

Portfolio project management

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Abstract

The project resource portfolio includes various types of resources, such as financial, human, technical, and others. It is important to determine exactly what resources are available for use by a team or an organization. Definition of the resource portfolio is the process of identifying, evaluating, and managing disparate resources that are available for use within an organization or a team. It will be considered only the aspect of portfolio management of human resources used to achieve strategic goals and objectives.

Keywords

project resource portfolio, portfolio management, human resources

1. Introduction

At the team selection stage, it is important to select people with the appropriate competencies and skills, taking into account not only technical skills, but also interpersonal qualities, the ability to cooperate and openness to learning. The selection of team members is an important stage in the process of team formation. The effectiveness of team work and achievement of set goals depends on the correct selection of team members. Considering the analysis of the needs and tasks of the team, a detailed profile of each team member is created.

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1.1. State of problem research

Forming effective teams for the implementation of IT projects requires a balanced approach, considering the needs of the project and interaction between participants. The team must have the necessary competencies, experience, and ability to cooperate to achieve success in the project implementation.

A role-oriented approach to the formation of teams for the implementation of IT projects has received considerable attention and research in the field of project management. Some works include concepts and practices aimed at effectively organizing roles and responsibilities in a team. There are some of these developments.

Belbin [1] developed a role matrix that identifies several key roles necessary for an effective team. These roles include a coordinator, a sponsor, an idea generator, an implementer, a resource explorer, etc. Belbin's matrix provides an idea of typical roles that can be performed by different people and can be used for a more rational distribution of roles in the team.

Role analysis [2] allows you to analyze the needs of the project in detail and determine the necessary roles in the team. This analysis may include identifying key tasks, defining competencies and responsibilities for each role, and defining relationships and communications between roles.

Portfolio management of teams' organizational resources is a strategic approach to managing heterogeneous resources used to achieve team or organizational goals. This approach makes it possible to better ensure the use of resources and ensure an optimal balance between different projects and tasks.

These developments help organizations implement a role-oriented approach to team building for IT projects. They make it possible to define roles, distribute responsibilities and ensure interaction between team members, which contributes to achieving better results in the project [3-4] more effectively.

2. Portfolio management of team human resources

Portfolio management of organizational resources of teams has many advantages that contribute to the effective use of resources and the achievement of strategic goals of the organization (Fig. 1). There are some of them:

1. Optimal distribution of resources. Portfolio management allows for the rational distribution of limited resources (budget, human resources, equipment) between various projects and initiatives. This helps to avoid overloads and ensure optimal performance of tasks [5].

2. Prioritization of tasks. Portfolio management helps identify the most important and most effective projects and tasks that have the greatest contribution to achieving strategic goals. This allows you to perform priority tasks first.

3. Joint strategic focus. Portfolio management helps ensure the common focus of the entire team or organization on achieving common strategic goals. All projects and tasks reflect a common strategy.

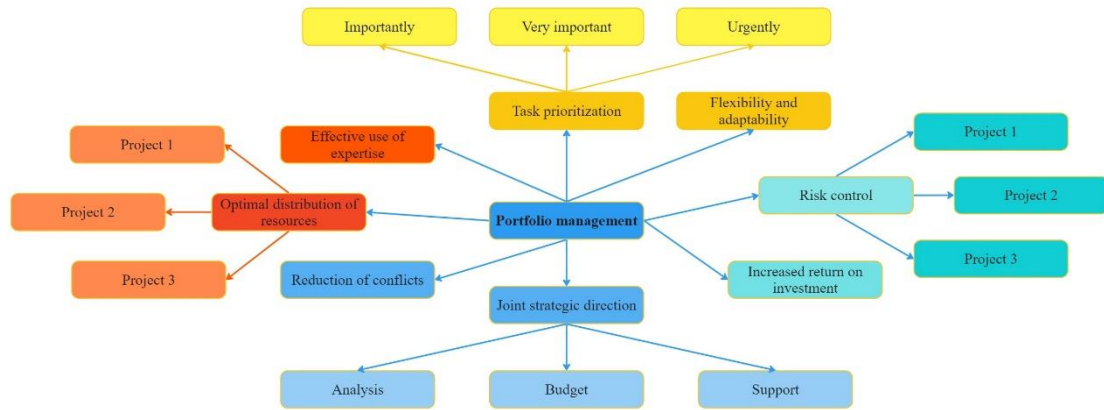


Figure 1: Portfolio management as a tool for successful project implementation.

4. Risk control. Portfolio management methods help to identify and manage risks at the portfolio and individual project level. This helps to reduce possible negative consequences and increase the chances of successful completion.

5. Increasing return on investment. Portfolio management helps identify projects and initiatives that have the greatest potential to contribute to the organization's value. This helps ensure a return on investment in project development and implementation.

6. Flexibility and adaptation. Portfolio management provides an opportunity to adapt to changes in the environment, change priorities and resources in accordance with new conditions, which allows the organization to be more flexible.

7. Effective use of expertise. The use of portfolio management methods helps to consider expert evaluations and opinions of various specialists when solving issues of resource allocation and project implementation.

8. Reduction of conflicts. Structured portfolio management allows you to avoid conflicts through a clear definition of priorities, allocation of resources and justification of decisions.

In general, portfolio management helps organizations achieve better results by ensuring efficient use of resources, prioritization of tasks, and solving strategic tasks [6]. This approach helps reduce the duplication of resources and efforts in different projects, the effective distribution of human resources to achieve the organization's strategic goals, and the provision of greater visibility and control over all aspects of activity by an active leader [7].

Portfolio management of organizational resources of teams is a powerful tool for ensuring successful implementation of projects and achievement of strategic goals. It helps organizations to optimize the use of their resources, avoid overloads and ensure effective coordination between different initiatives [8].

The management of human resources in the team includes a number of processes and tasks aimed at the effective use of the potential of team members, providing the team with the necessary resources, attracting and developing employees. The procedure for managing human resources in a team can be represented by a tuple:

$$hr_procedure = \{P, R, N, T, K, O, S, ZT, PK, M, V\} \quad (1)$$

where:

P - determining team needs is the first and most important stage of human resource management. This process includes an analysis to identify the needs and resources of the team to achieve its goals. As a result of determining the needs of the team, a basis is formed for further management of human resources and development of the team, taking into account specific requirements and circumstances;

R - recruiting and selection of candidates is an important stage of team formation;

N - assessment of skills and experience of candidates is a key stage in the recruiting process. The assessment of skills and experience ensures that the selected candidates meet the needs of the team and can successfully perform the tasks assigned to them;

T - team training and development can include various actions and initiatives to improve the skills, knowledge and effectiveness of the team;

K - conflict management is a complex and important process for ensuring the harmonious work of the team and achieving common goals;

O - evaluation and reporting of work results is an important part of team management;

S - stimulation and motivation of team players is a key aspect of successful management;

ZT - talent retention is an important aspect of human resource management in the team;

PK - career and development planning in the team is an important process that allows employees to understand their career goals and ways to achieve them;

M - monitoring employee satisfaction is an important aspect of team management, which involves constant analysis of employee moods;

V - solving problems and challenges in a team is a process that involves the formation of strategies and the identification of responsible persons.

It will be analyzed each component tuple in more detail, since the work of the recommendation system is based on the portfolio approach to human resources management. Determining the needs of the team includes several steps that can be included in this phase:

Step 1. Analysis of team goals. It consists of a thorough review of the team's goals and objectives. This may include defining strategic and tactical objectives, as well as the main tasks that need to be completed to achieve them.

Step 2. Assessment of current resources. There is an analysis of available resources of the team, such as human, financial, technical and others. This includes an expert assessment of the skills, experience, knowledge, and capabilities of team members.

Step 3. Determination of unjustified gaps. Identifying areas where there are unjustified gaps or the need for additional resources. This may be due to the lack of certain skills in the team or limited financial resources.

Step 4. Forecasting future needs. Reviewing prospects for team development and determining future needs in skills, resources, and other aspects.

Step 5. Consultations with team members. It is important to consider the opinions and feedback of team members regarding their needs and expectations. This may include individual conversations, surveys, or group meetings.

Step 6. Creation of a resource management strategy. There is a development of a resource management plan based on identified needs. This may include staff development plan, financial strategies, and other aspects.

Recruitment and selection of candidates takes place according to the following method:

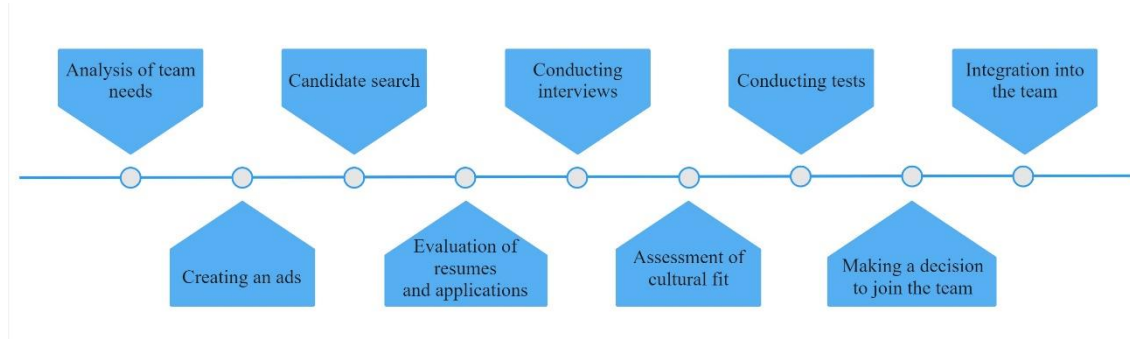


Figure 2: Recruitment process.

1. *Analysis of team needs.* Determining the specific needs of the team in new members. This may include analyzing gaps in the skills needed to complete the team's tasks.

2. *Creating an ad.* Developing an advertisement that clearly defines the requirements for candidates, describing the role, responsibilities, requirements, and expectations of potential team members.

3. *Candidate search.* Using various sources to attract potential candidates, such as recruitment agencies, online platforms, social networks, internal referrals, etc.

4. *Evaluation of resumes and applications.* Review resumes and applications from candidates to select those who meet the job requirements and criteria.

5. *Conducting interviews.* It is to arrange interviews with selected candidates to assess their skills, experience, motivation, and interaction with the team.

6. *Assessment of cultural compatibility.* There is consideration of the candidate's cultural compatibility with the corporate culture and team values.

7. *Conducting tests.* It is to use tests or practical exercises to assess the candidate's specific skills and abilities that are important for teamwork.

8. *Making a decision to join the team.* It includes decision-making on selection and job offers to the best candidates.

9. *Integration into the team.* Carrying out the integration process for a new team member, including familiarization with the team culture, with colleagues and other aspects.

This process facilitates the selection of qualified and motivated candidates who meet the needs of the team and contribute to the achievement of its goals.

Candidates' skills and experience are evaluated according to the following algorithm (Fig. 3):

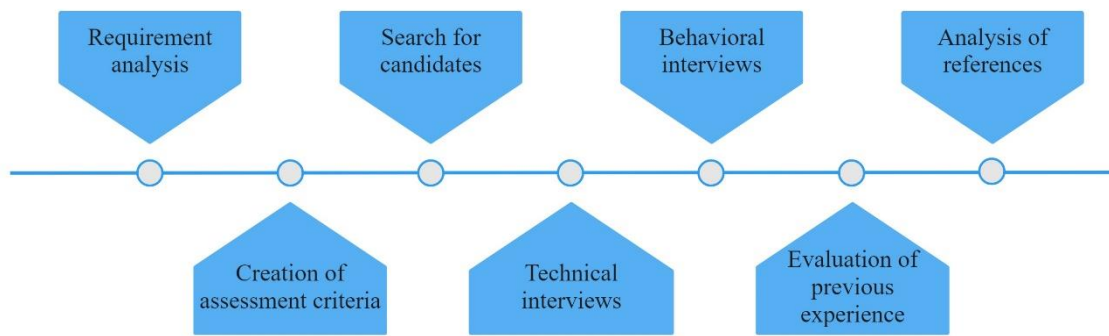


Figure 3: Assessment of candidates' skills and experience.

1. *Analysis of requirements.* A clear definition of the skills and experience that are necessary for the successful performance of work duties in a team. This can include technical skills, soft skills, education, and previous work experience.

2. *Creation of assessment criteria.* Development of specific criteria by which the skills and experience of candidates will be evaluated. This can be an ability to solve problems, previous experience in similar projects, the ability to work in a team, etc.

3. *Collection of information.* Obtaining information about the skills and experience of candidates. This may include review of resumes, portfolios, references, and placement tests or assignments.

4. *Technical interviews.* It is to conduct technical interviews or tests to test the specific technical skills required to perform the job.

5. *Behavioral interviews.* Conducting interviews that assess soft skills such as communication, collaboration, leadership, and problem solving.

6. *Evaluation of previous experience.* There is an analysis of the candidate's previous work achievements, their role in previous projects, success, and contribution to previous organizations.

7. *Analysis of references.* References from previous employers or colleagues to obtain additional information about the candidate's experience and professional qualities are necessary.

Training and development of the team takes place considering the needs of the team, determining the areas in which it is necessary to improve skills or acquire new ones.

The following elements of the tuple contribute to the establishment of teamwork and characterize the soft skills of team members. It will be provided only brief information about them.

Conflict management involves several steps, including determining the cause of the conflict, a common goal or interests that can unite team members, and determining a conflict resolution strategy.

Evaluation of work and reporting involves a regular review of the team's performance based on the established criteria, development of a plan for further actions to achieve strategic goals aimed at improvement and development.

Stimulating and motivating team players requires a clear understanding by team members that the contribution of each team member affects the overall success, their importance to the success of the team.

These approaches can be combined depending on the characteristics of the team and its tasks. The individual adaptation of motivation strategies to the needs and characteristics of each team member is the key one.

Talent retention encompasses strategies and practices aimed at retaining and developing the most valuable employees, creating a stimulating work environment, and providing opportunities for learning and development.

Career planning and team development involves defining specific goals that the employee wants to achieve, creating opportunities for growth within the team.

Monitoring employee satisfaction helps identify key issues or positive aspects that affect employee satisfaction [9].

Solving problems and challenges in a team requires identifying the problem, analyzing the causes, formulating a strategy for solving and preventing problems.

3. Requirements for the recommendation system for selecting the project team

The implementation of the project's human resources management procedure requires the development of a recommendation system with the following requirements for it. Based on the analysis of approaches to forming teams for IT projects, it can be formulated the primary requirements for a recommendation system for selecting a project team:

Collection of information about relevant specialists. The system must find capable and qualified specialists to participate in the project in accordance with the requirements and specifics of the project.

Analysis of skills and experience. The system should assess the skills, experience and competencies of potential team members and recommend individuals with the appropriate skills.

Considering the specifics of the project. The system should take into account the specific requirements and specifics of the project, such as technologies, industry, programming languages, etc.

Consideration of roles. The system should allow you to define roles in the team, such as a developer, a tester, a designer, a project manager, etc.

Assessment of individual and team skills. The system can assess both individual and team skills of potential team members [10-11].

Compatibility analysis. Considering compatibility between team members is an important aspect for successful project execution.

User interface. The system should have an intuitive and convenient interface for users who select a team.

Data protection. Ensuring security and confidentiality of information about specialists and projects is a critical aspect.

Analytics and reporting. The system should provide analytical tools for evaluating and tracking the effectiveness of team selection.

Scalability. The system should be able to work with both small and large teams and projects.

Integration. There is an ability to integrate with other systems, such as project management tools or personnel systems.

Support. There is an availability of technical support and updates for the system.

User training. It is provision of training materials and support for system users.

Secondary requirements for the project team selection system may include the following aspects:

Languages and geographic requirements. It is about ability to select specialists with specific programming languages or regions if this is important for the project.

Ways of communication. There is support of different ways of communication between team members, such as chat, video conferencing, etc.

Flexible filters. An ability is to configure various filters for accurate selection of specialists.

Graphic display of data. Visualization of information for user convenience, such as graphs and charts.

Ability to view portfolio. Displaying the portfolio of specialists' works to evaluate their previous work.

Support for mobile devices. It is to ensure the system work on different types of mobile devices and tablets.

Analysis of the history of choice. Retention of history of previous selections for analysis and improvement of recommendations.

Support for managing profiles. An ability for users is to change and update their profiles.

Support reports. Team selection and performance reports are for analytics and system improvement.

Support for ads and notifications. The ability of users is to receive notifications and announcements about possible elections or changes in the team.

These secondary requirements can be additional functions that improve the ease of use of the system and provide additional functionality to users.

The following methods and tools can be used to compare the requirements for the role in the team and the applicant's competencies:

Comparison matrices. Creating a matrix where one column lists the role requirements, and the other one contains the applicant's competencies. Determining the correspondence between them using grades or symbols.

SWOT analysis. It is to identify the candidate's strengths and weaknesses in relation to the role requirements, as well as opportunities and threats. Comparison of the obtained data is with the characteristics of the role in the team.

Rating scales. Creation of scales is to assess the level of compliance of the applicant's competencies with the requirements for the role. Use of numerical values or categories (for example, fully meets, partially meets, does not meet).

An assessment using competency models helps identify key skills and characteristics for a specific role. A comparison of the applicant's abilities with these models is present.

It is important to consider the specifics of the role and business context to determine which aspects are most critical. Combining different methods will help create a complete and objective image of compliance.

4. Comparison of requirements and role in the team to applicant's competencies

All the methods and tools listed above can be used to compare the requirements for the role in the team and the applicant's competencies.

Let's consider an example of using a comparison matrix to assess the compliance of the applicant's competencies with the requirements for the role in the team.

There is a role "Project Manager" and we have requirements for that role as:

- Leadership skills
- Organizational abilities
- Technical experience
- Communicability

Each leader has their own personal characteristics, influence, other attributes, etc. They make decisions based on their properties and interact with other agents.

The dynamics of interaction between leaders and team members is presented with the help of visualization (Fig. 4).

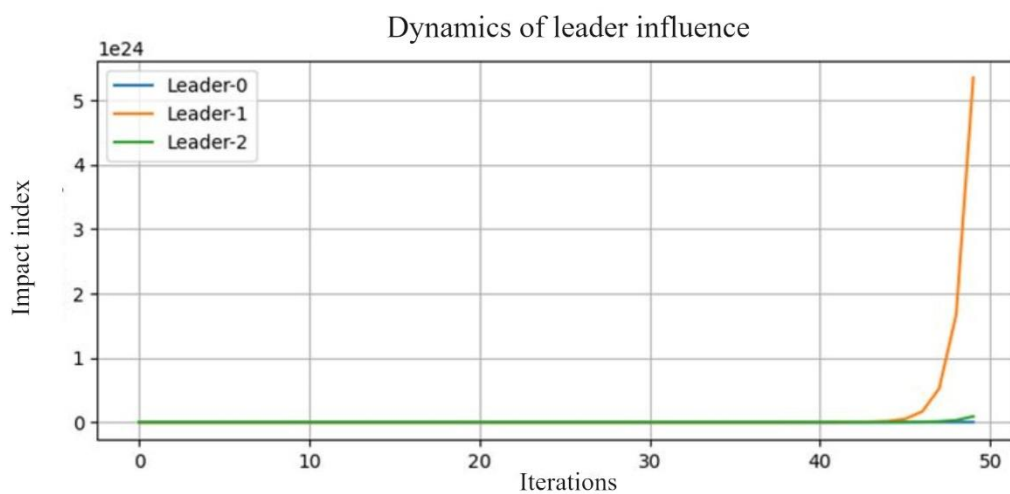


Figure 4: The dynamics of the leader's influence.

We will now create a comparison matrix where the rows represent the requirements, and the columns represent the applicant's competencies. In this example, a score from 1 to 5 indicates the extent to which the applicant possesses a certain competence in the context of the specified requirements. For example, if leadership skills are key for the role of Project Manager, then the applicant in this example has a high level of leadership skills (score 5).

Competency models are used to assess and develop employee competencies. There is the evaluation algorithm using competency models:

1. Definition of competencies. First, you need to determine the necessary competencies for a specific role or a position. This can include technical skills, interpersonal skills, leadership qualities and other aspects.

2. Creation of a competency model. Development of a clear competency model that identifies each competency and describes how it relates to job performance.

3. Assessment of competencies. Application of tools for assessing employee competencies.

4. Collection of reasonable data. Provision of reasonable data on the level of competencies. This may include regular evaluations, studying the history of participation in previous projects.

This approach helps not only to assess the competencies of employees. Let's consider an example of creating a competency model for the role "Project Manager" by first defining the competencies.

Leadership. There is an ability to manage and motivate a team, make strategic decisions.

Communications. Effective communication with various stakeholders, writing reports and presentations.

Organizational skills. There is an ability to effectively plan and solve tasks, resource management.

Technical knowledge. Understanding of basic project management methodologies, and use of planning tools.

Next, we proceed to the creation of a competency model:

Leadership.

Level 1. Ability to motivate a team.

Level 2. Ability to make decisions during crisis situations.

Communications.

Level 1. Effective communication within the team.

Level 2. Ability to present the project to clients.

Organizational skills.

Level 1. Ability to plan daily tasks.

Level 2. High-risk project management.

Technical knowledge.

Level 1. Knowledge of basic project management tools.

Level 2. Experience using a specific methodology (such as Scrum or Kanban).

Competency assessment takes place using a rating system (for example, a scale from 1 to 5) to evaluate employees for each competency. This example is general and can be adapted depending on the specific requirements and characteristics of the organization.

It is analyzed the model of an effective team:

$$UR = \{FK, OP, B, R, K\} \tag{2}$$

FK is team building, which involves choosing and placing the right people in the right positions in the team. It is important to consider the skills, experience, and characteristics of each team member. This procedure is a critical task of human resource management.

The management of human resources in a team varies depending on the size of the team, its purpose and industry. Effective management of human resources in the team helps to achieve the desired results and ensures high productivity of the team.

OP is evaluation of needs and priorities, which involves determining the current and prospective needs of the team or projects included in the portfolio, setting priorities for the use of resources to achieve strategic goals. An assessment of needs and priorities is an important step in the portfolio management of organizational resources of teams. This process helps determine which tasks, projects, or initiatives have the highest priority and which resources should be allocated to accomplish them.

B is the balance, the provision of which between different types of resources and projects allows you to avoid overloading or lack of resources. This process involves the rational allocation of resources between different projects, tasks, or initiatives to achieve optimal results and ensure efficient use of resources. Creating balance in portfolio management is an important step to ensure the efficiency and success of projects and tasks. It allows optimal use of resources and achievement of strategic goals of an organization or a team.

R is definition of roles and responsibilities of participants in the portfolio management process. It is clearly defined who should make decisions, who should be responsible for completing tasks, who should provide information, etc.

K is ensuring open communication for timely exchange of information between all participants, considering different communication channels, such as face-to-face meeting, e-mail, video conferencing, etc. Effective interaction and communication ensure team cohesion, reduce the risk of misunderstanding, and help achieve common strategic goals of resource management.

5. Conclusions

The expediency of using portfolio management of team human resources is analyzed, and it is determined which aspects of such management can be implemented using a recommendation system.

It is proposed to use the method of hierarchy analysis and expert evaluation to build a hierarchy of candidates for the team.

A conceptual model of the human resources management procedure in the team is proposed, which is the basis of the developed recommendation system. The features of each component of the model are determined.

Based on the analysis of approaches to forming teams for IT projects, the primary and secondary requirements for the recommendation system for selecting a project team were formulated.

The means of building a recommender system, its functionality and advantages are substantiated as well.

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