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Redefining Success: How Personal Ambitions and Confidence Levels Shape IT Project Dynamic

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Abstract

Background: Failures in information technology (IT) projects continue to concern executives and organisations. Individuals are realising that to remain competitive in the workplace, they must develop skills to become successful project team members and project managers. **Objectives:** The purpose of this paper is to examine the relationship between IT project team members' competencies and their impact on IT project success, considering the iron triangle. **Methods/Approach:** Our study is based on IT projects that have been implemented for a public or private organisation in Slovenia and where contractors are employed in IT development enterprises on a sample of 141 IT companies. Step-wise regression was used to determine which competencies of various project roles are relevant for project success. **Results:** The most intriguing result is the negative association of achievement orientation with project success for analysts or consultants, suggesting that an excessive focus on personal accomplishments could potentially conflict with team objectives. Additionally, the variation in the significance of self-confidence across roles, particularly its less critical impact on project managers, challenges conventional wisdom regarding the universal importance of confidence in leadership positions. **Conclusions:** These insights reveal the nuanced and role-specific contributions of individual characteristics to project success, highlighting the importance of aligning personal traits and professional actions with the project team's collective goals.

Keywords: projects, project management, project team members, competencies, project success, information technology

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Introduction

When companies want to succeed and achieve sustainable development in today's dynamic, rapidly changing and highly competitive business environment, they must learn and adapt as quickly as they can. Sustainable development is an unending process - defined not by fixed goals or the specific means of achieving them but by an approach to creating change through continuous learning and adaptation (Žnidaršič & Jereb, 2011). The ability to learn and to adapt is especially important at times of crisis, such as the Covid-19 pandemic or the past economic crises. Here, individuals and their development in the business environment come to the forefront. The development of an individual means not only improving his/her knowledge but also improving his/her competencies. In the 21st century, an individual's formal education does not always guarantee his/her work performance. Technical skills are not enough to deal with challenges, and product quality is no longer the main value for consumers. Competences are therefore also important. The most important result of introducing competencies is that employees know what is expected of them and how they can achieve this.

Since the failure of IT projects continues to trouble executives and organisations (Sumner et al., 2006), this study aims to determine which competencies of the project team members are necessary for a completed project in the field of information technology (IT). In the reports of The Standish Group (2009), which are published every few years, we see that in 1994, only 16% of projects were completed, 53% were partially successful, and 31% were unsuccessful. In the research that followed, we see that the success of projects increased until 2002 when 34% of IT projects were successful, 51% were partially successful, and 15% of projects were unsuccessful.

To improve the success rate of IT projects, project managers need to develop a better understanding of people as well as organisations (Schwalbe, 2018). If we assume that the competencies of the IT project team have a significant impact on the implementation of the project and that for each IT project in which a competence deficit is identified, it is possible to increase the probability of its successful completion by upgrading competencies or replacing project team members with inappropriate competencies with members with relevant competencies (Varajão et al., 2019). In order to determine the impact of competencies, it is necessary to investigate the presence of competencies of project team members in completed IT projects and the lack of competencies of project team members in unsuccessfully completed projects. Project management has also been investigated in the domain of specific software applications, such as business intelligence (Pejić Bach et al., 2017).

There is no well-defined competence model that allows organisations to assess personnel competencies and establish the relevant training program that allows them to work efficiently in IT project teams, such as software development. However, several studies have already been done in the field of competence identification (Araújo & Pedron, 2015; Boyatzis, 2008; Jha & Iyer, 2007; Dörge, 2010). Araújo & Pedron (2015) also suggested in their study that IT project managers should combine technical skills with interpersonal and managerial competencies so they are better equipped to achieve project success.

Project managers must possess problem-solving expertise, leadership skills, context knowledge and analytical, people and communication expertise in addition to the more commonly emphasised project administration expertise (i.e., setting and managing scope, timelines and budgets) (Brill et al., 2006). However, companies and organisations must strive for the abilities and roles of all project participants in the project team to ensure continuous innovation (Oh & Choi, 2020). Some researchers have shown that a lack of knowledge of project team members leads to unsuccessful

projects (Gemino et al., 2007). Success requires a whole team, and the project manager is by no means able to perform all the tasks of the project team members alone (Alvarenga et al., 2019). The role of the project manager is becoming less important as responsibility for project success is shared with all members of the project team, so each member of the project team must have a clearly defined role (Princes & Said, 2022). With the advent of new technologies and project-driven changes in the working environment, companies are increasingly relying on teams with expertise to achieve organisational goals. Therefore, a company can no longer rely solely on the roles and control of the project manager (Oh & Choi, 2020). There is a lack of study on the competencies of the entire IT project team (Araujo & Pedron, 2015). The roles of project team members are defined according to the needs of project groups of IT companies involved in the development of business applications and depend on the complexity of the project. Every IT project always needs the following roles in the project team in order for the project to run smoothly: project manager, analyst-consultant in charge of the content of the application, application developer (development engineer) and test engineer who also takes care of customer support.

The project team, therefore, consists of four different performers for project activities, all of whom must have the necessary expertise. The central person of the project is still the project manager, who is personally responsible for the effective implementation of the project. A member of the project team can, at the same time, engage in different roles on the project, which, of course, depend on the complexity of the project.

This study is based on IT projects that have been implemented for a public organisation or private company in Slovenia and where contractors are employed in IT development enterprises. The main goal of the study is to examine the success of IT projects (i.e., completed projects within the planned constraints - costs, time frame and quality) according to the competencies of members of the entire project team. The research focused on the competencies of the members of the IT project group. We summarised the competencies of the technical staff. The competency model described in that study is based on the long-lasting research done by different researchers from different countries and continents. Besides that, this study is also the basis for later competency models (e.g., Project Management Institute, 2017).

The study's contribution is providing empirical evidence of the effectiveness of IT projects in relation to the competencies of all members of the project team. Therefore, we focused on the qualifications of the members of the core IT project team and their impact on project success, as this area has not yet been adequately addressed in the literature. In this article, the research question has been posed:

- RQ1: Which competencies are the most important for each specific member of the project team for the successful completion of an IT project?

The first and most important step in the study of competencies is to identify criteria for measuring the performance of all the roles that are presented in the project team. Based on a review of the existing literature, we found that many experts and researchers identified several different criteria for measuring project performance. Taking into consideration the implementing companies (which were also our sample), a project is successful when its total costs do not exceed the total revenues that were incurred within the completed deadline, and the client is fulfilled. A number of criteria determine the success of a project, but many authors (Atkinson, 1999; Jha & Iyer, 2007) mention the most important three criteria: cost, time frame and quality and those three criteria we used in our research.

Our study's contribution to organisational management provides empirical evidence of the effectiveness of IT projects in relation to the competencies of all

project team members. Therefore, we focused on the qualifications of the members of the core IT project team and their impact on project success, as this area has not yet been adequately addressed in the literature.

Literature review

A project is a temporary endeavour undertaken to create a unique product, service or result (Project Management Institute, 2017). IT projects involve using hardware, software, and networks to create a product, service or result (Schwalbe, 2018). Many organisations rely on the use of information technology, and a wide variety of projects use information technology for success. To avoid problems that might occur when the scope, time, and cost goals are not met, project management should be included to manage those constraints. Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements (Project Management Institute, 2017). It is the process of working with a team of people to solve a problem. (Snedaker, 2005). Project managers must not only strive to meet specific scope, time, cost and quality goals of projects but also facilitate the entire process to meet the needs and expectations of people involved in project activities or affected by them (Schwalbe, 2018). The IT project manager should possess project management and IT knowledge, an understanding of the project and how it will fit into the organisation and experience in general management and human relations or soft skills needed to guide the project team (Schwalbe, 2018).

Most technology projects are complex, and lack of funding, lack of staff and lack of time or focus are all blamed in equal measure for project failure). The people involved are responsible for the success or failure of the project (Snedaker, 2005). Because IT projects are diverse, the people involved come from diverse backgrounds and possess different skills. Even with these different educational backgrounds, there are common job titles for people working on most IT projects, such as business analyst, programmer, network specialist, database analyst, quality assurance expert, technical writer, security specialist, hardware engineer, software engineer and system architect. It is important to select team members carefully and to form a team in which all roles are covered. If organisations want to implement IT projects successfully, they need to make effective use of people. People are the most important asset in most projects (Schwalbe, 2018).

When forming a project team, the first step is to define the skills that are needed for the project to finish successfully. Only later will the roles and responsibilities be identified. The tendency for most people is to identify people rather than roles, responsibilities, and competencies.

Competence is the knowledge, skills and behaviours (experience) a person needs to fulfil his or her role. The theory of competence has been studied theoretically and empirically in many research fields from multiple perspectives (Oh & Choi, 2020). Competence is linked with individual behaviour and job performance. Effective job performance is the attainment of specific results (outcomes) required by the job through specific actions while maintaining or being consistent with policies, procedures and conditions of the organisational environment (Boyatzis, 1982). Defining the required competencies and mapping them to roles and responsibilities can help identify the specific people we need to make our project successful. Assessing the skills, abilities and competencies of individuals increases the chances of choosing a team that has the potential to succeed (Snedaker, 2005).

Using the McClelland/McBer job competence assessment methodology, Spencer & Spencer (1993) stated that competency is a feature that is effective concerning the criterion in a job or situation and represents a relatively long-lasting behaviour and

mindset in various situations. In our study, we use the competencies of technical professionals (see Table 1) based on the study described in "Competence at Work" since this study also represents the basis for later competence models (Project Management Institute, 2017).

Table 1
Generic Competency Model for Technical Professionals

Competency	Competency description
Achievement Orientation	• measures performance • improves outcomes • sets challenging goals • innovates
Impact and Influence	• uses direct persuasion, facts and figures • gives presentations tailored to the audience • shows concern with professional reputation
Conceptual thinking	• recognises key actions, underlying problems • makes connections and patterns
Analytical thinking	• anticipates obstacles • breaks problem apart systematically • makes logical conclusions • sees consequences, implications
Initiative	• persists in problem-solving • addresses problems before being asked to
Self-Confidence	• express confidence in own judgement • seeks challenges and independence
Interpersonal Understanding	• Understand the attitudes, interests, and needs of others
Concern for Order	• seeks clarity of roles and information • checks quality of work or information • keeps records
Information – Seeking	• contacts many different sources • reads journals, etc
Teamwork and Cooperation	• brainstorms, solicits input • credits others
Expertise	• expands and uses technical knowledge • enjoys technical work; shares expertise
Customer Service Orientation	• discovers and meets underlying needs

Source: Spencer and Spencer, 1993)

Methodology

Research instrument

The first version of the research instrument, which is a measuring instrument for collecting quantitative data, was prepared at the beginning of 2021 as an online survey supported by the 1KA application.

Firstly, we tested the questionnaire with a retrospective technique of in-depth interviews with two respondents from two different companies involved in the development of IT solutions to determine how respondents understood the questions and take into account possible suggestions for improvement. Respondents had some difficulties in understanding competencies; two. For this reason, we prepared more detailed descriptions of all competencies. Next, we conducted in-depth interviews before the survey to test the questionnaire and possibly acquire an additional set of important competencies of project team members, which was not included in the model "Competence at work". We anticipated that we would also obtain some other

important amendments to the questionnaire. We chose ten appropriate enterprises, taking care that the respondents represented different roles in the project team. In three companies we interviewed with a project manager, three with a developer, two with a customer support technician and two with an analyst. The respondents did not suggest any additional competencies for the roles of IT project team members, so we can conclude that all important competencies, despite the age of the competence model used, are still relevant.

Data collection

To be able to check and compare the competencies of project teams and to eliminate as many external factors as possible that may affect the implementation of the project, we prepared a database of IT companies in Slovenia engaged in software development and competing in the same or related projects. Our research population are Slovenian small and medium-sized enterprises (SMEs) active in the field of IT, specifically in the development of computer applications. In the Slovenian Business Register, which is a central public database on all business entities, we chose NACE (Nomenclature of Economic Activities) code J62 (Computer programming, consultancy, and related activities) and selected 414, which were active at the time of selection (beginning of the year 2021).

The interviews were conducted online and recorded through the Microsoft Teams tool, which allowed for their analysis. Interviews were analysed using the Atlas.ti software tool.

The final version of the survey questionnaire was entered into the 1KA application in August 2021 and was sent to 414 companies. Because the first response rates were not encouraging, we also established contact with some project sponsors (these are usually directors in the case of SMEs) and asked them for assistance. The online survey ended in September 2021. We received 114 completed questionnaires. Statistical analyses were done with the open-source software package PSPP.

Sample characteristics

Out of a total of 141 responses received, more than half were men (55,3%), 21,3% were women, and 23,4% of responses did not indicate their gender. Most responses are in the 41-50 age group (33,3%), 18,4% are in the group aged 31-40, 17,7% of respondents are under 30 years old, and 2,1% are over 61 years old. Thirty-three respondents, or 23,4%, did not declare their age group affiliation. From the distribution of the sample, we can conclude that most respondents who participated in the questionnaire are highly educated since the largest percentage has a level of education VII., spec. After higher education programs, master's degree (39%). The second most represented group of education is VIII. /1. specialisation according to the UN program, Master of Science, which includes 11,3% of respondents, VI/2. Spec. after high school. Program, higher education profession. Prog., 1. Bol. deg., which includes 9,9% of respondents.
The sample's distribution shows that 45,5% of respondents are project managers, the highest number of respondents. Other roles are represented very similarly: 17,7% of respondents are analysts, 15,6% are programmers, and 18,4% are test engineers/user support.

Most respondents (66,7%) cite work experience as a source of knowledge, slightly less than 50% (48,9%) of respondents cite formal education, and 39,7% of respondents cite informal education as a source of acquired knowledge for performing their current role in the project team.

From the project management point of view, most respondents (66%) chose the statement that they have a project manager, 25% stated that they have a project

office, and 7% chose the statement that the company they currently work in does not have a project manager.

Looking further into the descriptive statistics in our study about the competencies of the IT project team, the following results were obtained from the survey questionnaire about the required competencies of the members of the IT project team. The respondents evaluated the variables with scores from 1 to 5, where a score of 1 meant that the selected competency was not necessary at all, and a score of 5 meant that the selected competency was very necessary. The competency "Interpersonal Understanding" has the highest average score of competencies for Project managers (4,69), and the competency "Information Seeking" was rated by the respondents with the lowest average score (3,93) regarding the importance of the competency. According to the results, the competency "Analytical thinking" is rated with the highest average score (4,87), and the competency "Concern for order" is rated with the lowest average score (3,18) for analytics/consultants. The respondents seem to think that the highest average score (4,47) rated the competency "Conceptual thinking" as the most important competency for developers. With the lowest average score, the competency "Concern for order" is the least important for developers. The competency "Concern for order" was rated as the least important (3,18) for test engineer/user support, but the competency "Customer Service Orientation" was valued with the highest average score (4.34).

As the literature lacks studies on the relationship between IT project manager competencies and project success (Turner & Müller, 2005), and especially between IT project team competencies and project success, this research aims to identify which project team member's competencies are more relevant to achieve success in IT project settings. In the first subchapter chapter, we explain the basic characteristics of our respondents. Then, we continue with explanations of the main research question, investigating competencies that are *possibly the most important for each specific member of the project team for the successful completion of an IT project*.

Results

Competencies of project team members

To verify the research question, which competencies of the members of the project team are important for the successful completion of an innovative IT project, data was collected on the following competencies: Achievement orientation, Impact on project implementation, Conceptual thinking, Analytical thinking, Motivation, Self-confidence, Understanding with members of the project group, Taking care of order on the project, Searching for information, Working in a group, Professional knowledge, and Taking care of the client. The data for the different project roles was collected, as presented in Table 2, which shows a summary of the average ratings of competencies that people on the project must possess.

The overall average ratings of the competencies of all project members were evaluated with more than 3.5. Therefore, it is concluded that the competencies of all members are marked as necessary on average. The project leader's competencies were evaluated with the highest average score when the competencies are observed in summary (4.41), and the programmer's competencies were evaluated with the lowest average score (3.86), which would mean that respondents consider the project leader's competencies to be the most important. As for the competencies of the project leader, the results of the descriptive statistics show that, although the respondents rate all competencies highly on average, they emphasise understanding with the members of the project group as the most important, which indicates that

communication with the leader is important to all members. As for the other members, the results of descriptive statistics indicate that group members are primarily expected to have expertise in a narrow area of their activity, so the variable analytical thinking has the highest average score for the analyst, professional knowledge for the programmer, and customer care for the test engineer.

Table 2
Average ratings of competencies for project roles

Code	Project management competencies	Project manager	Analysts consultant	Devel-oper	Test Engineer / User Support
C1	Achievement orientation	4.49	3.97	4.34	4.06
C2	Impact on project implementation	4.53	3.50	3.64	3.40
C3	Conceptual thinking	4.35	4.41	4.47	3.77
C4	Analytical thinking	3.98	4.87	4.03	3.54
C5	Giving initiatives	4.24	3.95	3.85	3.78
C6	Self-confidence	4.47	3.82	3.62	3.78
C7	Understanding with project team members	4.69	4.04	3.99	4.20
C8	Taking care of order on the project	4.51	3.18	3.13	3.16
C9	Searching for information	3.93	4.41	4.10	3.93
C10	Working in a group	4.58	4.02	4.04	4.14
C11	Expertise	4.02	4.60	4.71	4.16
C12	Customer care	4.41	3.70	3.29	4.34

Note: Respondents answered from 1 to 5 (1- not important at all, 2- not important, 3- neither important nor unimportant, 4-important, 5-very important): Source: Author's work

Step-wise regression analysis

The Step-wise regression analysis was used to examine the dependence of the dependent variable, which in this case is the level of the percentage of successful project completion, and the independent variables in the research present the competencies of different team roles. Interdependence was examined through the statistical parameters significance of independent variable in regression models at 1%, 5% or 10% probability.

The dependent variable was defined as binary with a value of 0 for the companies that had lower than 75% of successful projects and a value of 1 for the companies that had equal or higher than 75% of successful projects in the next three years. 40.4% of companies have 75% or more successful projects in the last three years, and 35.5% of companies have less than 75% successful projects in the last three years. 24.1% of respondents did not provide information about the variable. The results indicate a success rate of more than 75% in the majority of cases.

Project manager competencies. From the results of the analysis of the regression model of the dependent variable of the project's success and the independent variables of the project manager's competencies, Table 38 shows that the final regression model (Model 3) obtained from the analysis contains three independent variables C12, C2, and C6. The coefficient of determination is 0.375, which means that the selected model (Model 3) explained 37,5% of the dependent variable. By developing the final model, the average standard error was reduced to 47%.

Table 3
Representativeness of regression models for project manager

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.250	0.062	0.053	0.48800
2	0.321	0.103	0.086	0.47965
3	0.375	0.140	0.115	0.47185
Predictors Model 1: (Constant). C12				
Predictors Model 2: (Constant). C12. C2				
Predictors Model 3: (Constant). C12. C2. C6				
Dependent Variable: Project_success				

Source: Author's work

Table 4 shows the change in the coefficients of determination of the regression models with the independent variable of the project manager's competence. The second model's coefficients of determination changed by 0.041 compared to the first model, which represents a statistically significant difference at 5% probability (with F Values = 4.654, p-value=0.033). The change of the third model compared to the second is 0.037, which is also statistically significant at 5% probability (with F value=4.432, p-value=0.038).

Table 4
Change in the coefficient of regression models for project manager

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	0.062	6.921	1	104	0.010**
2	0.041	4.654	1	103	0.033**
3	0.037	4.432	1	102	0.038**
Predictors Model 1: (Constant). C12					
Predictors Model 2: (Constant). C12. C2					
Predictors Model 3: (Constant). C12. C2. C6					
Dependent Variable: Project_success					

*Note: ** statistically significant at 5% probability; Source: Author's work*

Table 5 shows the regression model that includes the dependent variable of project implementation success and the independent variables of the competencies of the project manager. Step-wise regression analysis was used to form the model. In the selected third model (Model 3), the independent variables C12 and C2 have a statistically significant influence on the dependent variable project success at a 1% probability level. Both variables have a positive influence, which would mean that customer care and level of influence on project success have a positive effect on project success. The third variable, C6, also has a statistically significant impact on the dependent variable project success at a 5% probability level. However, it has a negative impact on the dependent variable, which would mean that the greater the leader's self-awareness at the project level, the more negative the impact on project success is.

Table 5
Estimation of parameters of regression models for project manager

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.218	0.287		-0.757	0.451
	C12	0.169	0.064	0.25	2.631	0.010**
2	(Constant)	-0.821	0.398		-2.065	0.041**
	C12	0.153	0.064	0.227	2.415	0.018**
	C2	0.147	0.068	0.203	2.157	0.033**
3	(Constant)	-0.453	0.429		-1.056	0.294
	C12	0.189	0.065	0.28	2.923	0.004***
	C2	0.196	0.071	0.27	2.761	0.007***
	C6	-0.169	0.08	-0.213	-2.105	0.038**

*Note: ** statistically significant at 5% probability; *** 1%; Source: Author's work*

Analyst/consultant competencies. Table 6 presents the results of the analysis of the regression model of the dependent variable for the successful project and the independent variables of the analyst/consultant. The final regression model (Model 2) obtained from the analysis contains two independent variables: C6 and C1. The coefficient of determination is 0.471, which means that the chosen model (Model 3) explained 47.1% of the deviation of the dependent variable. By developing the final model, the average standard error was reduced to 44.66%.

Table 6
Representativeness of regression models for analyst/consultant

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.426a	0.182	0.174	0.45572
2	0.471b	0.222	0.206	0.44657
Predictors Model 1: (Constant). C6.				
Predictors Model 2: (Constant). C6. C1				
Dependent Variable: Project_success				

Source: Author's work

Table 7 shows the change in the coefficients of determination of the regression models with the independent variable of the analyst's competence. Compared to the first model, the second model had a change in coefficients of determination by 0.040, which represents a statistically significant difference at 5% probability (with F values=5.180, p-value=0.025.

Table 7
Change in the coefficient of determination of regression models for analyst/consultant.

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	0.182	22.418	1	101	0.000***
2	0.040	5.180	1	100	0.025**
Predictors Model 1: (Constant). C6.					
Predictors Model 2: (Constant). C6. C1.					
Dependent Variable: Project_success					

*Note: ** statistically significant at 5% probability; *** 1%; Source: Author's work*

Table 8 shows the regression model that includes the dependent variable for project implementation success and the independent variables for analyst/consultant competencies.

Table 8
Estimation of parameters of regression models for analysts/consultant

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.454	0.213		-2.126	0.036**
	C6	0.258	0.054	0.426	4.735	0.000***
2	(Constant)	-0.237	0.23		-1.032	0.305
	C6	0.342	0.065	0.566	5.267	0.000***
	C1	-0.136	0.06	-0.244	-2.276	0.025**

*Note: ** statistically significant at 5% probability; *** 1%; Source: Author's work*

A step-wise regression analysis was used to form the model. In the selected second model (Model 2), the independent variable C6 has a statistically significant impact on project success at a 1% probability level, and the variable C1 has a statistically significant impact on the dependent variable for project success at a 5% probability. The analyst's self-confidence (C6) has a positive influence on the project's success, which means that the higher the self-confidence, the more successful the project will be. In contrast, achievement orientation has a negative influence. So, a higher degree of achievement orientation will result in a less successful project.

Competencies for developers. From the results of the analysis of the regression model of the dependent variable of the project's success and the independent variables of the developer's competencies, it is evident that the first regression model of the Step-wise analysis is also the final one and contains one variable: Q6b (Impact and Influence). The coefficient of determination is 0.471, which means that the selected model (Model 1) explained 47.1% of the deviation of the dependent variable, and the amount of the standard error is 44.66% (Table 9).

Table 9
Representativeness of regression model for developers

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.471	0.222	0.206	0.44657
Model 1 Predictors: (Constant). C2				
Dependent Variable: Project_success				

Source: Author's work

Table 10 shows a regression model that includes the dependent variable of the project's success and the independent variables of the developer's competencies. Step-wise regression analysis was used to form the model. Variable C2 (Impact and Influences) has a statistically significant influence on the dependent variable, successful project execution, at the 1% probability level. The independent variable has a negative effect on the dependent variable, which is interpreted in such a way that the more focused the developer is on the project, the less successful his performance will be.

Table 10
Estimation of regression model parameters for developer

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.994	0.183		5.419	0.000***
	C2	-0.125	0.049	-0.251	-2.566	0.012**

*Note: ** statistically significant at 5% probability; *** 1%;*

Competencies of test engineer/user support. From the results of the analysis of the regression model of the dependent variable looking at the project's success and the independent variables for the test engineer/user support competencies, Table 11 presents the final regression model (Model 3), where three independent variables were shown: C2, C6 and C11. The coefficient of determination is 0.407, which means that the chosen model (Model 3) explained 40.7% of the deviation of the dependent variable. By developing the final model, the average standard error was reduced to 46.4%.

Table 11
Representativeness of regression models for the test engineer/user support

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.263	0.069	0.060	0.48532
2	0.355	0.126	0.108	0.47259
3	0.407	0.166	0.140	0.46405
a. Predictors: (Constant). C2.				
b. Predictors: (Constant). C2. C6				
c. Predictors: (Constant). C2. C6. C11				
d. Dependent Variable: Project_success				

Source: Author's work

Table 12 shows the change in the coefficients of determination of the regression models with the independent variable of the competence of test engineer/user support.

Table 12
Change in the coefficient of determination of the regression models: dependent variable: Project_success, independent variables: competencies of test engineer/user support.

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	0.069	7.493	1	101	0.007***
2	0.057	6.512	1	100	0.012**
3	0.040	4.716	1	99	0.032**
a. Predictors: (Constant). C2					
b. Predictors: (Constant). C2. C6					
c. Predictors: (Constant). C2. C6. C11					
d. Dependent Variable: Project_success					

*Note: ** statistically significant at 5% probability; *** 1%; Source: Author's work*

The second model's coefficients of determination changed by 0.057 compared to the first model, which represents a statistically significant difference at 5% probability (with F values=6.512, p-value=0.012). The change of the third model compared to the second is 0.04, statistically significant at 1% probability (with F values=4.716, p-value=0.032).

Table 13 shows a regression model that includes the dependent variable for successful project implementation and the independent variables of the competencies of test engineer/user support. Step-wise regression analysis was used to form the model. In the selected third model (Model 3), the independent variables C2 and C6 (Self-confidence) significantly influence the dependent variable, which is a successful project at a probability level of 1%. The variable C11 is significant at a probability level of 5%. The variable C6 has a positive influence on the project performance. The variables C2 and C11 have a negative influence on project success, from which it can be concluded that the more self-aware the test engineer/user support is, the more positively the influence on project performance; also when a test engineer/user support is focused more on performance and has a higher level of professional knowledge, that will negatively affect the project performance.

Table 13
Estimation of parameters of regression models for test engineer/user support

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.923	0.147		6.294	0.000***
	C2	-0.113	0.041	-0.263	-2.737	0.007***
2	(Constant)	0.457	0.232		1.970	0.052**
	C2	-0.123	0.041	-0.286	-3.048	0.003***
	C6	0.134	0.052	0.240	2.552	0.012**
3	(Constant)	0.824	0.284		2.905	0.005**
	C2	-0.120	0.040	-0.277	-3.004	0.003***
	C6	0.186	0.057	0.332	3.270	0.001***
	C11	-0.138	0.064	-0.220	-2.172	0.032**

*Note: ** statistically significant at 5% probability; *** 1%; Source: Author's work*

Table 14 presents the summary of the results of the Step-wise regression.

As for the competencies of the project manager, the results of the step-wise analysis showed that the competence of customer service orientation and impact and influence on project performance are statistically significant at a 1% level and are positively correlated with the dependent variable. The competence Self-Confidence is statistically significant at a 5% probability level and is negatively correlated with the dependent variable. Other competencies did not show an impact on the success of the project. It is concluded that a project manager who is focused on performance and who cares about customers but who at the same time does not have a pronounced self-awareness that would be associated with arrogance and difficulty communicating will have a positive impact on the project's success. In contrast, other competencies will have no impact.

As for analyst/consultant competencies, the Self-confidence competency is statistically significant at 1%. The probability level and the Achievement Orientation

competency are statistically significant at a 5% level, while the other competencies do not affect the project's success. The analyst's self-awareness is positively correlated with the success of the project, which means that a self-aware analyst/consultant will contribute to the project's success. In contrast, the focus on achievement is negatively correlated, according to which it is assumed that the analyst/consultant should focus on his professional framework of action and not on achievement because, in this case, the influence on the successful project will be negative.

Table 14
Results of examining the research question RQ1

	Project role			
	Project manager	Analysts/consultant	Developer	Test engineer/user support
Method	Step-wise regression: Criterion – Probability-of-F-to-enter<=.050, Probability-of-F-to-remove>=.100			
Dependent variable	Project success (0-less than 75% of successful projects in the company; 1-75% and more successful projects in the company)			
Independent variables	Achievement orientation; Impact on the implementation of the project; Conceptual thinking; Analytical thinking; Excitement; Self-confidence; Understanding with members of the project group; Taking care of order on the project; Searching for information; Working in a group; Professional knowledge; Care for a customer			
Criteria for the research question	Statistically significant parameters of the independent variable in the regression model at 1%, 5% or 10% significance			
Statistically significant independent variables	Searching for information (+1%); Impact on the implementation of the project (+1%); Self-confidence (-5%); Other variables (∅)	Self-confidence (+1%); Achievement orientation (-5%); Other variables (∅)	Impact on the implementation of the project (-5%) Other variables (∅)	Impact on the implementation of the project (-1%); Self-confidence (+1%); Professional knowledge (-5%); Other variables (∅)
Conclusion	The project manager who is focused on performance and cares about customers but lacks a high level of awareness will positively influence the project's success.	An analyst/consultant who is self-aware and not focused on achievement will positively influence project success.	A developer who is not oriented on performance will have a positive impact on the project's success.	Test engineer/user support who possesses professional knowledge but is not focused on performance and does not have a high level of self-awareness will positively influence project success.

Source: Authors' work

The results of the developer competencies on project success indicate that only one developer competency impacts project success, and that is Impact and Influence. Impact and influence are negatively correlated with project success at the 5% probability level, which means that as well as for the analyst/consultant, impact and influence will not bring many possibilities to project success. However, quite the opposite, it is assumed that for the project's success, the developer is most expected to act successfully within the framework of expertise.

Regarding the test engineer/user support competency results, the Impact and Influence and Self-Confidence competencies were found to be statistically significant at a 1% probability level, and the Expertise competency at a 5% level. Other competencies of the test engineer/user support were shown to have no impact on the project's success. Expertise competency is positively correlated with project success, which implies that the more knowledge test engineer/user support has, the more will contribute to project success. In contrast, Self-confidence and Impact and Influence competencies are negatively correlated and not desirable for test engineer/user support.

Results reveal that in project management, the significance of specific characteristics varies across roles, as highlighted by step-wise regression analysis findings. For project managers, proactively searching for information and having a tangible impact on project implementation are positively associated with project success, suggesting their crucial role in guiding decision-making and strategy. Conversely, while self-confidence is deemed essential for analysts, consultants, and test engineers, indicating its importance in decision-making and quality advocacy, it is intriguingly less critical for project managers, where excessive confidence might lead to oversight of details. Developers and test engineers who perceive their work as significantly impacting project outcomes are vital for success, emphasising the importance of ownership and quality. However, an overemphasis on personal achievement for analysts or consultants might detract from team goals, indicating that aligning personal ambitions with broader project objectives is crucial. The findings underscore the varied importance of characteristics such as self-confidence, impact perception, and information-seeking across different project roles, each contributing uniquely to project success.

Discussion and conclusion

In an increasingly competitive and globalised market, technological innovation is one of the important key strategies for the survival and growth of high-tech companies (Wang et al., 2022). For this reason, our study has focused on new, innovative IT projects, which means that the results of these IT projects are new or significantly improved products, processes or services that appear on the market or represent a significant novelty or improvement for the user, but not necessarily new to the market (Likar & Fatur, 2006). Suppose these have a significant impact on the implementation of the project for each IT project in which competence deficiencies are identified. In that case, it is possible to increase the probability of its success or to improve the performance indicators of the IT project by upgrading competencies (or replacing project team members with inadequate competencies). To determine the impact of competencies, it is necessary to investigate which competencies of project team members were present in completed IT projects and which competencies of project team members were absent in unsuccessfully completed projects. The literature already confirmed that the competencies of project management personnel are important as they are seen as having a major impact on project performance and,

therefore, on business performance (Crawford, 2005); less is known about the competencies of other project team members who are not managers.

Competencies include knowledge, skills, abilities, personality and behavioural characteristics, beliefs, motives, values, self-image and other abilities of an individual; in short, everything that is a guarantee of successful work performance so that an individual can successfully and efficiently and in accordance with work standards, perform a specific task, achieve goals or play a role in the business process. As more complex and dynamic projects increase, professional and multifunctional requirements are required to build a project team; team members then also need the skills and expertise that managers have, and they must have a high level of communication, management skills, integration capabilities and ability to utilise and understand knowledge, tools and techniques (Oh & Choi, 2020).

The main aim of our research was to create a model of the most important competencies for each role by using the Competence at Work (Spencer & Spencer, 1993) list of competencies, and this aim was achieved. Our work has important implications for IT business owners. It gives them a competency framework that can support them when recruiting new project members. It also considers training for the project team members who currently lack the competencies necessary for a specific role within the project.

Our study confirms previous research which emphasised the importance of soft skills for the project manager (Schwalbe, 2018), not only in IT but also in other industries. The competence of Expertise is very low rate in our study for project managers, and this confirms the conclusion that technical skills are recognised as one of the minimal requirements for a project manager, but excellent interpersonal or soft skills are necessary requisites for success (Gillard, 2009).

In line with previous studies (Jha & Iyer, 2007; Wateridge, 1998), we can also confirm that project managers are the most responsible for project success. However, developers follow closely behind, so we also show that all team members are significant and may play an important role in project success or failure.

A very interesting finding of this study is that the competencies of IT team members, which are important for the successful implementation of a project, are not necessarily the same as the competencies which were lacking in case the project was not completed successfully. The situation when all goes well is not the same as a situation when something is wrong. For example, in the case of a project manager, if a project is successful, "Interpersonal Understanding" and "Teamwork and Cooperation" are considered as the most important competencies. However, if that project was not completed successfully, "Impact and Influence" and "Concern for Order" were the competencies that were lacking the most. Testing engineer/user support has a similar situation: the missing competency is "Initiative", and the desired competency for successful projects is "Customer Service Orientation". However, in the case of analysts and especially developers, competencies in both cases (in successful and unsuccessful projects) significantly overlap.

Therefore, we could conclude from this finding that competencies are more clearly defined for developers and analysts. There is a greater consensus among all four groups regarding the competencies of developers and analysts, as shown by our analysis of the comparison of competency assessments for different team members. To fully understand this inconsistency in understanding the project roles' competencies, we certainly suggest further studies that would pay more attention to this phenomenon.

The limitation of this study is that it was done on Slovenian IT companies only. Since the study deals with understanding the competencies of particular roles which project

members play within the project, there is a probability that other cultural environments would provide different results. Another limitation of this study is that we have focused mostly on productivity (i.e., success of IT projects) only, while other aspects are neglected. Čehovin Zajc and Kohont (2017) emphasise that when managing human resources and the quality of the work process, two perspectives can be considered: a technical aspect, which focuses on productivity as well as the individual, the human aspect that focuses on the person and ensures that they are positively affected. Our study, therefore, presents the organisational perspective for researching the "human aspect", for example, how comfortable or satisfied the respondents are with their role in the IT project.

Future research should delve deeper into the specific competencies required for navigating the complexities of business software implementation projects, building upon the foundational framework established by Pejić Bach, Omazić, and Miloloža (2022). Investigating how project managers can leverage data analytics for risk management and fraud detection presents a pathway for further exploration, underscored by Pejić Bach et al.'s (2020) work on utilising data mining to detect internal fraud within project-based organisations. The importance of adaptive learning competencies that enable project teams to evolve and improve project outcomes over time has been highlighted by Terzieva and Morabito (2016), suggesting a need for research in this area.

Additionally, the critical role of evaluation competencies in determining project success, as focused on by Teixeira, Oliveira, and Varajão (2019), could inspire future studies on how project evaluation frameworks are developed and applied across different project types. With the advent of digital disruption, an exploration into the competencies required for managing projects in rapidly changing digital environments is suggested by Vukadinović and Fabac (2022), particularly in understanding how digital competencies intersect with traditional project management skills.

Lastly, the study by Ćirković, Čubrić, and Čubrić (2022) on project management tools for the fashion and apparel industry opens up an avenue for research into industry-specific project management competencies, investigating how these tools are selected and utilised. Future research should focus on the intersection of traditional project management competencies with digital, analytical, and evaluative skills to address the evolving landscape of project management, including a deeper examination of how competencies are developed, applied, and adapted across industries and project types to drive success in an increasingly complex and dynamic environment.

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