

Features of Forming a Successful IT Project Team and Method of Team Leader Choosing

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Abstract

Today, the IT sector remains one of the most developed and complex, competition is constantly growing, projects are becoming more complex and organizations that implement these projects are trying to succeed as much as possible. The project success depends on a large number of components. In this article considered how the effectiveness of the IT project team affects its success, studied where the impact on efficiency, which should pay special attention when forming a team. The work of many scientists is devoted to the formation of an effective project team. The issues of individual psychological participants qualities, their influence on team interaction and obtaining a positive effect from further work remain open for study. The main aspects of team work, signs of a successful team and key characteristics are highlighted in the work, the research model of project success dependence on quality of team work is presented. The process of team formation, which requires considerable attention and responsibility, is considered. During this process, there are many influencing factors, neglect of which will lead to a negative result. It is important to take into account the personal characteristics of each participant, to study psych types and to form a common psychological field. The choice of the project manager plays a significant role in the success of forming a coordinated team. It must be the best of the best - a high-level specialist, a leader who is able to work with a large number of people, feel the mood in the team, form and maintain team spirit. The method of selection of the best candidate for IT project managers is offered in the work. This methodology is based on the candidate's assessment on three components: the values it adheres to, the cost of its work and the risks associated with possible failure to perform their functions. The calculations based on the selected criteria allow you to accurately select the best candidate, the leader of an effective IT project team, on the way to the success of the whole project.

Keywords 1

Project team, efficiency, project success, method, project manager, team leader

1. Introduction

Today the IT industry market continues to develop rapidly. Requirements for the implementation of IT projects are high and constantly growing. There is a need for an integrated approach to project implementation and the creation of strong competitive advantages. The success of the project depends on the coordinated and effective work of all its participants, their cooperation and mutual assistance. The IT project team works with many project parameters - these are economic, social and organizational parameters, and must take into account their features. Factors of the external environment of the project - economic, political, cultural, legal, which operate in the area of the project itself also have an impact. Considering the work of the team in such an environment, we can say that still relevant is the development of approaches and methods of forming an effective project

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team, which would take into account environmental factors, individual characteristics of participants and aspects of inter-action between them.

2. Setting objectives and theoretical studies

The issue of research approaches to the formation of an effective project team and the impact of the relationship between the participants has been of concern to scientists for decades. In domestic science there are works devoted to the essence and role of factors of uniqueness of the project in team management of projects, which is based on taking into account the features of the product and the environment of the project; a special role is given to team development tools [1-8]. It is believed that the foundation of a team's success is not only the association of high-quality professionals, but also the development of team skills of image and communication, as well as team interactions.

Team building processes are closely linked to effective communication skills. World scientists pay attention to the study of the communication management process in the IT industry at the macro and micro levels to improve their efficiency [9].

It remains to open the question of the relationship between the team effectiveness and the individual psychological properties and characteristics of the participants interaction (relationship). Taking these factors into account will reduce some of the project risks and improve the benefits of the project organization.

The purpose of this work is to describe the peculiarity for forming the composition of the IT project team, taking into account the individual psychological characteristics and peculiarities of the participants interaction, which has made it possible to increase the efficiency of the team's work, as well as to offer recommendations on the selection the leader of such team.

For further research, considered the following aspects of the project team work:

1. As a result of the increase in the size of the team, satisfaction with the overall work of the team often decreases.
2. If the project manager is a strong leader, he can influence the cohesion of the team, increasing the number of interactions between participants. The leader controls these interactions, from himself available to interact. If such an atmosphere is formed in the team and the degree of recognition of the leader increases, then the overall satisfaction with the work of the team increases.
3. If the variation in the amount of intellectual capital in the team and the team of leaders decreases, then the customer's satisfaction with the result of the team's work decreases.
4. The increase in customer satisfaction with the team result is influenced by:
 - Growth in the value of intellectual capital;
 - Reduction of variation in the types and sizes of career and value orientation of the participants in the team.
 - Separation of action roles and analysis roles;
 - The predominance of the roles of analysis over social roles;
 - An increase in the number of participants fulfilling the role of an idea generator in comparison with those performing other roles in the team;
 - Growth in the size of the career and value orientation of the team members and the team of leaders.

Forming a team of IT specialists for high-quality project implementation is one of the strategic tasks on the way to ensuring maximum competitiveness of the domestic IT industry.

The very concept of a project team has changed and expanded today. The complexity and complexity of projects in modern organizations dictates the need to unite people with knowledge and skills, and experience in different fields, into a project team [10].

Let's consider the definition of a project team. The project team consists of people with defined roles and responsibilities for the implementation of the project, and who act together to achieve the goal of the project [11, 12]. Solving a problem within a team is called teamwork or teamwork [11].

The structure and characteristics of the project team may differ; however, the role of the project leader remains unchanged - the team leader responsible for managing the project, and the rest of the team members who carry out the work of the project, but do not necessarily participate in the

management. Project management team - members of the project team directly involved in managing its operations.

As the project progresses, the professional and size of its team may change [12].

If we are talking about an IT project team, then this is a team involved in the development of new software products and information systems of the organization. A software product development team is a team of people with technical knowledge and skills who actively interact and exchange information to ensure high-quality and fast delivery of the product being developed [13, 14].

IT project teams have the following attributes:

- The heterogeneity of the composition, including the diversity of roles, technical knowledge, skills and personal characteristics of the participants [14, 15];
- Coordination and synchronization, including awareness of the division of tasks within the team and the possibility of redistributing the load [16],
- The intensity of information exchange associated with the high rate of changes in the information environment [16];
- Integration and interaction, including the exchange of knowledge through the use of a single pool of data and information systems [14, 15];
- The important role of informal communication, which allows you to form a common circle of interests and develop a common style of communication [15, 16, 17].

The research was based on the hypothesis that the characteristics of the team shape the quality of the project product and project processes and affect the efficiency of the team and the success of the project. Below the Figure 1 shows the model for studying the dependence of project success on team performance, introductory factors, dependencies and results.



Figure 1: Research model of project success dependence on team work efficiency

3. Formation of an effective IT project team

In software development projects (IT teams), people (teams) are considered as a key factor in the success of the project [19, 20], which allows us to consider the success of the project and the success of the team as synonyms. In addition, the goal of a software development project is a product that coincides with the output of agile IT project teams. In this regard, for such projects, the parameters of the project results can be equated to the parameters of the command result [19, 20].

In this regard, the parameters of the team's result can be conditionally equated with the parameters of the project's result, especially for flexible teams of IT projects, in which the result of the team's activity is a product that determines the goal of the project.

The factors related to the team activities, which directly or indirectly affect the parameters of the results of the team's work and the success of the project, will be called the factors of the effectiveness of the team. The process of creating an effective team is complex, as it depends on many factors that

have a complex structure and change over time. The factors can be divided into two groups according to the principle of localization: organizational (factors located in the zone of influence of the team) and environmental factors (factors outside the zone of influence of the team) [12].

Organizational factors include:

- Factors of group interaction (behavior) - communication, coordination), cooperation, relations between participants, previous experience of interaction of participants;
- Social and psychological properties of a small group or properties of group processes (group dynamics) - cohesion, leadership, focus on mutual support, social identification and commitment;
- Factors of composition and structure - team abilities, team intellectual capital, team size, compatibility of individual characteristics of the participants.

Environmental factors include:

- Type of project environment
- Parameters of the organization's environment,
- Top management support.

The properties of group processes and factors of group interaction relate to the relationship of the team, and the factors of composition and structure mainly depend on the individual characteristics of the team members.

For new teams that are formed at the start of the project, there may not be enough information about the direct relationships between the participants, so it makes sense to consider primarily the compatibility of the team [13]. Compatibility is a factor of conformity, compatibility of one team member with others in terms of a number of parameters, under the influence of which the team is either strengthened or weakened.

The best use of individual and professional qualities of team members can be ensured through various mechanisms of psychological compatibility. The most important ones are the following:

1. The similarity and complementarity, the similarity of the characteristics of the team members, is used for teams that solve formalized repeatable tasks, for example, in operational activities (crews of ships, aircraft, conveyors);
2. Complementarity, diversity - complementarity, applicable for teams solving non-formalized atypical tasks, for example, in project activities (a team of designers and software developers);
3. The contrast of properties and qualities, complete diversity, leads to effective activity only when all team members have a pronounced striving for a common collective goal; rarely used.

3.1. Development process of the IT project team

Team building - actions for the selection of participants, optimization of the team structure and functional-role distribution [11]. The formation of a team is consonant with one of the stages of the formation of a team, and is an organized accompaniment of this stage [18]. The goal of the team building process is to build an effective team.

In general, team building is a complex process influenced by many factors. The success of team building depends on the parameters of the team, the behavior of the participants, as well as the effective work of the project manager in building the team in traditional IT projects.

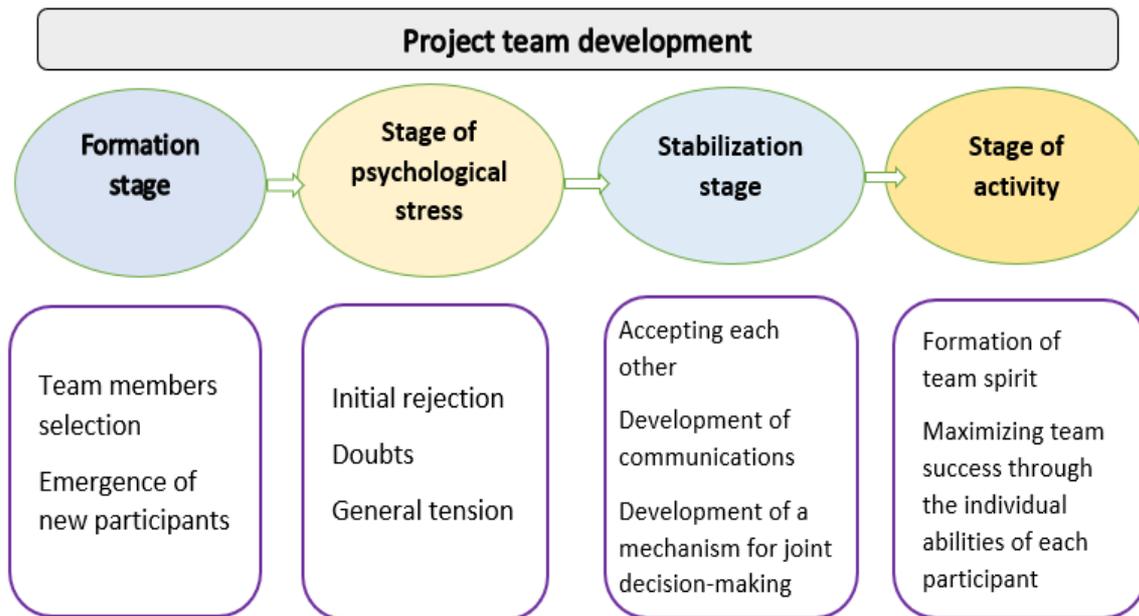


Figure 2. Project team development process

The successful work of the project team is influenced by both group interaction factors and individual influence factors. It is important to evaluate the possibility of building a team taking into account both sides of the impact. Individual factors are individual social experience and direction of personal development (career growth and values).

The properties of group processes include the most significant factors: team size (structure parameter), cohesion, leadership.

Can be argued that an IT Project Team is effective if:

1. The size of the team is the smallest possible with a full set of skills and available time for the required speed of work (from 3 to 10 people);
2. There is a high level of cohesion in the core of the team (leaders in terms of the number of connections), there may be a lack of connections with individual team members (outsourcing of insignificant work);
3. There is a high degree of recognition of the leader (more than half of the team members), the leader by recognition is a participant with the greatest intellectual capital in terms of contribution to the project;
4. The team of leaders all have a predominant focus on "themselves", team members - on "business", the minimum number of people with an orientation toward "communication";
5. The team leader has a high service orientation; the leadership team has a high skill orientation;
6. The team has a full set of roles (GI - generator of ideas, NA - analyst, CR - critic), there is a predominance of action roles over mental, and mental over social roles, a small number of GI and NA in comparison with other roles;
7. The intellectual capital of the team of leaders should be multi-level: a combination of one intellectual leader and several social leaders with less intellectual capital is preferable.

4. Method of selecting a candidate to IT project team leader

The project manager plays an important role in forming an effective IT project team. He must have a wide range of knowledge in the field of IT project management, know all stages of the project life cycle. However, the most important area of his activity is effective cooperation with a large number of people: team members and project stakeholders.

The project manager must understand people, evaluate and anticipate what can be expected of them in a given situation. Such knowledge helps him to find contact with team members and other project participants. Understanding people's psychology will allow the project manager to take the right position in negotiations, meetings, conflicts, as well as to take people in favor of the project with maximum effect.

The choice of a candidate for the project manager role is great importance and influence on the further success of the team and the project as a whole. You need to use effective tools for this.

The hierarchy analysis method will help to choose the candidate for the role of IT project team leader [23-38].

The first stage is a developing a hierarchical structure of the problem of choosing a candidate for the role of IT project team leader (Figure 3).

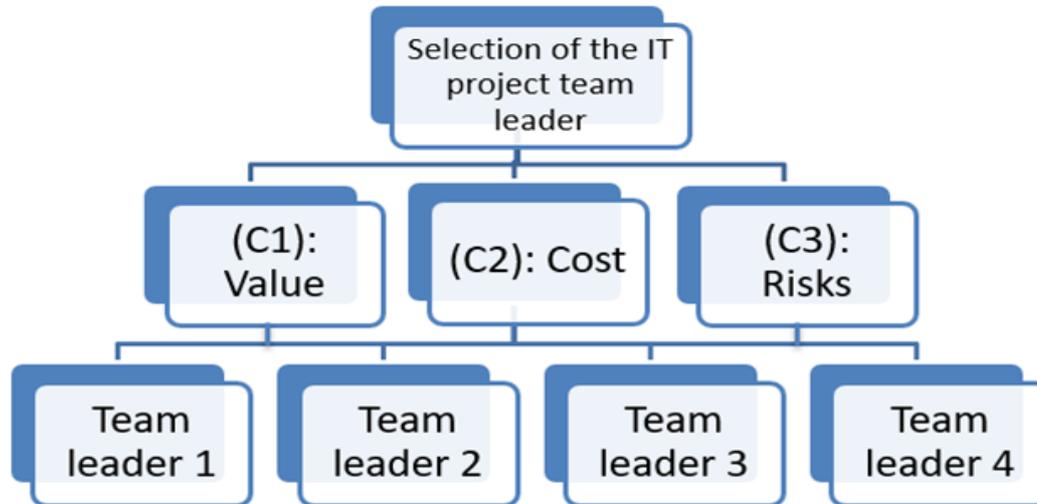


Figure 3. Hierarchical structure of the candidate's choice for the role of IT project team leader

The second stage is forming a matrix of pairwise comparisons for the elements of the first level of the hierarchy (criteria). Using a scale of relative weight of the criteria (Table 1) after interviewing an expert group to form a team of IT project, next step is to build a matrix of pairwise comparisons of the weight of the criteria (Table 2). The following characteristics are taken into account when selecting experts: competence in the field of IT project management, high level of communication, collective perception. Most of these characteristics are evaluated qualitatively, not quantitatively.

Table 1.

Scale of relative criteria weight

Intensity of relative weight	Definition
Unambiguous (accurate) assessment	
1	Equivalent weight
3	Moderate advantage
5	Average advantage
7	The advantage is above average
9	A significant advantage
Compromise cases (intermediate decisions between two adjacent assessments)	
2	Between equivalent weight and moderate advantage
4	Between moderate and medium advantage
6	Between the average advantage and the advantage above the average
8	Between the above-average advantage and the significant advantage
Inverse values	

1/k	Used to evaluate non-predominant elements
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Table 2.
Scale of relative criteria weight

Criteria	Value (C1)	Cost (C2)	Risks (C3)
Value (C1)	1	2	6
Cost (C2)	1/2	1	4
Risks (C3)	1/6	1/4	1

Next, calculate the basic parameters of the matrix by formulas. Calculation of the main eigenvector of the vector $x = \{x_1, x_2, x_3, \dots, x_n\}$ positive square matrix $A = \{a_{ij}\}$ implemented on the basis of the definition of equality: $Ax = \lambda_{max}x$, where λ_{max} - the maximum eigenvalue of the matrix A.

The components of the eigenvector of local priorities are calculated by the formulas:

$$\bar{x}_i = \sqrt[n]{\prod_{j=1}^n a_{ij}}, \quad i = \overline{1, n} \quad (1)$$

Where a_{ij} - i element of the j -column of pairwise comparisons matrix of criteria;
 n - is the number of criteria,

$$p_i = \frac{\bar{x}_i}{\sum_{i=1}^n \bar{x}_i}, \quad i = \overline{1, n} \quad (2)$$

The calculation of the main eigenvector of the criterion local priorities is presented in Table 3.

Table 3.
The calculation of the main eigenvector of the criteria local priorities

Criterion	C1	C2	C3	Eigenvector components of local priorities	Local priorities
C1	1	2	6	$x_1 = \sqrt[3]{1 \cdot 2 \cdot 6} = 2,289$	$p_1 = 0,588$
C2	1/2	1	4	$x_2 = \sqrt[3]{\frac{1}{2} \cdot 1 \cdot 4} = 1,26$	$p_2 = 0,323$
C3	1/6	1/4	1	$x_3 = \sqrt[3]{\frac{1}{6} \cdot \frac{1}{4} \cdot 1} = 0,347$	$p_3 = 0,089$
				$\sum_{i=1}^3 x_i + x_2 + x_3 = 3,896$	

Next, determine the consistency of local priorities:

a) the maximum eigenvalue of the matrix λ_{max} :

$$\lambda_{max} \approx \sum_{j=1}^n p_j \left(\sum_{i=1}^n a_{ij} \right) \quad (3)$$

$$\lambda_{max} = 0,588 \cdot 1,667 + 0,323 \cdot 3,25 + 0,089 \cdot 11 = 3,01$$

b) estimates of the relative importance of the elements being compared must be consistent, so determine the index (CI) and the ratio (CR) of consistency:

$$CI = \frac{\lambda_{max} - n}{n - 1} = 0,004 \qquad CR = \frac{CI}{N} = 0,003, \qquad (4)$$

were N – the number of random agreements.

At the third stage forms matrices of pairwise comparisons of alternatives on each criterion (Tables 4-6).

Table 4
Matrix of pairwise comparisons for alternatives by the criterion "Value"

Value	Team leader				Vector of priorities
	CC1	CC2	CC3	CC4	
CC1	1	2	5	6	0,673
CC2	1/2	1	4	5	0,43
CC3	1/5	1/4	1	2	0,136
CC4	1/6	1/5	1/2	1	0,087

In accordance $\lambda_{max} = 5,39, CI = 0,46, CR = 0,51$

Table 5
Matrix of pairwise comparisons for alternatives by the criterion "Cost"

Cost	Team leader				Vector of priorities
	CC1	CC1	CC1	CC1	
CC1	1	1/6	1/8	1/9	0,0352
CC2	6	1	1/4	1/5	0,1265
CC3	8	4	1	2	0,4835
CC4	9	5	1/2	1	0,363

In accordance $\lambda_{max} = 4,24, CI = 0,08, CR = 0,09$

Table 6
Matrix of pairwise comparisons for alternatives by the criterion "Risks"

Risks	Team leader				Vector of priorities
	CC1	CC1	CC1	CC1	
CC1	1	1/3	1/7	1/8	0,048
CC2	3	1	1/2	1/5	0,1276
CC3	7	2	1	1/3	0,2535
CC4	8	5	3	1	0,571

In accordance $\lambda_{max} = 4,18, CI = 0,06, CR = 0,07$

The vector of global priorities of alternatives was calculated. For this purpose, from vectors of local priorities of alternatives on each criterion will be made a matrix.

$$P^A = \begin{pmatrix} 0,673 & 0,0352 & 0,048 \\ 0,43 & 0,1265 & 0,1276 \\ 0,136 & 0,4835 & 0,2535 \\ 0,087 & 0,363 & 0,571 \end{pmatrix},$$

Next, calculate using the formula:

$$\vec{p}_a = P^A \cdot \vec{p}^K \quad (5)$$

Therefore, the vector of global priorities is equal to:

$$\vec{p}^K = (0,588; 0,323; 0,089)^T$$

$$\vec{p}_g = \begin{pmatrix} 0,673 & 0,0352 & 0,048 \\ 0,43 & 0,1265 & 0,1276 \\ 0,136 & 0,4835 & 0,2535 \\ 0,087 & 0,363 & 0,571 \end{pmatrix} \cdot \begin{pmatrix} 0,588 \\ 0,323 \\ 0,089 \end{pmatrix} = \begin{pmatrix} 0,4114 \\ 0,305 \\ 0,2587 \\ 0,2192 \end{pmatrix}$$

Based on the obtained priority values, choosing the alternative CC1, because the maximum component of the vector of global priorities corresponds to the first alternative.

And although the criteria for selecting a candidate for the role of team leader of the IT project are demanding, using MAH (this technique), it is possible to choose the leader who will succeed in the project.

5. Conclusions

The article considers the current problem of decision-making on the selection of a candidate for the role of IT project team leader in the conditions of multi-purpose and multi-criteria uncertainties. With the help of MAH (Saati method) the optimal candidate was selected from the proposed ones, criteria were determined that are important for the investor (customer). This technique can be used in the educational process in the form of laboratory and term papers, in theses and directly in production in IT project management, when it is necessary to choose the optimal candidate for the role of IT project team leader, guided by specific requirements of the investor (customer).

Thus, working on existing knowledge and practices for the formation of an effective IT project management team, it can be concluded that the success of the entire project directly depends on the effectiveness of the team.

When choosing a new team member, it is necessary not only to evaluate his experience, knowledge, practical skills, but also to take into account how he fits the existing team, how it complements the individual characteristics of the whole team. If it is considered the process of team building from the point of view of individual psychological and personal characteristics, it is necessary to set up remote team work, which in modern conditions will be effective and safe. The team leader must select new members so that they complement the roles of the team, correspond to the psychological types of other members, have common values. It is equally important to choose the right leader for the team.

The article proposes a method of selecting candidates for the role of project manager, based on the method of hierarchy analysis. This method allows to determine the satisfaction of the candidate requirements for the position and choose the best manager and leader for the project team.

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