KEY RISK FACTORS IN IT PROJECTS MANAGED WITH THE USE OF AGILE METHODS

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Purpose: The aim of this article is to present the results of research aimed at identifying the most frequent risk factors of IT projects managed using the agile approach to project management.

Design/methodology/approach: The research was conducted by means of in-depth structured interviews, on a sample of 111 project managers, leaders and project team members. The research included identification of risk factors and their assessment during project planning, as well as the most frequent risk factors in an agile-managed project.

Findings: While carrying out a critical analysis of the literature, it can be observed that in the majority of publications concerning risk in projects managed in the agile way, the human factor is strongly underestimated, often excessively favouring procedures. However, when analysing the risk factors arising in IT projects managed in the agile way, except for the technology, equipment, system, or even the project schedule and cost, the project team is strongly accentuated.

Research limitations/implications: The article presented recommendations to conduct supplementary research concerning the assessment of risk factors directly resulting from the specific nature of IT projects and the application of agile methodology to project management in terms of project team work organisation as well as potential project stakeholder groups.

Originality/value: Software companies are one of the typical industries in which project management and the concept of teamwork are applied and the functioning of these teams is the dominant form of work organisation.

Keywords: risk, project management, agile, key risk factors.

Category of the paper: Viewpoint.

1. Introduction

The risk in the project is inherent, and so it appears in all levels of its implementation. Depending on the scope, complexity or nature of the project, the risk may be higher or lower, but it should always be identified (Juchniewicz, & Bukłaha, 2016). The subject of project risk

management has been under discussion for many years (Hottenstein, & Dean, 1992; Wyrozębski et al. 2012), but it still remains relevant (Thamhain, 2013; Hopkin, 2017). There are many definitions of risk in the literature, however, for the purpose of this article it is assumed (Trocki) that *risk is defined as the probability of a specific event or activity that may have a negative or positive impact on the implementation of the whole project and/or on its individual parts* (Trocki, 2012).

Three different approaches to risk management can be identified in the agile project management approach depending on the *heavy-weight* or *light-weight* methods used. The literature on agile *heavy-weight* methods (DSDM, 2010; Stapleton, 1997; AXELOS, 2015) distinguishes models based on a three-stage risk management process (identification, impact assessment, counteraction planning) in the process of project implementation (in ongoing iteration) and monitoring from the project management level. In the *light-weight* (Schwaber, & Sutherland, 2016; Chrapko, 2015; Shore, & Warden, 2008) agile methods, two approaches have been developed. The first one emphasises the significance of risk analysis in the project management process (Little, 2006) as an additional element executed by the team leader (Shore, & Warden, 2008; Boehm et al., 2002), however, it does not provide risk management models that could be used in practice. The second approach considers project risk as an inherent element (Lasek, & Adamus, 2014; Highsmith, 2007), incorporated in agile methods (Walczak, 2010) through transparency, prioritisation, iterative approach or continuous contact with the contracting party and almost immediate reaction to changes in requirements, technology or even scope elements (DeMarco, & Lister, 2003).

The agile approach to project management is essentially about the human factor, with particular emphasis on communication, involvement, cooperation and proactivity of stakeholders closely linked to project implementation.

What is the success of the project? There are at least a few answers to this question. Clearly, the most essential criterion for assessing the success of a project is to keep the time, cost and scope of the project in balance, where success means meeting these three criteria, with established quality (Betta, 2012). Phillips has a different approach to defining the success of a project itself, as it identifies it with the statement that teamwork is the key to success in project management (Phillips, 2005). Kisielnicki and Wirkus, however, similarly to IPMA (International Project Management Association), claim that the success of the project lies in the satisfaction of stakeholders with the results of the project (Kisielnicki, & Turyna, 2012; Wirkus, & Kusio, 2016). And this is also expressed in Betta's thoughts. She states that according to practitioners, the impact of stakeholders on the success or failure of a project is, depending on the complexity, type or size of the project, in the range of 70% and 90% (Betta, 2012). Meanwhile, financial resources and techniques play a minor role in this aspect (Gregorczyk et al., 2004; Lent, 2005). Furthermore, the success of a project in contemporary understanding should take into account not only the dimension of project effectiveness, business impact on the organisation and on the customer (benefits), but also new perspectives for all groups of

project stakeholders directly related to the proper achievement of their level of satisfaction, perceived from the perspective of organisational, personal and technical project implementation (Mierzwińska, 2013).

2. Research methodology

The analysis of national and foreign literature on the methods of managing IT projects implemented in the agile approach to project management shows that there is a lack of methodological approach to risk management. Furthermore, most of the factors affecting the success of a project often result from omitting human aspects. The research conducted in this article is aimed at filling the identified gap. Therefore, the research problem is formulated as follows: What risk factors of an IT project have a significant impact on its success?

The following research questions were therefore asked:

1. What are the most frequent risk factors for an IT project implemented in the agile approach to project management in Poland?
2. Which risk factors are crucial for project success?

The main objective of the article is to identify the risk factors which are crucial for the success of the project.

2.1. Subject of the research

Characteristics of the subject under analysis by means of a standardised interview questionnaire

The research conducted by means of a structured interview questionnaire was addressed to the target group, however, it was executed in Polish IT companies. In addition, the research was conducted based on the target group, which included project managers and/or leaders and members of project teams, who were characterised by the following qualities:

– they have participated in the implementation of at least one project in the last three years,
– they have held a management or project team member position,
– they have had practical and theoretical knowledge of IT project management in the agile approach to project management,
– they have worked with the agile approach to project management.

As a result of the undertaken activities, a total of 111 interviews, based on criteria describing the target group, were conducted with managers and project team members from 31 IT companies. During the analysis of the correctness of all data provided in the completed interview questionnaires, 108 correct questionnaires were used for further analysis.

Characteristics of the subject under analysis by means of the questionnaire

The quantitative research conducted using the questionnaire was addressed to a target group characterised by the following features:

– they have participated in at least one IT project,
– they have worked as part of a project team or a production team in the organisation executing the project,
– they have worked in a team managed in the agile way, based on the principles and postulates of the Software Agile Manufacturing Manifesto.

The research was conducted by means of an anonymous questionnaire, which was distributed in the form of a printout at the community meetings promoting the agile approach to project management, and electronically using the prepared e-mail database.

The size of the target group to which the surveys were directed can be estimated at 2500, while the total return of completed surveys was 173, which accounted for 6.92%. Furthermore, while performing a preliminary analysis of the collected results, it was discovered that some questionnaires (11) were not fully completed, which resulted in 162 results being accepted for further analysis. Based on the verification of the adopted characteristics of the target group, 123 cases were accepted for the basic analysis of the obtained research results.

2.2. Research methods

In order to obtain answers to the research questions asked, the research was conducted by means of a standardised interview and a questionnaire.

To answer the research questions concerning the identification of the most frequent risk factors present in IT projects, a structured (standardised) interview questionnaire was used. The construction of the structured interview questionnaire was conducted using experts' consultations and generally applicable rules. The questionnaire was divided into three parts. The first one was a metric (5 questions), the second one concerned issues related to the identification, assessment and management of the project stakeholders (8 questions), and the third one concerned issues related to the identification of risk factors (10 questions) and tools and methods of quantitative and qualitative assessment of risk factors (6 questions).

In order to respond to the research questions posed concerning the assessment of the identified risk factors, a survey questionnaire was used (Dillman, 1978), which included four parts. The first one was a metric (6 questions), the second concerned general questions on stakeholders, risks and success of the IT project (15 questions), the third consisted of questions on the impact of selected risk factors on the success of the IT project (27 questions), and the fourth included questions on the impact of key stakeholder groups and their characteristics on the development of risk (42 questions). The questionnaire consisted mostly of a closed-ended questions, which were arranged in the form of a matrix based on a five-point Likert scale, which made its completion time accessible.

3. Research results

The analysis of research results involved their preparation using descriptive statistics tools. It is worth mentioning that the results obtained are preliminary in nature and are the basis for further in-depth research, which is the subject of other publications.

The aim of this research was to identify empirically the most frequent groups of risk factors resulting from the implementation of an IT project, managed in the agile approach to project management.

The risk factors were identified by means of the structured (standardised) interview described earlier, where they were evaluated by means of a questionnaire. In the surveyed group (108 respondents) — 409 potential risk factors were identified. The data received were subsequently sorted and repeated results were removed, assigning an increasing number of indications of the defined risk factor accordingly. It resulted in 207 potential risk factors. Then, the obtained results were grouped by the characteristics to which they referred. In this way 42 potential groups of risk factors were obtained for an IT project managed in the agile project management approach.

Based on the results obtained, 10 out of 42 key risk factors were listed in the agile approach to project management, which were the most crucial, according to the respondents (Table 1).

Table 1.
Identified risk factors in a structured (standardised) interview

| Most frequent risk factors			Other identified risk factors		
Risk factor	**Responses**	**%**	**Risk factor**	**Responses**	**%**
communication in the project team	33	30.56%	changes in the priority of requirements by the customer or organisation	11	10.19%
user/client involvement in the development of functionality	28	25.93%	incorrect transfer of work to the team/measurable workload	10	9.26%
project team competence	21	19.44%	legislation	10	9.26%
equipment/technology	19	17.59%	the way the project is managed	10	9.26%
organisational culture	17	15.74%	support for management/ organisation	10	9.26%
estimation of workload	17	15.74%	user/customer attitude	9	8.33%
estimation of resources	13	12.04%	cultural barriers	8	7.41%
imprecise requirements on the customer side	13	12.04%	lack of project integrity	8	7.41%
communication with the project environment	12	11.11%	decision-making on the customer side	8	7.41%
interpretation of customer needs/requirements	12	11.11%	size of the project team (availability of members)	8	7.41%

Cont. table 1.

|	vague, unclear business objectives	8	7.41%
	new procedures, technologies	8	7.41%
	decision-making time	8	7.41%
	level of technical complexity of the project	8	7.41%
	testing environment or lack of it	8	7.41%
	timeliness of external stakeholders	8	7.41%
	the limitations and availability of resources (including technology)	7	6.48%
	changes in the team/turnover of members	7	6.48%
	design errors at the start of the project	6	5.56%
	vague, unclear assignment of tasks	6	5.56%
	change resistance/change management	6	5.56%
	project team progress reporting/ project monitoring and control	6	5.56%
	high level of task abstraction	6	5.56%
	competence of the project manager	5	4.63%
	personalities in the project team	5	4.63%
	diluted responsibility for task execution	5	4.63%
	cooperation between team members	5	4.63%
	project team involvement	5	4.63%
	conflicts	4	3.70%
	non-functional requirements	4	3.70%
	estimation of the project budget	4	3.70%
	communication between the team and the project manager	3	2.78%

Source: own elaboration.

In the study sample, the most frequent risk factor indicated by the respondents was communication within the project team (30.56%). Taking into account the specific nature of IT projects and the agile approach used to implement them, communication both within the team and with the project environment (11.11%) undoubtedly has a significant role. The team working in the agile way is obliged to communicate the most essential information among themselves, especially those that are directly related to emerging problems. One of the methods of mitigating this risk factor are 15-minute daily stand-up meetings.

Moreover, the vast majority of respondents participating in the survey conducted by means of the survey questionnaire are of the opinion that communication is essential for the success of the project.
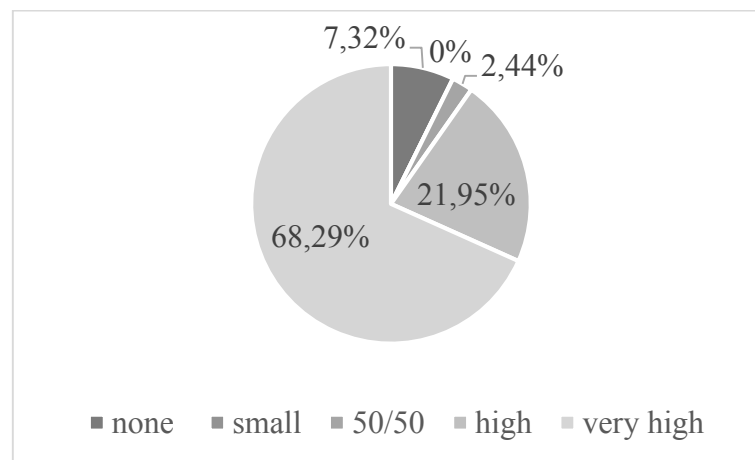
Figure 1. The impact of communication in the project team on the success of the project — results of own research (questionnaire). Source: own elaboration.

The second most significant risk factor is user/client involvement in the development of functionality (25.93%). This factor is also considered to be relevant in the assessment of the impact on project success (68.3%)[1]. Also, the impact of customer involvement has been emphasised by many authors as one of the crucial risk factors in their research. The life cycle of project management in the agile approach consists of a specific period of time (1-4 weeks), consecutive iterations without interruptions, in which the final product is developed with each added, working functionality. The team working in this manner without the involvement of the client or end user of the product is not able to deliver a product that meets all requirements. One of the methods of mitigating this risk factor is a review and retrospective (summary) after each iteration.
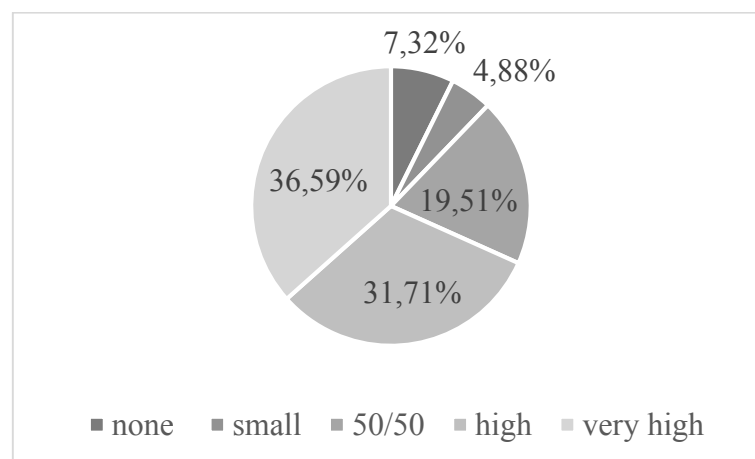
Figure 2. The impact of the client's involvement in the development of the functionality on the success of the project — results of own research (questionnaire). Source: own elaboration.

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[1] The total impact "high" – 31,71% and „very high" – 36,59%.

The third place in terms of the number of responses are the risk factors related to competence, qualifications of the project team (19.44%). This factor is one of the highest ranked factors in terms of impact on project success (82.93%)[2]. The above research results have also been reaffirmed in the research on the competences of project team managers (Wachowiak, & Gregorczyk, 2018). The authors of the research emphasise that the assessment of competences of project team managers in Polish companies is not satisfactory. There are competence gaps in all areas of competence. In addition, the competence of the relevant personal characteristics of a project team leader was assessed the worst in the research. As far as the knowledge that a project team manager should have is concerned, the knowledge of communication management was assessed as the lowest, which is also confirmed by the research conducted in this paper. Each project is implemented by human resources and its success depends on them. Lack of competence of individual team members or the whole has certainly a substantial impact on both the project implementation and success.
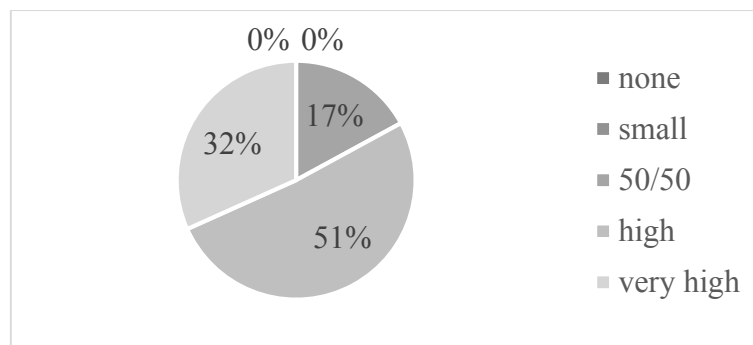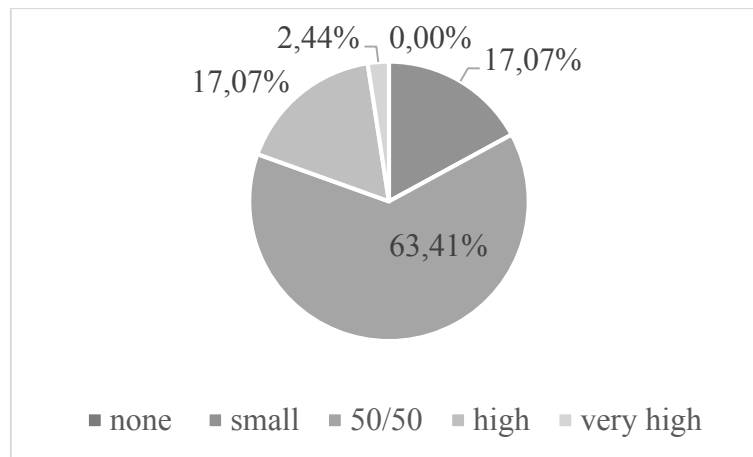

Figure 3. The impact of the project team's competence on the success of the project — results of own research (questionnaire). Source: own elaboration.

Equipment and technology are ranked fourth (17.59%). IT projects are focused almost 100% on the use of technology (often brand new) and the equipment required for this. It is worth mentioning that in the overall assessment of the impact of the factor on the success of a project, the vast majority of respondents claim that the impact is moderate. However, this factor is also expressed both in the competence of the team and in the involvement of the customer/user, which may lead to e.g. errors in system integrity or lack of information on the technologies used in the target structure on the part of the product purchaser.

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[2] The total impact "high" – 51.22% and „very high" – 31.71%.

Figure 4. The impact of equipment and technology on the success of the project — results of own research (questionnaire). Source: own elaboration.

Estimation of workload (15.74%) and resources (12.04%) are risk factors directly affecting project planning and control. Poor planning and control often leads to unrealistic schedules and budgets, although detailed planning in software development risks prolonging the response to changes. The problem of estimating the workload in IT projects is one of the biggest challenges in the industry. The topic is crucial, as in many IT projects the cost of work reaches almost 100% of the project costs. An additional challenge is the fact that we need a reliable estimate at a very early stage of the project. When analysing the characteristics of IT teams' work, it can be concluded that a valuable estimate must be made already during the initial phase — that is, before we know the requirements to the end. The failure of the cascade model, proven by many studies, has shown that projects must be ready for high volatility of requirements.
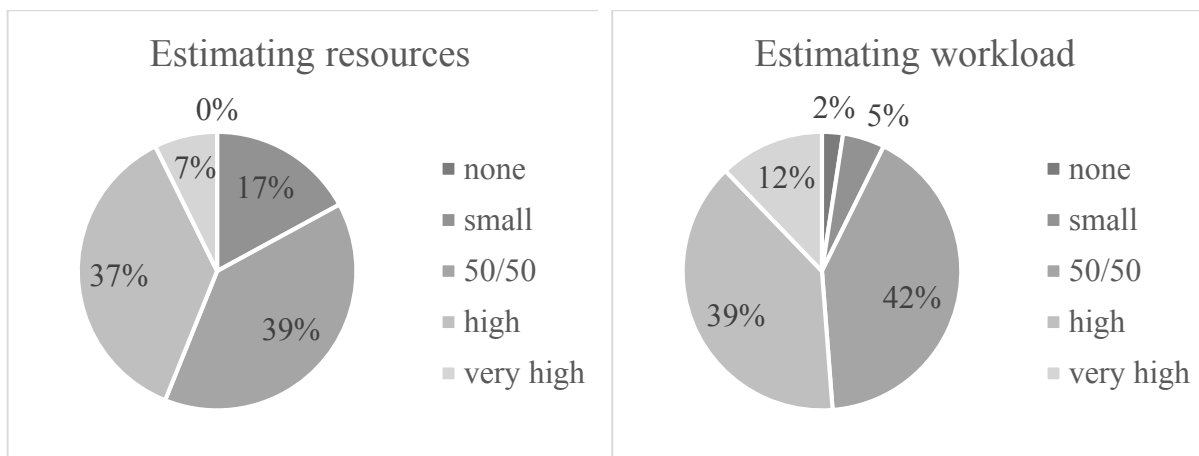
Figure 5. The impact of estimating workload and resources on the success of the project — results of own research (questionnaire). Source: own elaboration.

Respondents in the research also identified a significant impact on risk of the organisational culture (15.74%) of the parent organisation in which the project is implemented, defining such factors as: management support, project maturity of the organisation, or decision-making time, which in the vast majority of cases confirm the results of research conducted by The Standish Group. Since the projects managed in the agile way do not give a full picture of the project's

scope, as in the case of cascade projects, the management of the organisation must also be convinced of such a system of teamwork.
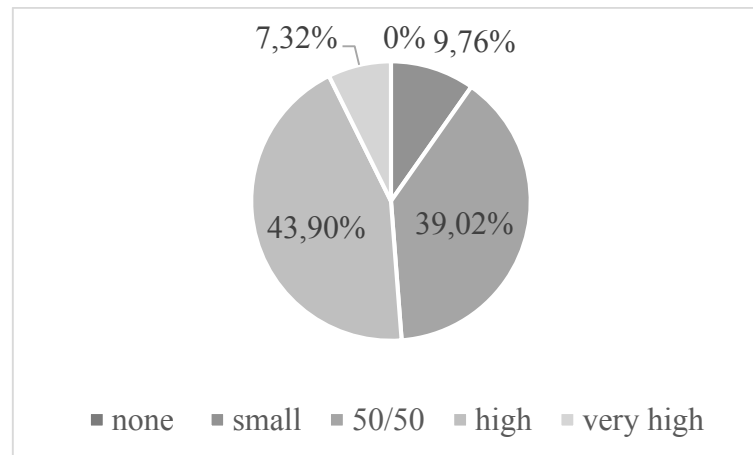

Figure 6. The impact of the organisational culture on the success of the project — results of own research (questionnaire). Source: own elaboration.

Lack of specific requirements on the customer side (12.04%) or unclear, misinterpreted customer needs (11.11%) are directly linked to the communication in the project as well as customer involvement in its development. These factors are one of the most frequently quoted risk factors in IT projects managed in the agile approach to project management.
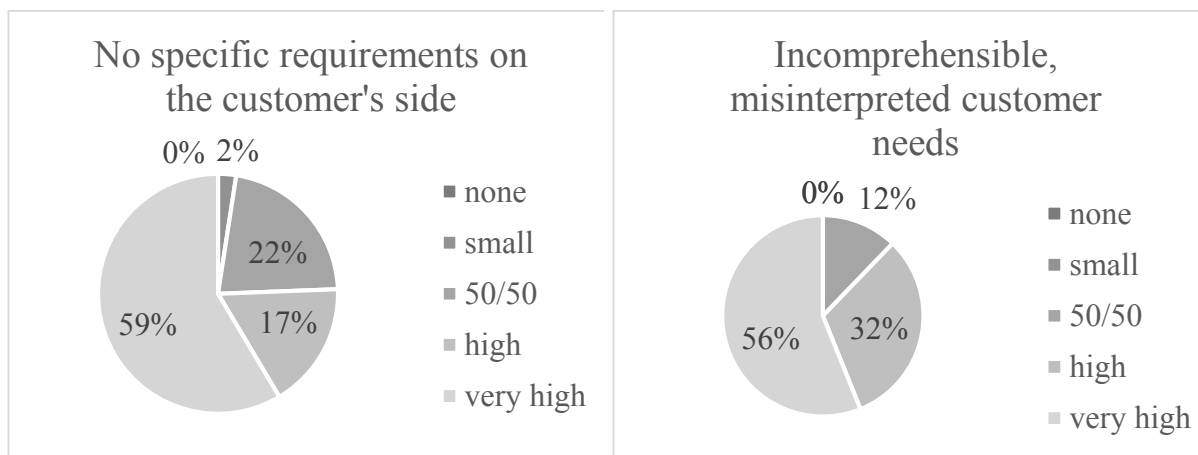
Figure 7. The impact of customer requirements and needs on the success of the project — results of own research (questionnaire). Source: own elaboration.

When analysing the results of the research, it is clear that the human factor has an impact on the development of the project risk. The first three risk factors — in terms of number of responses — are directly linked to the work of the project team. Moreover, the results of the research are in many cases consistent with the results presented by The Standish Group in the Chaos Manifesto Reports on key success factors of IT projects, in which there is also a growing trend in the impact of the human factor.
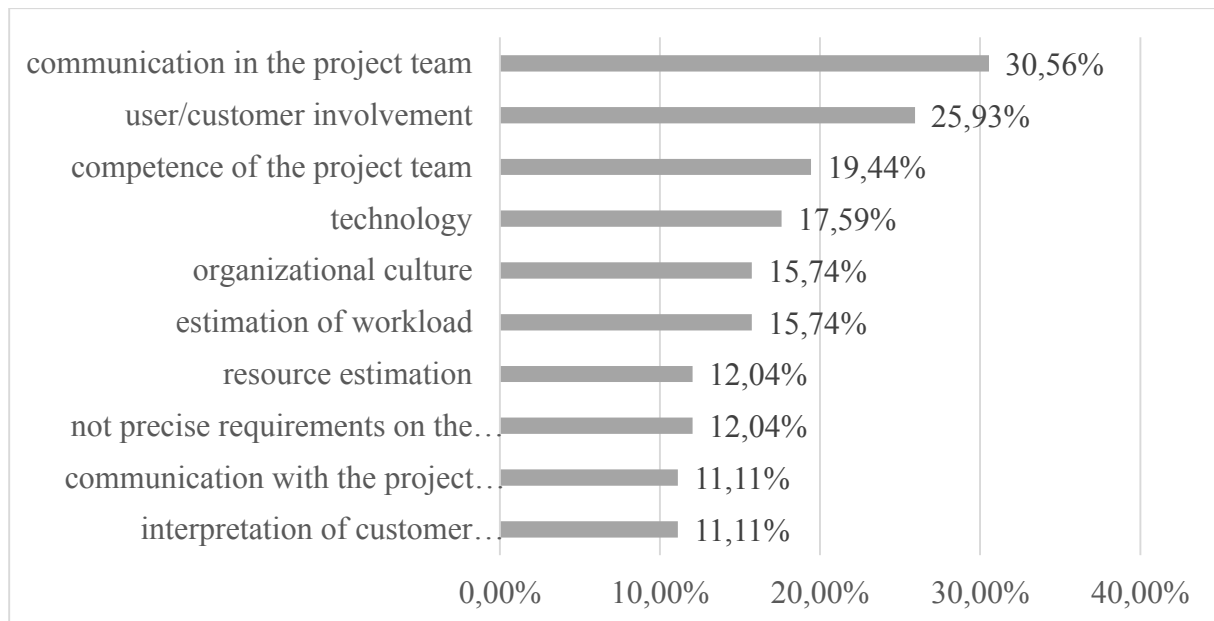
Figure 8. Key risk factors of IT project implemented in the agile approach to project management. Source: own elaboration.

It is noteworthy that five of the identified key risk factors, including the three most frequently identified, relate directly to stakeholders closely related to project implementation, i.e. the project team and the user/customer.

4. Conclusions

The aim of the article was to identify factors affecting the quality of the research process as a complementary element of the existing methodological approaches. After the research effort, including the empirical research, the main goal of the article was achieved.

While carrying out a critical analysis of the literature, it can be observed that in the majority of publications concerning risk in projects managed in the agile way, the human factor is strongly underestimated, often excessively favouring procedures. However, when analysing the risk factors arising in IT projects managed in the agile way, except for the technology, equipment, system, or even the project schedule and cost, the project team is strongly accentuated. According to practitioners, risk analysis in the agile project management as a separate process seems to be unnecessary, and relying on customer decisions concerning the choice of functionality and short iterations constitute a built-in risk reduction strategy. The key success factors of IT projects presented in reports relating to both the state of the IT industry (Galant-Pater, 2009), as well as for the agile methods (Parys, 2013) emphasise the growing influence of the project team or individuals involved in the project on the project risk level. The reports describing the key success factors of IT projects underline the importance of both the functioning of the project team as a whole and the personalities of each member.

In the Chaos Manifesto Report 2018 on key success factors of IT projects, there is a growing trend in the significance of the human factor.
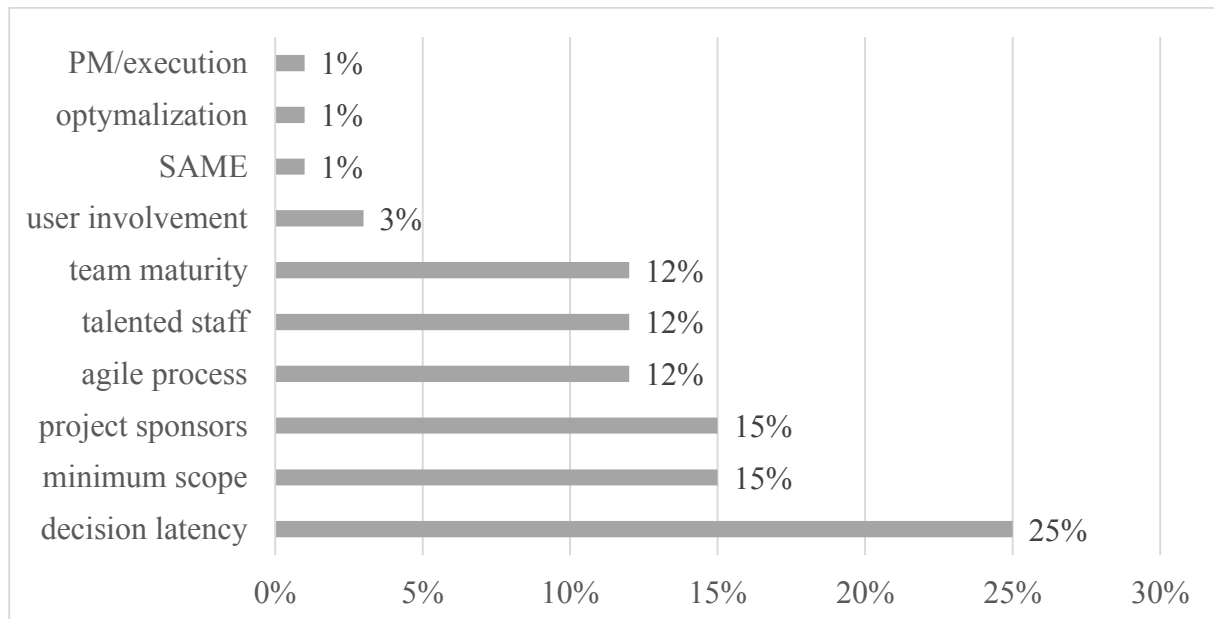
Figure 9. Success and failure factors for projects. Source: Own elaboration based on the Chaos Manifesto 2018.

Six out of ten of these factors are directly associated with the aspect of teamwork. By adding factors such as scope optimisation, work environment, the agile management and clear project objectives, it is possible to react immediately to risks or uncertainties. The results presented by The Standish Group are consistent with the results obtained from the research.

With regard to the fact that most of the risk factors identified in the research are related to both the project team and the project environment (stakeholders), it is recommended to conduct research on the assessment of risk factors resulting directly from the specificity of IT projects and the application of the agile approach to project management in terms of the work organisation of the project team and potential project stakeholder groups.

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