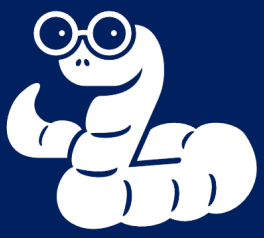

WORKing papers in Management Science

WORMS/22/02

Success of research projects – prediction and assessment from the point of view of project stakeholders thereby taking into account a sustainability approach

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Success of research projects – prediction and assessment from the point of view of project stakeholders thereby taking into account a sustainability approach

Abstract

The literature research carried out points to a large number of publications on the management of research projects, but not many address the issue of success in the context of such projects, identifying criteria and success factors for this type of project. The aim of the article is to present the results of research on the success of research projects. Based on the conducted quantitative research, the importance of individual success factors and success criteria of research projects was determined, taking into account the opinions of various stakeholders thereby a sustainable approach. The research results indicate the high importance of most of the success factors and the success criteria of research projects pointed in the literature and those in turn are important for project management and supports decision-making.

Keywords: project success, success factors, success criteria, research projects, project stakeholders, sustainable approach

Introduction

Information on which project success factors to consider when predicting project success or which success criteria to consider when assessing project success is valid for project management, as emphasized by theoreticians and practitioners (see Section: Literature review and theoretical background). This type of information is important for project management and supports decisions such as: should I start the project? should I quit the project? what are my chances of successfully completing the project? was my project successful?

Some literature emphasizes the importance of the influence of different stakeholders on a project [1] and the need to manage them to increase the project's potential for success, e.g., [2] [3] [4] [5] [6]. The approach to project management, taking into account the views of different stakeholders, is in line with the APM (Association for Project Management) definition of sustainability: „sustainability" in the project profession is an approach to business that balances the environmental, social, economic aspects of project-based working to meet the current needs of stakeholders without compromising or overburdening future generations [7]. The authors of this article assume that the use of the opinions of different stakeholders in project management, including predicting the project's potential for success or assessing the success of a project, is an application of a sustainable approach to project management. This assumption is consistent with what can be found in the literature: [8] [9] [10] [11] [12] [13].

The topic of the success of research projects, their success factors or success criteria is not very extensive. Although a few items on this topic can be found they either do not deal with the distinctions from the perspective of the stakeholders in this type of project or were conducted as qualitative rather than quantitative studies

The aim of the article is to present the results of research on the success of research projects. Based on the conducted quantitative research, the importance of individual success factors and success criteria of research projects was determined, taking into account the opinions of various stakeholders thereby a sustainable approach. This is essential for project management and supports decision making.

The research results presented in the article are part of extensive research on success factors and success criteria of research projects, taking into account the phases of the project

life cycle defined in the surveyed organizations. The respondents (different project stakeholders) assessed the importance of each success factor and the project success criterion and identified the phase or phases for which this factor or project success evaluation criterion was important. This study focuses only on presenting the results of research on the importance of success factors and success criteria of projects, for different stakeholder groups, without including the results taking into account the phases of the project life cycle.

This article focuses on the success of research projects and the assessment of the importance of factors and success criteria by various stakeholders thereby it emphasis on a sustainable approach. For the purposes of conducting literature and empirical research, 3 research questions were asked. The conducted research process (with research questions) is shown in Figure 1.

Research process	Research questions (i-iii)
1st part of research process	Literature review (i) What is project success and how can we measure it, also in research projects? (ii) Are project stakeholders (as inclusion of a social aspect of sustainability approach) taken into account in measuring the success of projects, also in research projects?
2nd part of research process	Quantitative research (iii) Which research project success factors and success criteria are important according to different stakeholders of this type of projects?
3rd part of research process	Conclusions

Figure 1. Research process conducted for the article needs

Source: own work

This study consists of three main parts. The first part of the article presents a conceptual framework based on two elements: (i) the first presents the concept of project success and its measurement, also in research projects, (ii) the second explains that stakeholders should be taken into account in measuring project success (also in research projects). The second part explains the methodology of the empirical research undertaken, describing the research sample, the data collection process and the analysis of the results of the quantitative research. The third part ends the article with conclusions.

Literature review and theoretical background

The literature research conducted for this paper was a typical literature review, which covers a wide range of topics at different levels of comprehensiveness and may include analysis of research findings [14]. The authors considered those publications that were within the scope of this article and related to research projects, including R&D projects.

The concept of project success and its measurement, also in research projects

Many definitions of project success can be found in the literature, an overview of these definitions can be seen e.g. in [15]. In general, at the beginning (1960s-70s), project success was

linked to the iron triangle, i.e. time, cost and quality of the project [16]. Over time a number of authors of publications on the topic distinguish the concept of 'project success' from 'project management success' [17] [18] [19] [20] [21] [22] [23]. Project success is equated with effectiveness in achieving project outcomes, project management success is related to efficiency in implementing the project plan (so, to the iron triangle) [24] [25] [26] [27] [28]. Many researchers [29] [30] [31] regard that project success (in project management) includes two components: project success and project management success. The success of a project according to some authors should be measured over time [27] [28] Some emphasize the importance of stakeholders in project success measurement [32] [2].

In order to determine whether a project is likely to succeed (prediction of project success) or whether it has succeeded (assessment of project success), it is required to identify ways of measuring it. In the case of predicting success, it is useful to use so-called project success factors (SF). For assessing a project or its phases, project success criteria (SC) are used. In the literature, many authors [19] [33] [34] [35] [36] suggests defining the two terms as follows:

- "success criteria" (success criteria) are dimensions for assessing whether a project succeeds or fails.
- "success factors" (success factors) are factors that, if they interact with a project, increase the probability of its success. In the literature, these are also referred to as critical success factors (CSF) or determinants.

What does the concept of project success look like for research projects? Here, the literature is not extensive, but on the basis of this literature it is possible to present the most important information on this topic [15] [37] [38] [39] [40] [41] [42]:

- stakeholders in research projects interpret the success of a project differently, thus the success of research projects should be assessed from the perspective of its various stakeholders,
- the success of a research project is characterized both by the success of the project management (e.g. by indicating success criteria such as 'closing within the budget and time allowed to achieve the objectives') and the success of the project (by indicating success criteria such as publications, doctorates or patents).

On the other hand, few publications can be found in the context of success factors for research projects: [43] [44] [45] [46] [47] [48] [49] [50] [51] [52], which (especially [53] [54]) formed the basis for the carried out quantitative studies.

Project stakeholders and their connection with project success and sustainability approach, also in research projects

Generally, in the contemporary literature, stakeholder management/analysis is treated as one of the most important aspects of project management and emphasizes the importance of stakeholder participation in projects, e.g., [55] [56] [57]. Moreover, as already mentioned, stakeholders and their opinions are important in measuring the success of projects [58] [59] [2], including research projects [42] [60]. At the same time is linked to the sustainability approach. How? Sustainability in project management is about social (people), environment (planet), and financial (economic) aspects/goals [61] [62]. Stakeholders' involvement and participation in projects are significant for sustainability from the project's point of view (inclusion of a social aspect). Several authors [9] [63] [12] [11] have recognized the need for more open and proactive engagement of stakeholders as a consequence of integrating sustainability into project management. According to [64], proactive stakeholder engagement is one of the basic principles of sustainability [55] [65].

Methodology of quantitative research

Data collection

Data were collected from organizations in Poland that run research and R&D projects. 200 organizations registered or operating in Poland from the Central Registration and Information on Businesses (CEIDG) database and the National Court Register (KRS) were selected for the study. The study was conducted in the form of a telephone interview. The estimated time of the study for one respondent was about 8 minutes. The research was conducted in December 2021 on a sample of 200 organizations in Poland that run research and R&D projects. Research in organizations implementing research projects was carried out as part of the Miniatura 4 project, financed by the National Science Center, entitled "A fuzzy model for assessing the success of research projects" (project number: 494893, 2020/04/X/HS4/01922).

The research procedure included obtaining consent from the respondent for the research and informing him about the anonymization of data processing. The respondent was also informed that the answers to the questionnaire were supposed to concern one research or R&D project that was completed in the last 5 years. In the introductory part of the survey, the respondents answered 5 preliminary (Demographics) questions, i.e. providing information on the size of the organization, the sector of the organization, the age, gender and the responsibility of the respondent in the selected project. In the main part of the survey, the respondents answered questions related to success factors and success criteria of research projects taking into account in the surveyed organization.

The questionnaire was prepared in Polish, and the research was conducted in that language due to the fact that it concerned organizations operating in Poland. For the purposes of this study, the questionnaire was translated into English by project management specialists. Respondents answered the most of the questions in the questionnaire using a seven-point Likert scale (ranging from 1 to 7). These questions concerned the degree of significance of the success factors and the success criteria for research projects. If a given factor or given criterion is not applicable in respondent's organization, the respondent could answer "not applicable". The questionnaire are presented in Appendix A.

General information about the research sample

In the research sample of 200 organizations, 32 (16%) were micro-enterprises (employ less than 9 employees), 84 (42%) were small enterprises (employ between 10 and 49 employees) and 84 (42%) were medium-sized enterprises (employ over 50 employees) (Demographics1).

In total, 200 respondents were invited to participate in the survey. Most of them were between 25 and 34 years old (n=101; 50.5%); 25 (12.5%) respondents were up to 24 years old; 52 (26%) respondents were between 35 and 44 years old; 19 (9.5%) respondents were between the ages of 45 and 54 years old, and only 3 (1.5%) respondents were over 55 years old (Demographics2).

Among the respondents who took part in the survey, 125 (62,5%) were members of the project team, 70 (35%) were project managers, 5 (2,5%) of the respondents performed other role in the project than those listed in metric (Demographics3).

81 (40,%) respondents were women, 117 (58,5%) respondents were men, 3 (1,5%) respondents did not indicate their gender / indicated the answer 3? (Demographics4).

Figure 2 shows the characteristics of the research sample.

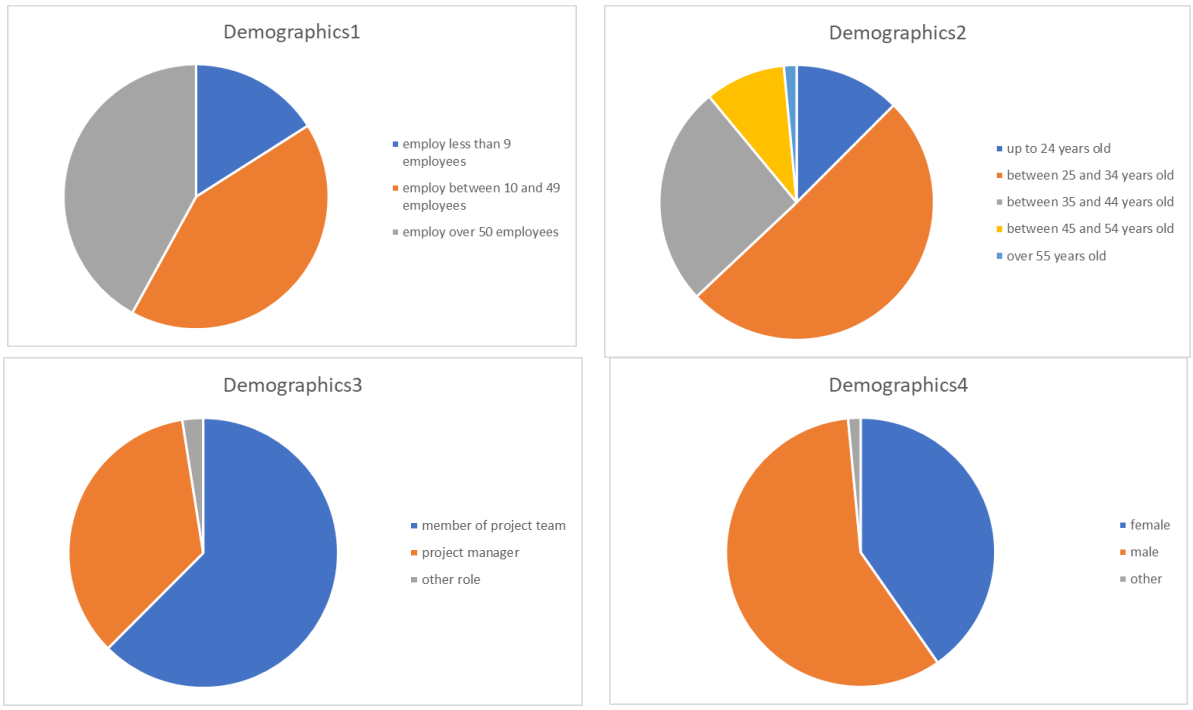

Figure 2. Characteristics of the research sample: Demographics1 (the size of the organization), Demographics2 (respondent's age), Demographics3 (respondent's responsibility of the project), Demographics4 (respondent's gender)

Source: own work

The organizations in which the respondents worked represented different types of sectors: 39 (19,5%) organizations operated in "services", 48 (24%) in "trade", 31 (15,5%) in "IT", 26 (13%) in "industry", 7 (3,5%) in "construction", 27 (13,5%) in "science", 18 (9%) in "government and local government administration", 4 (2%) in other sector than those listed in metric (Figure 3).

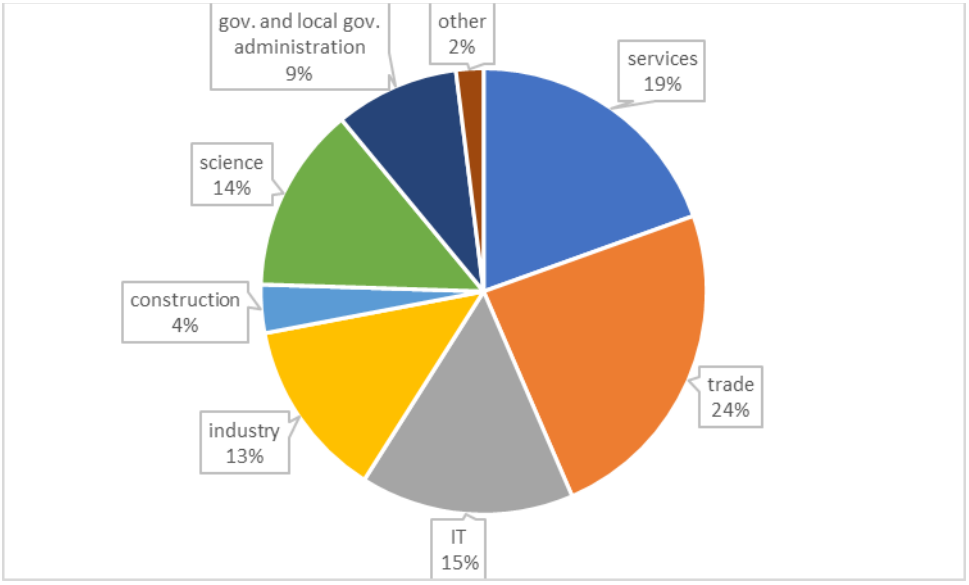

Figure 3. Type of activity / sectors of the organizations

Source: own work

As shown in the Figure 3, in the research sample, most organizations operated in the trade, services and IT sector (in total 58%). Other organizations were active in public sector (in total 23 %) and industry, construction and production[1] sector (in total 19 %).

The projects were divided into research and R&D projects; 132 (66%) of the organizations carried out research projects and 94 (47%) of the organizations carried out R&D projects, yet 26 (13%) of the total number of organizations carried out both types of projects.

In the further part of the study, the results of research related to success factors and success criteria of research projects in the surveyed organizations will be presented.

Results

First, the stakeholders who are identified in the research projects (except for the project managers and project team members) will be introduced. Then the results of research projects success factors (for predicting success of this type of projects) and success criteria (for assessing success of this type of projects) were presented.

The stakeholders of research projects

The stakeholders of research projects identified in the study (apart from the project manager and the project team members) included:

- administration supporting the service of the research project (n=60; 30%),
- authorities of the organization that implements the research project (n=43; 21.5%),
- sponsor / financing institution (n=64; 32%)
- advisory institution (for example, a consulting company helping to prepare an application for research funding) (n=52; 26%),
- expert evaluating the results of the project (n=73; n=36.5%),
- partner in a consortium (n=37; 18.5%),
- no one outside the project team (n=7; 3.5%).

[1] In the open question concerning the organization sector, the respondents entered "production", hence the term production sector appeared here alongside industry and construction.

Figure 4. Stakeholders of the research projects in the study (apart from the project manager and the project team members)

Source: own work

The data presented in Figure 4 shows that the respondents most often indicated expert evaluating the results of the project (36,5%), sponsor / financing institution (32%) and administration supporting the service of the research project (30%) as a stakeholder of projects implemented in their organization (apart from the project manager and the project team members). Only 3.5% of respondents indicated that their organization did not identify project stakeholders from outside the project team. It is worth emphasizing that the surveyed organizations that carry out research projects identify stakeholders in their projects. This aspect proves that the surveyed organizations incorporate a sustainable approach to project management.

In the further part of the study, the results of research related to success factors and success criteria of research projects in the surveyed organizations will be presented divided into various stakeholder groups, i.e. project managers and members of project teams[2].

Success factors of research projects – for predicting success of this type of projects

A questionnaire was prepared (see Appendix A) to carry out a quantitative survey on success factors for research projects based on two publications: [53] [54].

Figure 5 and 6 shows how significant each of the success factors (p10.1-p10.23) were for the research projects in which the project managers and members of project team members participated. The importance of the individual success factors was rated on a scale of 1 to 7 (ie very low to very high importance). If a given factor was not applicable in the surveyed organization, the respondent marked the answer "Not applicable"[3].That is, the higher the

[2] The answers given by respondents who played other roles in the studied projects, due to the low number (only 5 people) will not be subject to further analyzes.

[3] The figure shows only the answers of the respondents, determining the importance of individual success factors of research projects on a scale from 1 to 7. For greater clarity, the above-mentioned a drawing of respondents' answers if a given factor was not applicable in their organization (answer "Not applicable").

weight given by the respondents, the higher the importance of a given factor of the success of research projects.

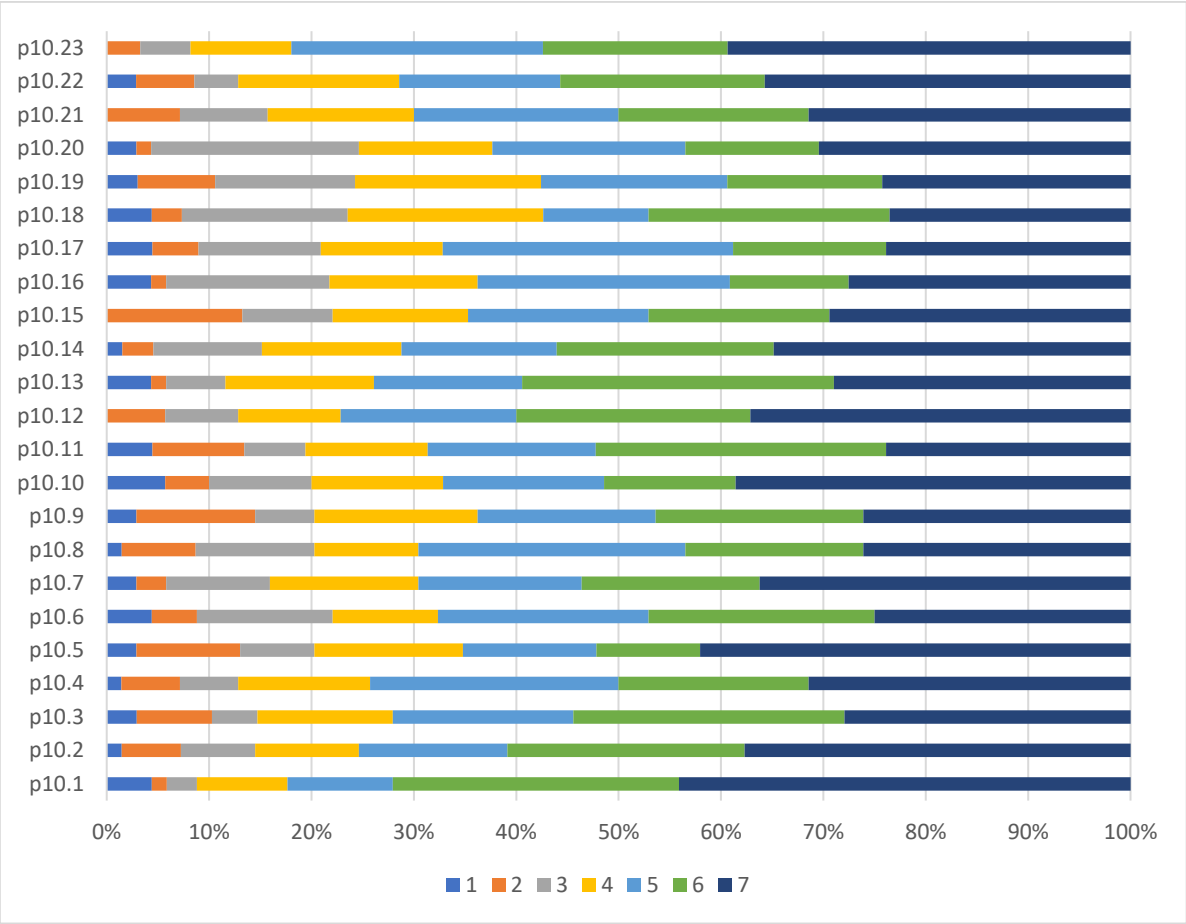

Figure 5. Importance of success factors for research projects - distribution of responses by project managers

Source: own work

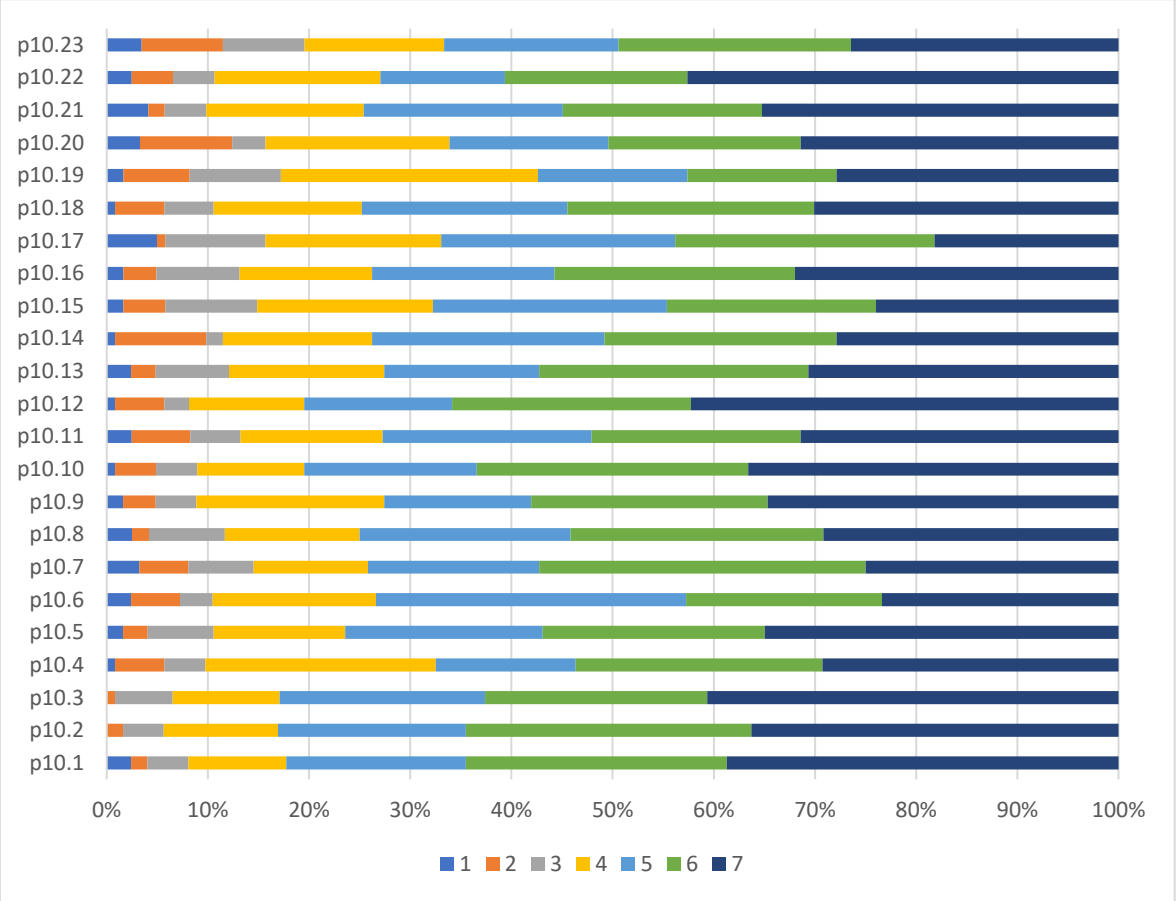

Figure 6. Importance of success factors for research projects - distribution of responses by members of project team

Source: own work

For greater clarity, the conclusions from Figure 5 and 6 along with the names and numbers of success factors of research projects are included in Table 1.

Table 1. Success factors of research projects with importance 6 or 7

Number of factor	Success factors for research projects	Percentage of respondents for whom the success factor was important 6 or 7	
		Project managers	Members of project team
p10.1	Efficient cooperation in the preliminary phase of the project	70,0	64,0
p10.2	Properly planned project tasks and proper allocation of resources	60,0	64,0
p10.3	Adequate financing, secured research and equipment facilities	52,9	61,6
p10.4	Involvement of scientists, their cooperation and focus on research	50,0	52,8
p10.5	The team and its substantive skills	51,4	56,0
p10.6	Achieving benefits from research conducted by consortium partners	45,7	42,4
p10.7	Proper selection and involvement of consortium partners	52,9	56,8
p10.8	Choosing the right place for the project and introducing the rules for its implementation	42,9	52,0
p10.9	Leadership and management	45,7	57,6
p10.10	Strong, respectful relationships within the project team	51,4	62,4

p10.11	Equal distribution of time for research conducted in individual countries	50,0	50,4
p10.12	Effective communication and information flow	60,0	64,8
p10.13	User benefits of the project deliverables	58,6	56,8
p10.14	Flexible project implementation, constant monitoring and reviews	52,9	49,6
p10.15	Invariability of partners in the consortium (no changes among partners involved)	45,7	43,2
p10.16	Properly estimated duration of the project	38,6	54,4
p10.17	The influence of sponsors on the shape of the project	37,1	42,4
p10.18	The implemented project is a subsequent research collaboration	45,7	53,6
p10.19	The implemented project is a continuation of other research	37,1	41,6
p10.20	Adjusting the subject of the project to the development strategy of a given country	42,9	48,8
p10.21	Experience of the project leader in the implementation of projects within the consortium	50,0	53,6
p10.22	Sufficient trust in the team	55,7	59,2
p10.23	Other factors	50,0	34,4

Source: own work

After analysing the results of the respondents' research in the area of the importance of the success factors of research projects, the following conclusions can be drawn:

- over 50% of project managers rated 13 out of 23 success factors as important or very important,
- more than 50% of members of project team rated 16 out of 23 success factors as important or very important,
- for both project managers and members of project team, the three most important success factors for research projects turned out to be: efficient cooperation in the preliminary phase of the project, properly planned project tasks and proper allocation of resources, effective communication and information flow,
- less than 10% of project managers rated 16 out of 23 success factors as little or very little important,
- less than 10% of members of project team rated 22 of the 23 success factors as being of little or very little important,
- only 0-5,7% of the respondents chose the answer "not applicable" to the success factors given in the questionnaire.

In the last question on the success factors of research projects, respondents were allowed to choose their own answer. According to the research, as many as 75.5% of the respondents (project managers and members of project team) in the group "Other factors" gave their own answer. Among the other factors for the success of research projects that respondents (project managers and members of project team) reported in the research were largely those indicative of the organization's pursuit of a sustainable approach to project management. These factors were related, inter alia, to with social aspects, such as the trust of colleagues, team acceptance, team cooperation, communication, interpersonal relations, atmosphere, help, support, commitment of project members, joy, pleasure, customer trust. Some of the factors mentioned by the respondents were related to economic aspects, such as money, earning a lot of money, helpfulness. Among other success factors there were also such factors as learning, matching the project to the client, ease of submitting applications, speed of implementation, skillfully distributed time of each project participant.

Correlation of success factors for research projects with the size of the organization, the age and the responsibility of the respondent

Correlations were analysed with Spearman's rank correlations and shown graphically on scatter plots with 95% confidence intervals (Figure 7, 10). A two-sided *p* value of <0.05 was considered statistically significant. All analyses were performed using R version 3.4.4 (R Foundation for Statistical Computing, Vienna, Austria).

The correlation of success factors was calculated for the three questions from the introductory part of the survey (Demographics): demographics1 (the size of the organization), demographics2 (the age of the respondent) and demographics3 (the responsibility of the respondent). Correlation analysis was carried out for similar combinations for both the success factors (Table 2) and the criteria for assesing the success (Table 4) of research projects. The correlations regarding the success factors of research projects are shown in Figure 7.

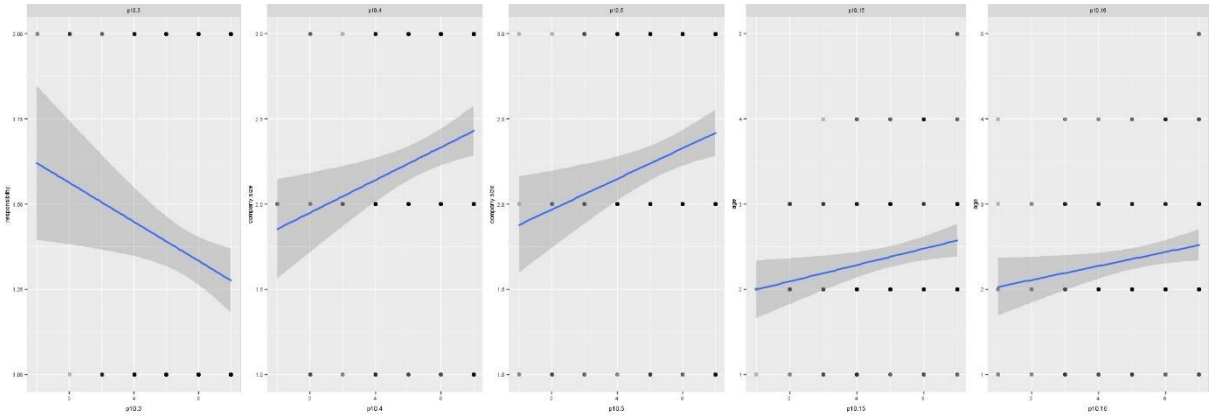

Figure 7. Correlation of success factors for research projects with the size of the organization, the age and the responsibility of the respondent
Source: own work

Table 2 presents the results of the correlation analysis for success factors for research projects and their conclusions.

Table 2. Correlation of success factors for research projects with the size of the organization, the age and the responsibility of the respondent

Number of factor	Success factors	Spearman's rank correlation	Conclusions
p10.3	Adequate financing, secured research and equipment facilities	r=-0.14; *p*=0.0469	Factor "Adequate financing, secured research and equipment facilities" ***correlates significantly negatively*** with the respondent's responsibility in the examined project (the smaller the respondent's responsibility in the project, the greater the importance of factor p10.3). ***Very low correlation.***
p10.4	Involvement of scientists, their cooperation and focus on research	r=0.21; *p*=0.0028	Factor "Involvement of scientists, their cooperation and focus on research" ***correlates significantly positively*** with the size of the organization (the larger the organization, the greater the importance of factor p10.4). ***Weak to low correlation.***
p10.5	The team and its substantive skills	r=0.18; *p*=0.0109	Factor „The team and its substantive skills" ***correlates significantly positively*** with the size of the organization (the

			larger the organization, the greater the importance of factor p10.5). ***Weak to low correlation.***
p10.15	Invariability of partners in the consortium (no changes among partners involved)	r=0.15; *p*=0.0430	Factor „Invariability of partners in the consortium (no changes among partners involved)" ***correlates significantly positively*** with the age of the respondent (the older the respondent, the greater the importance of factor p10.15). ***Very low correlation.***
p10.16	Properly estimated duration of the project	r=0.14; *p*=0.0446	Factor „Properly estimated duration of the project" ***correlates significantly positively*** with age of the respondent (the older the respondent, the greater the importance of factor p10.16). ***Very low correlation.***
p10.23	Other factors[4]	r=0.16; *p*=0.0489	Other factors ***correlates significantly positively*** with the respondent's responsibility in the examined project (the higher the respondent's responsibility, the greater the importance of factor p10.23). ***Weak to low correlation.***

Source: own work

After analysing the correlation regarding the success factors of research projects, the following conclusions can be drawn:

- only 4 success factors correlated significantly positively with the age, responsibility of the respondent or the size of the organization, they were very low or weak to low correlations,
- only 1 success factor correlated significantly negatively with responsibility of the respondent, it was very low correlation,
- the larger the organization, the greater the importance of "Involvement of scientists, their cooperation and focus on research" and "The team and its substantive skills",
- the older the respondent, the greater the importance of "Invariability of partners in the consortium (no changes among partners involved)" and "Properly estimated duration of the project",
- the higher the respondent's responsibility, the less importance of "Adequate financing, secured research and equipment facilities" and the greater the importance of "Other factors".

Success criteria of research projects – for assessing success of this type of projects

A questionnaire was prepared (see Appendix A) to carry out quantitative research into the success criteria of research projects based on the study described in the publications: [15] [66].

Figure 8 and 9 shows to what extent each of the success criteria (p12.1-p12.18) was relevant for the research projects in which the project managers and members of project team participated. The importance of the individual success criteria was rated on a scale of 1 to 7 (ie very low to very high importance). If a given criterion was not applied in the surveyed organization, the respondent marked the answer "Not applicable"[5]. That is, the higher the

[4] This result will not be analyzed. Respondents marked the answer "other factors", but often did not enter "what?" or treated this answer as "not applicable".

[5] The figure shows only the answers of the respondents, determining the importance of individual success criteria of research projects on a scale from 1 to 7. For greater clarity, the above-mentioned a

weight given by the respondents, the higher the importance of a given success criterium of research projects.

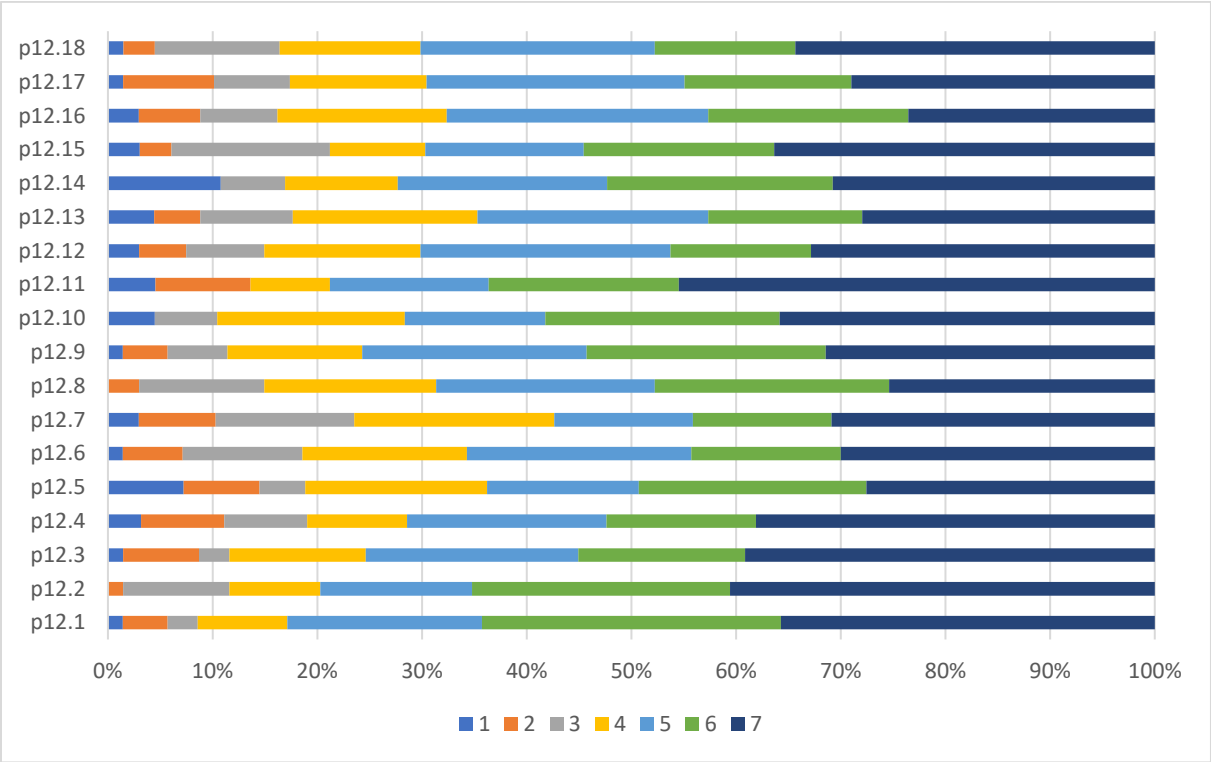

Figure 8. Importance of success criteria for research projects – distribution of responses by project managers

Source: own work

drawing of respondents' answers if a given criterium was not applicable in their organization (answer "Not applicable").

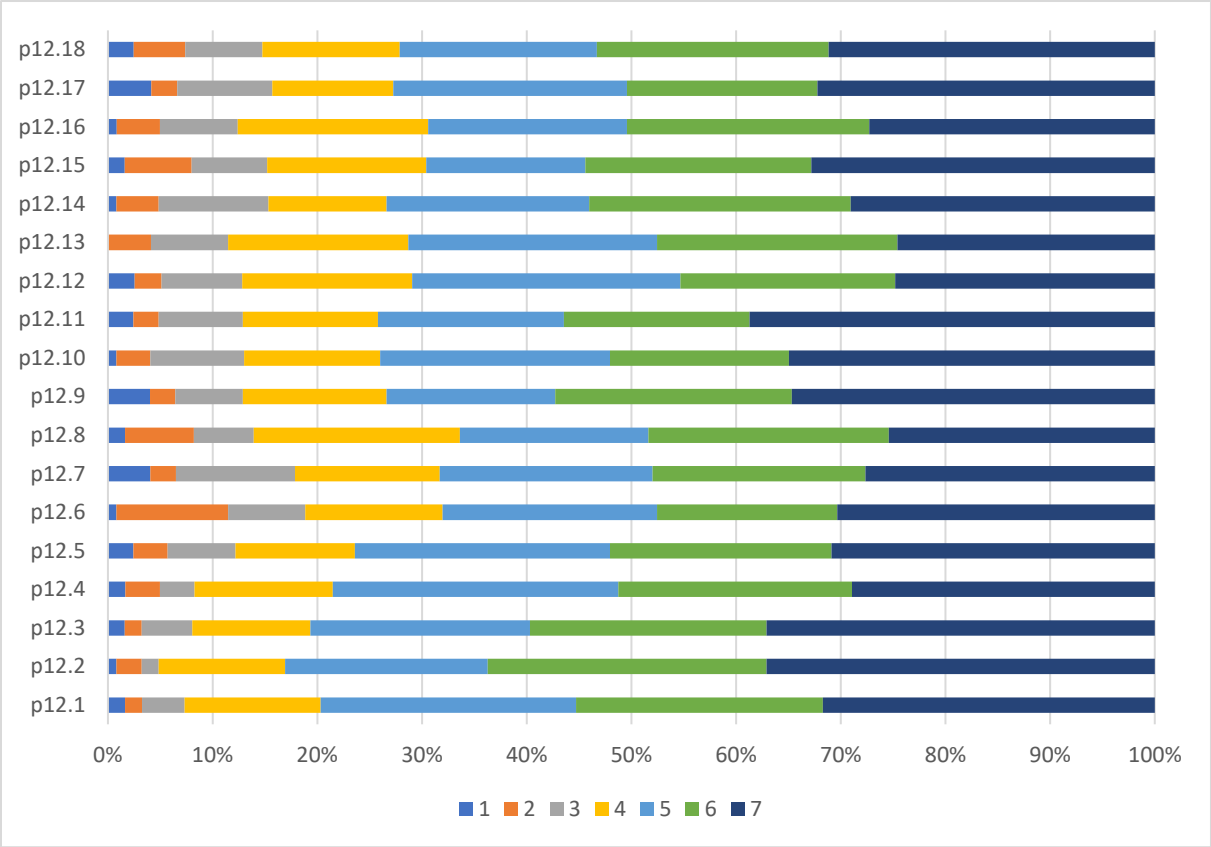

Figure 9. Importance of success criteria for research projects – distribution of responses by members of project team

Source: own work

For greater clarity, the conclusions from Figure 8 and 9 along with the names and numbers of success criteria of research projects are included in Table 3.

Table 3. Success criteria of research projects with importance 6 or 7

Number of criterium	Success criteria for research projects	Percentage of respondents for whom the success criterium was important 6 or 7	
		Project managers	Members of project team
p12.1	Publication	64,3	54,4
p12.2	Established cooperation	64,3	63,2
p12.3	Project deliverables	54,3	59,2
p12.4	Concept for the next project, generating ideas for the future	47,1	49,6
p12.5	Meeting the needs of end-users	48,6	51,2
p12.6	Scientific impact (recognition of the environment, prestige)	44,3	46,4
p12.7	Economic impact (as a result of the commercialization of research results)	42,9	47,2
p12.8	Social and political impact	45,7	47,2
p12.9	Completion of the project on time	54,3	56,8

p12.10	Completion of the project within the set budget	55,7	51,2
p12.11	Achieving the project goal	60,0	56,0
p12.12	Doctoral degrees	44,3	42,4
p12.13	Conference presentations	41,4	46,4
p12.14	Formation of a team thanks to a project	48,6	53,6
p12.15	Manager's satisfaction with the research carried out	51,4	54,4
p12.16	Patents	41,4	48,8
p12.17	Experience gained by scientists	44,3	48,8
p12.18	Substantive and financial settlement of the project, acceptance of the final report	45,7	52,0

Source: own work based on [53] [54]

After analysing the results of the respondents' research in the area of the importance of the success criteria of research projects, the following conclusions can be drawn:

- over 50% of project managers rated 7 out of 18 success criteria as important or very important,
- more than 50% of members of project team rated 10 out of 18 success criteria as important or very important,
- for project managers the three most important success criteria for research projects turned out to be: publication, established cooperation, achieving the project goal,
- for members of project team the three most important success criteria for research projects turned out to be: established cooperation, project deliverables, completion of the project on time,
- less than 10% of project managers rated 12 of the 18 success criteria as little or very little important,
- less than 10% of members of project team rated 17 of the 18 success criteria as little or very little important,
- only 0-5,7% of the respondents chose the answer "not applicable" to the success criteria given in the questionnaire.

Correlation of success criteria for research projects with the size of the organization, the age and the responsibility of the respondent

Similar to success factors, the correlation of success criteria was calculated for the three questions from the introductory part of the survey (Demographics): demographics1 (the size of the organization), demographics2 (the age of the respondent) and demographics3 (the responsibility of the respondent). None of the success criteria correlated with the respondent's responsibility. The correlations regarding the success criteria of research projects are shown in Figure 10.

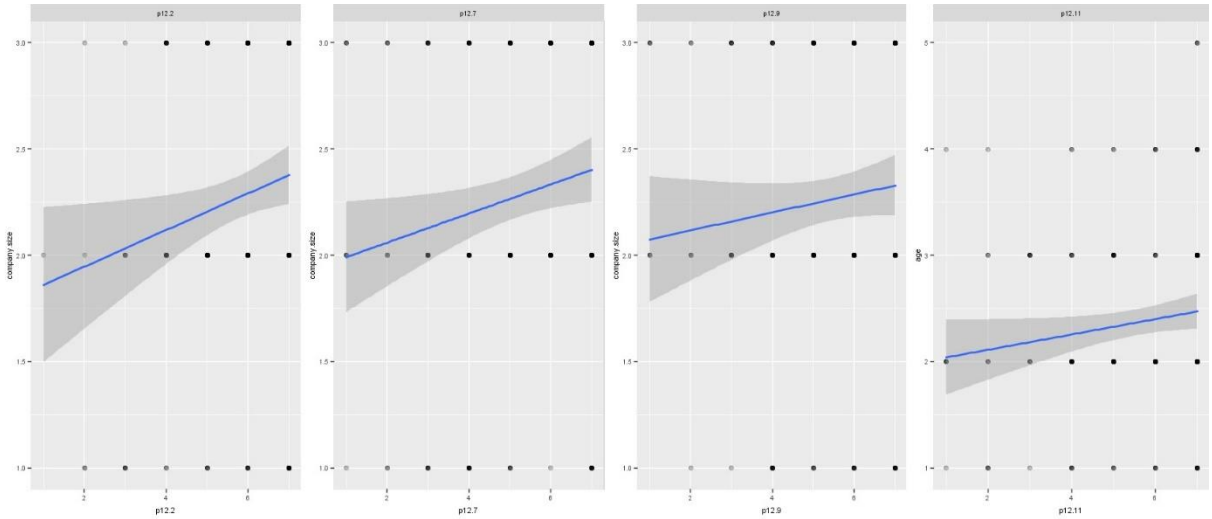

Figure 10. Correlation of success criteria for research projects with the size of the organization and the age of the respondent
Source: own work

Table 4 presents the results of the correlation analysis for success criteria for research projects and their conclusions.

Table 4. Correlation of success criteria for research projects with the size of the organization and the age of the respondent

Number of criterium	Success criteria	Spearman's rank correlation	Conclusions
p12.2	Established cooperation	r=0.15; *p*=0.0410	Criterium "Established cooperation" ***correlates significantly positively*** with the size of the organization (the larger the organization, the greater the importance of criterium p12.2). ***Very low correlation.***
p12.7	Economic impact (as a result of commercialization of research results)	r=0.17; *p*=0.0130	Criterium "Economic impact (as a result of commercialization of research results)" ***correlates significantly positively*** with the size of the organization (the larger the organization, the greater the importance of criterium p12.7). ***Weak to low correlation.***
p12.9	Completion of the project on time	r=0.14; *p*=0.0470	Criterium "Completion of the project on time" ***correlates significantly positively*** with the size of the organization (the larger the organization, the greater the importance of criterium p12.9). ***Very low correlation.***
p12.11	Achieving the project goal	r=0.15; *p*=0.0374	Criterium "Achieving the project goal" ***correlates significantly positively*** with the age of the respondent (the older the respondent, the greater the importance of criterium p12.11). ***Very low correlation.***

Source: own work

After analysing the correlation regarding the success criteria of research projects, the following conclusions can be drawn:

- only 4 success criteria correlated significantly positively with the age of the respondent or the size of the organization, they were very low or weak to low correlations,
- no success criteria correlated with responsibility of the respondent,
- the larger the organization, the greater the importance of "Established cooperation", "Economic impact (as a result of commercialization of research results)" and "Completion of the project on time",
- the older the respondent, the greater the importance of "Achieving the project goal".

Discussion and Conclusions

The main conclusions from the theoretical part include the following points:

- a project's success will be associated with satisfying the various stakeholders of the project;
- opinions of different stakeholders in project management, including predicting the project's potential for success or assessing the success of a project, is an application of a sustainable approach to project management;
- the topic of the success of research projects, their success factors or success criteria is not very extensive; do not deal with the distinctions from the perspective of the stakeholders in this type of project or were conducted as qualitative rather than quantitative studies.

Given the above, the article fills a research gap.

Based on the quantitative research conducted on a sample of 200 organizations implementing research projects, the following conclusions can be drawn:

- most of the surveyed organizations (96,5%) identified stakeholders in their projects (apart from the project manager and the project team members). They mainly included: experts evaluating the results of the project, sponsors / financing institution and administration supporting the service of the research project,
- over 50% of project managers rated 13 out of 23 success factors as important or very important,
- more than 50% of members of project team rated 16 out of 23 success factors as important or very important,
- for both project managers and members of project team, the three most important success factors for research projects turned out to be: efficient cooperation in the preliminary phase of the project, properly planned project tasks and proper allocation of resources, effective communication and information flow,
- among the other success factors of research projects that respondents (project managers and members of project team) reported in the research were largely those indicative of the organization's pursuit of a sustainable approach to project management,
- less than 10% of project managers rated 16 out of 23 success factors as little or very little important,
- less than 10% of members of project team rated 22 of the 23 success factors as being of little or very little important,
- only 0-5,7% of the respondents chose the answer "not applicable" to the success factors given in the questionnaire.

- over 50% of project managers rated 7 out of 18 success criteria as important or very important,
- more than 50% of members of project team rated 10 out of 18 success criteria as important or very important,
- for project managers the three most important success criteria for research projects turned out to be: publication, established cooperation, achieving the project goal,
- for members of project team the three most important success criteria for research projects turned out to be: established cooperation, project deliverables, completion of the project on time,
- less than 10% of project managers rated 12 of the 18 success criteria as little or very little important,
- less than 10% of members of project team rated 17 of the 18 success criteria as little or very little important,
- only 0-5,7% of the respondents chose the answer "not applicable" to the success criteria given in the questionnaire.

After conducting the correlation analysis regarding the success factors and the success criteria of research projects, several general conclusions can be drawn:

- only 4 success factors correlated significantly positively with the age, responsibility of the respondent or the size of the organization, they were very low or weak to low correlations,
- only 1 success factor correlated significantly negatively with responsibility of the respondent, it was very low correlation,
- the larger the organization, the greater the importance of “Involvement of scientists, their cooperation and focus on research” and “The team and its substantive skills”,
- the older the respondent, the greater the importance of “Invariability of partners in the consortium (no changes among partners involved)” and “Properly estimated duration of the project”,
- the higher the respondent's responsibility, the less importance of “Adequate financing, secured research and equipment facilities” and the greater the importance of “Other factors”.
- only 4 success criteria correlated significantly positively with the age of the respondent or the size of the organization, they were very low or weak to low correlations,
- no success criteria correlated with responsibility of the respondent,
- the larger the organization, the greater the importance of “Established cooperation”, “Economic impact (as a result of commercialization of research results)” and “Completion of the project on time”,
- the older the respondent, the greater the importance of “Achieving the project goal”.

The research conducted by the authors shows that organizations identify and analyse stakeholders in research projects, thereby taking into account a sustainability approach. Sustainable approach is also visible in the opinions of respondents who, among other factors of project success, included those related to social and economic aspects (from the perspective of the organization).

Hence an important conclusion for the area of decision support in project management that it is worth including the opinions of various stakeholders (from the researchers' perspective) when measuring the success of research projects.

All results have cognitive value potentially useful for those who care about effective/sustainable project management. By predicting the potencial of a project's success or

assessing the success of a project already completed, answers to the questions formulated at the beginning of the article can be found, namely: should I start the project? should I quit the project? what are my chances of successfully completing the project? was my project successful? Persons interested in the results can be: managers of research projects, management of an organization carrying out research projects, heads of departments of such organizations including those dealing in particular with decision support, partners in a consortium or funding institutions of research projects.

However, the study conducted by the authors has a certain limitation, which is related to the size of the organization. Over 80% of the respondents who took part in the survey worked in medium and large organizations. Thus, the results of the conducted research may be used to a lesser extent by small organizations (employing less than 9 employees). In the future, it would be useful to conduct similar research in small organizations. Due to the fact that the research concerned Polish organizations, it would also be possible to carry out research on the success of research projects in other (more or less developed) countries and compare the obtained results.

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Appendix A

Questions [6]

How important was each of the success factors listed for the research project in which you participated? Rate on a scale of 1-7. If a factor is not applicable in your organization, select "Not applicable".

Success factors	1	2	3	4	5	6	7	NA
1. Efficient cooperation in the preliminary phase of the project								
2. Properly planned project tasks and proper allocation of resources								
3. Adequate financing, secured research and equipment facilities								
4. Involvement of scientists, their cooperation and focus on research								
5. The team and its substantive skills								
6. Achieving benefits from research conducted by consortium partners								
7. Proper selection and involvement of consortium partners								

[6] The questionnaire also contained, inter alia, part on the phases of the project life cycle, because the research was part of a wider project Miniatura 4, financed by the National Science Center, entitled "A fuzzy model for assessing the success of research projects" (project number: 494893, 2020/04/X/HS4/01922).

8. Choosing the right place for the project and introducing the rules for its implementation								
9. Leadership and management								
10. Strong, respectful relationships within the project team								
11. Equal distribution of time for research conducted in individual countries								
12. Effective communication and information flow								
13. User benefits of the project deliverables								
14. Flexible project implementation, constant monitoring and reviews								
15. Invariability of partners in the consortium (no changes among partners involved)								
16. Properly estimated duration of the project								
17. The influence of sponsors on the shape of the project								
18. The implemented project is a subsequent research collaboration								
19. The implemented project is a continuation of other research								
20. Adjusting the subject of the project to the development strategy of a given country								
21. Experience of the project leader in the implementation of projects within the consortium								
22. Sufficient trust in the team								
23. Other factors								

How important was each of the success criteria listed for the research project in which you participated? Rate on a scale of 1-7. If a given criterion is not applicable in your organization, select "Not applicable".

Success criteria	1	2	3	4	5	6	7	NA
1. Publication								
2. Established cooperation								
3. Project deliverables								
4. Concept for the next project, generating ideas for the future								
5. Meeting the needs of end-users								
6. Scientific impact (recognition of the environment, prestige)								
7. Economic impact (as a result of the commercialization of research results)								
8. Social and political impact								
9. Completion of the project on time								
10. Completion of the project within the set budget								
11. Achieving the project goal								
12. Doctoral degrees								
13. Conference presentations								
14. Formation of a team thanks to a project								
15. Manager's satisfaction with the research carried out								
16. Patents								
17. Experience gained by scientists								
18. Substantive and financial settlement of the project, acceptance of the final report								
19. Other criterium								