.07.030.
3. Fakhar Manesh, M., Pellegrini, M., Marzi, G., and Dabic, M. (2021). Knowledge Management in the Fourth Industrial Revolution: Mapping the Literature and Scoping Future Avenues. *IEEE Transactions on Engineering Management*, Vol. 68, No. 1, pp. 289-300. doi: 10.1109/TEM.2019.2963489.
4. Garbharran, H., Govender, J., and Msani, T. (2013). Critical success factors influencing project success in the construction industry. *Acta Structilia*, Vol. 19, Iss. 2, pp. 90-108.
5. Lamprou, A., and Vagiona, D. (2018). Success criteria and critical success factors in project success: a literature review. *International Journal of Real Estate & Land Planning*, Vol. 1, pp. 276-284. doi: 10.26262/reland.v1i0.6483.
6. Mukhtar, M.M., and Amirudin, R. (2016). The Success Criteria of Public Housing Project in Nigeria. *International Journal of Built Environment and Sustainability*, Vol. 3, Iss. 2, pp. 102-110. doi: 10.11113/IJBES.V3.N2.126.
7. Nguyen, T.A., Chovichien, V., and Takano, S.E. (2013). Quantitative Weighting for Evaluation Indexes of Construction Project Success by Application of Structural Equation Modeling. *International Journal of Construction Engineering and Management*, Vol. 2, Iss. 3, pp.70-84.
8. Ojiako, G.U., Hamdan, A., and Bashir, H. (2019). *Modeling and analyzing interrelationships among project success factors and criteria*. Proceedings of the 9th International Conference on Industrial Engineering and Operations Management, Bangkok, Thailand, pp. 910-917.

9. Rusan, N., and Voitenko, O. (2021). *Emotional-intellectual and Cognitive Factors of Success in Project Management*. Proceedings of the 2nd International Workshop IT Project Management (ITPM 2021), Slavsko, Lviv region, Ukraine, pp. 85-94.
10. Salykova, L., and Abylova, V. (2019). Critical Success Factors in Project Management: A Comprehensive Review. 8 th Scientific Conference on Project Management in the Baltic States, University of Latvia. *PM World Journal, Vol. VIII, Iss. V*, pp. 1-13.
11. Silva, G.A.S.K., Warnakulasuriya, B.N.F., and Arachchige, B.J.H. (2016). *Criteria for Construction Project Success: A Literature Review*. Thirteenth International Conference on Business Management (ICBM), Colombo, Sri Lanka, pp. 697-717.
12. Soroka, T. (2015). Kluczowe czynniki sukcesu zarządzania projektami na podstawie badań wybranych firm województwa śląskiego. *Zeszyty Naukowe Politechniki Śląskiej, Seria: Organizacja i Zarządzanie, Vol. 83(1941)*, pp. 617-626.
13. Spalek, S. (2004). *Krytyczne czynniki sukcesu w zarządzaniu projektami [Critical success factors in project management]*. Gliwice: Wydawnictwo Politechnik Śląskiej.
14. Tabish, S.Z.S., and Jha, K.N. (2012). Success traits for a construction project. *Journal of Construction Engineering and Management, Vol. 138, Iss. 10*, pp. 1131-1138. doi: 10.1061/(ASCE)CO.1943-7862.0000538.
15. Trocki, M. (2011). Kompleksowa ocena projektów. *Studia i Prace Kolegium Zarządzania i Finansów, Vol. 113*, pp. 7-23.
16. Trzeciak, M., and Liebert, F. (2016). Interesariusze projektu jako kluczowy czynnik sukcesu. *Zeszyty Naukowe Politechniki Śląskiej, Seria: Organizacja i Zarządzanie, Vol. 96(1963)*, pp. 205-215.
17. Unterhitzenberger, C., and Bryde, DJ. (2019). Organizational Justice, Project Performance, and the Mediating Effects of Key Success Factors. *Project Management Journal, Vol. 50, Iss. 1*, pp. 57-70. doi: 10.1177/8756972818808984.
18. Vrchota, J., Řehoř, P., Maříková, M., and Pech, M. (2020). Critical Success Factors of the Project Management in Relation to Industry 4.0 for Sustainability of Projects. *Sustainability, Vol. 13, Iss. 281*, pp. 1-19. doi: 10.3390/su13010281.
19. Wai, S.H., Yusof, A.M., and Ismail, S. (2012). Exploring success criteria from the developers' perspective in Malaysia. *International Journal of Engineering Business Management, Vol. 4*, pp. 1-9. doi: 10.5772/51096.
20. Wirkus, M., and Tubielewicz, K. (2018). Kluczowe czynniki sukcesu projektu i przedsiębiorstwa w sieci tymczasowej [Key Success Factors for the Project and Enterprise in the Temporary Network]. *Przedsiębiorstwo we współczesnej gospodarce – teoria i praktyka [Research on Enterprise in Modern Economy – theory and practice], Vol. 3*, pp. 75-87.