Management of process control in innovative projects

Chapter 8
Formation of a team of executors of the innovative project

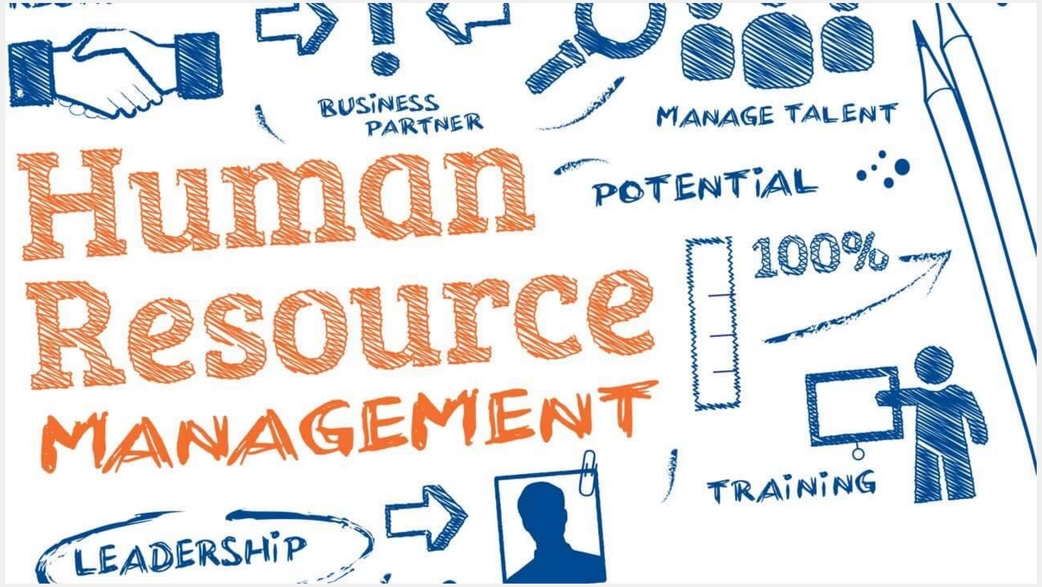
Lecturer: doc. Polishchuk Volodymyr, DrSc.

Lecture content

- Human resource management processes of the innovation project
- Organizational culture of projects
- Formation of an innovation project team
- Project team management processes
- Fuzzy model of forming a team of developers of innovative projects

01

Human resource management processes of the innovation project



In the general case, the human resources of the project are a set of professional, business, personal qualities of the project participants and their capabilities that can be used in the project. Human resources are part of the resources considered as a measurable resource in the project. Personnel are designated qualified specialists to perform the functional and job responsibilities described in the project staffing schedule.

Definition 1. Human resource management of the project includes the processes of organization, management, and leadership of the project team.

The following human resource management processes of the project are distinguished:

1. Human resource management planning - the process of identifying and documenting the roles, responsibilities, and skills of the team to implement an innovative project.
2. Project team recruitment - the process of confirming the availability of human resources and recruiting the team needed to complete project tasks.
3. Project team development - the process of improving the competence, interaction of project team members and general working conditions of the team in order to increase the efficiency of the project.
4. Project team management - the process of monitoring the activities of team members, providing feedback, problem-solving and change management, aimed at optimizing the implementation of project work.

The **main purpose** of project developer management is to ensure:

- appropriate behavior of each member of the project team, which is necessary to achieve organizational goals in particular and the successful implementation of the project in general;
- creation of a project team capable of the best possible (in terms of quality, time, and costs) project implementation.

The main areas of project management in projects are:

- project manager leadership;
- development of team and group work;
- motivation of individuals and groups;
- conflict management.

Definition 2. Project Manager - A manager who holds a permanent position in the project team and is empowered to make decisions about project activities.

Leadership is the ability to influence individuals and groups by directing their efforts to achieve goals; it is the ability to mobilize the potential psychological needs of followers (subordinates) and rely on them in times of acute rivalry or conflict.

If the team starts with the leader, then team management - with his knowledge and skills to organize the work of the team.

For example, according to a survey of 20,000 senior and middle managers in the United States, among the top ten qualities of a leader were: ethics; ability to work in a team; honesty; curiosity about everything; diligence; mind; purposefulness. In total, American businessmen named 26 qualities that are needed by senior management, including "intuition" and "luck".

The leadership of the project manager is manifested in the fact that he gives tasks to team members and gives them authority within the tasks in order to perform them. Team members assume these powers and responsibilities for the work.

Through empowerment - **delegation** - the project manager can:

- improve the efficiency of the project team;
- develop the abilities of employees;
- promote the growth of the company.

Definition 3. Delegation is the transfer of authority, responsibility, control over the levers of power to his subordinate.

The willingness of the head to delegate is determined by the following factors: self-confidence; trust in the subordinate; readiness to transfer power; availability of an effective control system; team's ability to delegate.

The delegation has three main elements:

1. definition of functions, obligations, or tasks of the subordinate;
2. the correct distribution of powers so that the executor can dispose of the necessary resources to perform the task;
3. receiving from the employee a commitment to perform the task at the appropriate level.

However, practice shows that project managers do not use delegation very widely. They try to take on more work and lose the opportunity to use the initiative of subordinates.

Leadership becomes a challenge in project management, as projects bring together professionals, sometimes from different fields, for a limited period of time to accomplish a specific task (achieve a goal).

The leader must help meet the needs of tasks (define and achieve goals); team needs (build and coordinate team activities); individual needs (meet the needs of team members).

- Task needs: the team must complete the project, and the manager must lead it to this goal, direct it to the implementation of the project work.
- Team needs: the team needs to be united so that it works as a whole and not as separate parts, then the results will be much better. Conflicts and misunderstandings that inevitably need to be resolved effectively.
- Individual needs. The leader should explain to everyone his role in the project, to give everyone an understanding of how he performs his tasks, how he sees his potential, thus contributing to the development of his team members.

If the manager focuses only on the task, the return of the team may be less than its potential. If a leader directs all his activities to creating a team, he can be credited with never carrying out a project on time.

There are three main criteria that an effective project manager must meet: leadership traits; use of different leadership styles; use of situational approach: adapt your style to the circumstances.

Traits most important for project managers: ability to solve problems, focus on results; energy, initiative, responsibility; self-confidence; perspective, strategic thinking; sociability; ability to negotiate.

02

Organizational culture of projects

"Organizational culture" is a set of values, principles, norms, rules of the organization, which are shared by the majority of employees and in some way affect the nature of the goals of the organization in which the project is developed.

In a general sense, the concept of "organizational culture" includes three main elements:

- The first is the basic principles that members of the organization adhere to in their behavior and actions.
- The second is the values (or value orientations) that an individual can adhere to in the process of making decisions and following actions.
- The third is the "symbolism" through which value orientations are "transmitted" to members of the organization.

The following components are distinguished in corporate culture:

1. The culture of working conditions is a set of objective conditions and subjective factors that impact human behavior in the process of its activities;
2. The culture of means of labor and labor process characterizes such elements as the introduction of innovations in production, the level of automation, quality of equipment and tools, level of logistics, quality of products, use of modern methods of work, evaluation of its results, discipline;

3. The culture of interpersonal relations (communications) in the workforce determines the sociopsychological climate, the presence of a sense of collectivism or mutual assistance, the perception of all employees of values, norms, and rules of conduct of the organization;
4. Management culture determines management methods. Leadership style, individual approach, perception of staff as the main element of maintaining the image of the organization, professionalism of managers, methods of stimulating the level of job satisfaction;
5. The culture of the employee is determined by the level of education, qualifications of the employee, his attitude to work, discipline and performance of duties.

The **main components** of organizational culture today are: management culture, production culture, external relations culture, business culture, environmental culture, shareholder relations culture.

The **main functions** to be performed by organizational culture should include the following:

- reproduction of the best elements of the accumulated culture, introduction of new values and their accumulation;
- evaluation and regulatory function;
- regulatory and regulatory function of culture, this is the use of culture as an indicator and regulator of behavior;
- cognitive function;

- semantic load (the influence of organizational culture on the human worldview);
- communication function - through the values accepted in the organization, norms of behavior and other elements of culture mutual understanding of workers and their interaction, function of preservation and accumulation of experience of the organization is provided;
- reactive function - the restoration of spiritual forces in the process of perception of elements of cultural activities of the organization is possible only in the case of high moral potential of organizational culture and the attitude of the employee to it and the division of its values.

Today there are three main areas of work with staff that contribute to the development and strengthening of organizational culture.

The first is to develop a unified external style of employees of the organization. This means, for example, that all employees must come to work in the same clothes, according to corporate criteria.

The second direction is the development of a Code of Conduct for the employee of the project, in the context of friendly and encouraging. The Code should motivate the executors to comply with the norms and rules of conduct adopted in the organization of the project entity.

The third direction of development of organizational culture is joint trainings of management with employees of all levels. Such trainings not only provide staff with factual information (for example, "How to make effective decisions", "Development of creative thinking", "Organization of working time", etc.), but also help to create a "team" in the organization, demonstrate common problems of managers and staff.

In Europe and the United States, there are the following types of organizational culture:

1. Feudal culture of the organization

It is based on emphasizing the difference between senior management and other project developers. Analogue of the traditional wage system. The administration in this case strictly controls the activity of employees, the provision of ownership is a kind of means of payment. Characteristic features are the underdevelopment of partnerships between staff and administration, the size of the share of ownership of employees is determined by the interests of project management.

2. "Investment" culture of the organization

The essence of this culture is that the company's management seeks to issue a significant share of staff salaries in the form of shares and proclaims the philosophy of "risky" rewards, this is when the salary is set depending on economic performance or successful implementation of the project.

3. "Culture of participation"

This organizational culture is based on the active involvement of employees in personnel management, with the simultaneous participation of employees in the property. In this case, the shareholder rights of employees are identified with their official duties, and the participation of employees in the investment activities of the company is a logical and practical way to recognize their shareholder rights. Real participation in management contributes to the awareness and responsibility of staff and meets their interests as shareholders.

4. "Joint-stock" organizational culture

The main feature and the main principle of it is the recognition of employees-shareholders of the company as a large collective owner who is able and has the right to significantly influence management in the project. It should be noted that this fact, in turn, provides an opportunity to have their representatives on the Board of Directors and through them to participate in addressing the most important issues of the project.

5. "Entrepreneurial" culture

This type of organizational culture is inherent in a very limited number of companies that view culture as part of a joint process of making the company the most competitive in the industry and attractive to investors. This culture is characterized by the fact that staff ownership is seen as a special investment that allows you to form the mentality of the employee as an economically active employee and an interested, demanding shareholder. In this culture, the main emphasis is not on employees receiving income as shareholders, but on giving them more responsibility and willingness to take risks as shareholders.

Basic methods of studying and measuring organizational culture.

1. Method of system analysis (including morphological and functional-parametric description of organizational culture).
2. Statistical methods (normative, comparative, random estimation method, change tracking method, constructive-critical method, etc.).
3. Methods: interviews, questionnaires, sociometric method.

To implement organizational culture in the system of rules and regulations of the organization, it is advisable to develop a code of organizational culture. Practical experience has shown that the development of a code in the form of rules of exemplary, civilized behavior and the implementation of the program of organizational culture should be carried out in the following sequence:

- analysis of the real state of production, management and commercial culture at the enterprise, identification of major problems in this area;
- questionnaires of managers, specialists and ordinary workers in order to find out their understanding of the main values of the life of the enterprise and obtain from them recommendations for improving the culture of production;

- determination of the main organizational and economic prerequisites for the introduction of organizational culture;

- development of a code of corporate governance of the enterprise, its discussion in the team and the decision of the general meeting of the staff;

- development and implementation of a program of measures to promote the implementation of the corporate governance code.

03

Formation of an innovation project team

Features of project activity are important for personnel management in the process of project implementation, such as: high activity of external factors influencing project implementation, inclusion of the project implementation process within the stages of its life cycle.

Modern practice of implementing innovative projects involves uniting project executors into teams. The project team is the most flexible element of the internal environment of the project-oriented organization. According to the PMBOK (Project Management Body of Knowledge), project personnel management includes the processes of organizing and managing a project team.

Systematizing the existing definitions of "project team", we can identify four approaches:

- "project team" as a set of all entities involved in the project;
- "project team" as a set of entities accountable to the project manager and involved in the project work;
- "project team" as any team working on the project;
- "project team" as a project management team.

Modern innovative development of technologies dictates a new practice of integrated project quality management, shifting the emphasis from individual work of individual performers to the activities of multifunctional management teams and interdisciplinary working groups focused on complex problems and tasks.

Definition 4. An innovation project team is a group of employees who work directly on the project and are subordinate to the project manager; it is a group of people who are highly qualified in a certain field and most committed to the common goal, work together, mutually coordinating their work.

The project team consists of people, each of whom is assigned a role and responsibility for the project. According to the team management methodology, after the division of roles and responsibilities, each team member must participate in project planning and decision-making.

In **terms of form**, the project team reflects the existing organizational structure of project management, separation of functions, responsibilities, and responsibilities for decisions made during project implementation. At the top level of the structure is the project manager, and at the bottom, respectively, the executors, responsible for a clear amount of work performed.

In **terms of content**, the project team is a group of highly qualified specialists with the knowledge, skills, and competencies necessary to effectively achieve the project objectives.

Today there are the following types of management teams - traditional and informal teams, formal team and project team.

The **traditional team** is a stable team, directly under the authority of the head, who solves the tactical and strategic tasks of the structural unit. The informal team consists of employees from different departments, who are at different levels of the hierarchy, who have joined together voluntarily, and allows you to solve tactical and strategic tasks facing the leader.

A **formal team** is a future team or an unsuccessful attempt to form a management team. In the formal group, there are strong signs of a problem team, employees occupy psychological, not managerial niches. The project team consists of employees of various departments and companies (partners and customers), which are united within the project.

The team is formed during the project implementation. Thus, the project team is a temporary, formally regulated group of specialists created for the existence of the project objectives.

Three types of project teams are used in the **organizational structure** of large innovation projects:

1. The project team (PT) is the organizational structure of the project, which is created for the period of the project or one of the phases of its life cycle. The task of the project team management is to develop a policy and approve the project strategy to achieve its goals. The project team includes people who represent the interests of various project participants.
2. Project Management Team (PMT) - the organizational structure of the project, which includes project members who are directly involved in project management, including - representatives of some project participants and technical staff. The task of the PMC is to perform all management functions and work in the project.

3. Project Top Management Team (PTMC) - the organizational structure of the project, which is headed by the manager (general manager) of the project and created for the period of the project or its life phase. The project management team includes individuals who directly perform managerial and other project management functions, the main tasks are the implementation of project policy and strategy.

In small projects, project management responsibilities can be shared among all team members or performed by the project manager. Project investors work in contact with the project management team and are usually involved in issues such as project financing and proactive cost-effectiveness of the project.

The main goals of creating a project team are as follows:

1. Improving the division of labor. Combine skills, abilities, abilities and distribute their tasks among members according to time.
2. Management and control of work. The work of each group is organized and supervised by other members.
3. Problem-solving and decision-making. This is always easier to do, combining the skills, abilities, awareness of a group of people.
4. Verification and approval of decisions. Check the reality of a decision that was perceived from the outside, or approve such a decision.
5. Communication and information to communicate decisions or information to those who need to know.
6. Accumulation of ideas, information, advice.
7. Coordination and communication between functional units.

8. Increasing the responsibility and involvement of team members, creating an environment that promotes participation in the planning and activities of the company.
9. Negotiation and conflict resolution at various levels of government.
10. Analysis of project results in order to improve the information base for their evaluation.

Advantages of group work:

- ❖ Teamwork is a tool that provides support and success of management.
- ❖ The team can be updated by selecting new people as needed.
- ❖ The team creates a collective experience that can be passed on to new members.
- ❖ Teamwork produces more success than individual.
- ❖ Synergy of the team generates a greater effect than the sum of individual contributions.

In project management, there are different approaches to modern classifications of teams, such as model:

The **Traditional Model**. This is a group of people who work under management and share some of his responsibilities and powers.

The **Team Spirit Model**. This is a group of people who are satisfied with the work on the project under the chairmanship of one leader. These people have teamwork, team spirit, but in fact they are not a team, because one person protects from all blows, without sharing authority or responsibility.

The **Cutting Edge Model**. This is a group of people with self-management. No person in the group has the authority to make all decisions about cases that the group has encountered in the process. This is a team of self-organization, because everyone has both authority and responsibility.

Task Force Model. This is a group working on a special project or task. This group is traditionally called a special purpose unit (committee), in particular on quality issues.

The Cyber Team. In this team model, members work remotely from each other. They have to work together to achieve the project goals, but they meet at the beginning of the project, and then work remotely, each on their own task.

Definition 5. Recruitment of a project team is a process of confirming the availability of human resources and recruiting a team needed to perform tasks on an innovative project.

The project team recruitment process should be carried out in conjunction with the project action decomposition processes: development of a control event plan, list of project actions, etc.

04

Project team management processes

Project team management processes include the following:

1. Planning the required number of project executors - defining and documenting roles, responsibilities and accountability, as well as creating a human resources management plan.
2. Recruitment of the project team - attracting human resources needed to implement the project.
3. Development of the project team - improving the skills of project team members and strengthening the interaction between them in order to increase the efficiency of the project.
4. Project team management - control over the effectiveness of project team members, providing feedback, solving problems and coordinating changes aimed at improving the efficiency of the project.

The project team management system includes organizational planning, project staffing, project team creation, as well as the functions of control and motivation of the project workforce for the effective course of work and completion of the project. The system aims to guide and coordinate the activities of the project team, uses leadership styles, motivation methods, administrative methods, training at all stages of the project life cycle.

The project management monitors the activities of the team, resolves conflicts, solves problems and evaluates the effectiveness of team members. The results of project team management are requests for change, updating the human resources management plan, problem-solving, providing input to assess performance and accumulation knowledge of the staff of the organization.

The main criterion for the effectiveness of the project team will be the end result of the implemented project of the required quality, on time and within the limits of project resources.

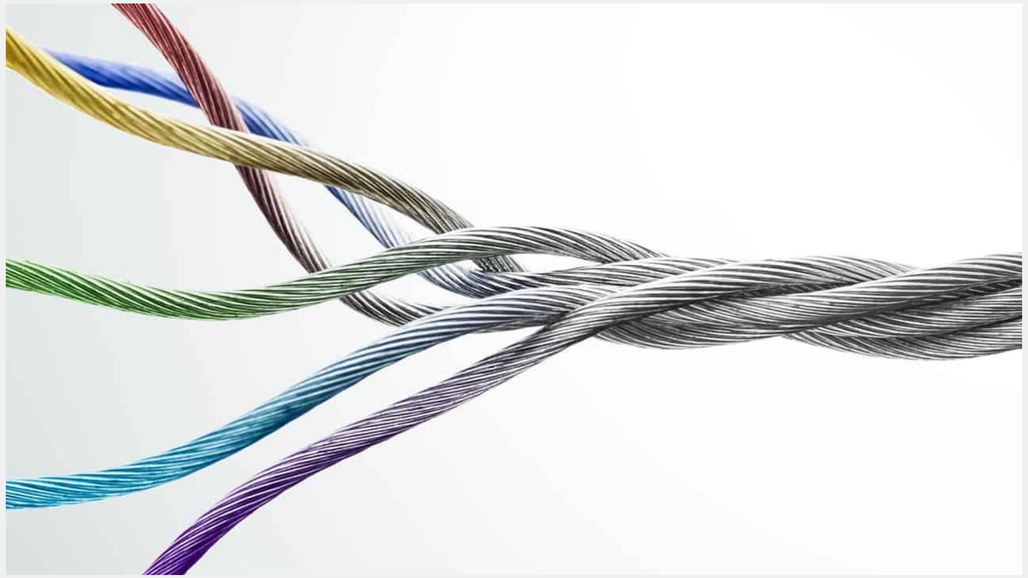
For each project and each customer, the success criteria can be defined and described in measurable form. There are three traditional types of criteria:

1. traditional for project management criterion "on time, within the budget, in accordance with the results and quality";
2. criteria of the leading organization, customer, user;
3. benefits for project participants.

Project team management includes motivation, monitoring team members, providing feedback, problem-solving, and change management to improve project performance.

05

Fuzzy model of forming a team of developers of innovative projects



We formulate the task of evaluation and selection of specialists for the team of developers of innovative projects as follows. Suppose you set a set of specialists $\mathrm{E} = \{\mathrm{e}_1, \mathrm{e}_2, \ldots, \mathrm{e}_n\}$, to select a team of developers who need to be evaluated by different models of competencies $\mathrm{M} = \{M_1, M_2, \ldots, M_s\}$, which in turn are formed from evaluation indicators (criteria). After that, specialists must be arranged according to a certain rule to select the most competent. Depending on the innovative project, different models of assessment of knowledge, skills, and abilities of specialists are used.

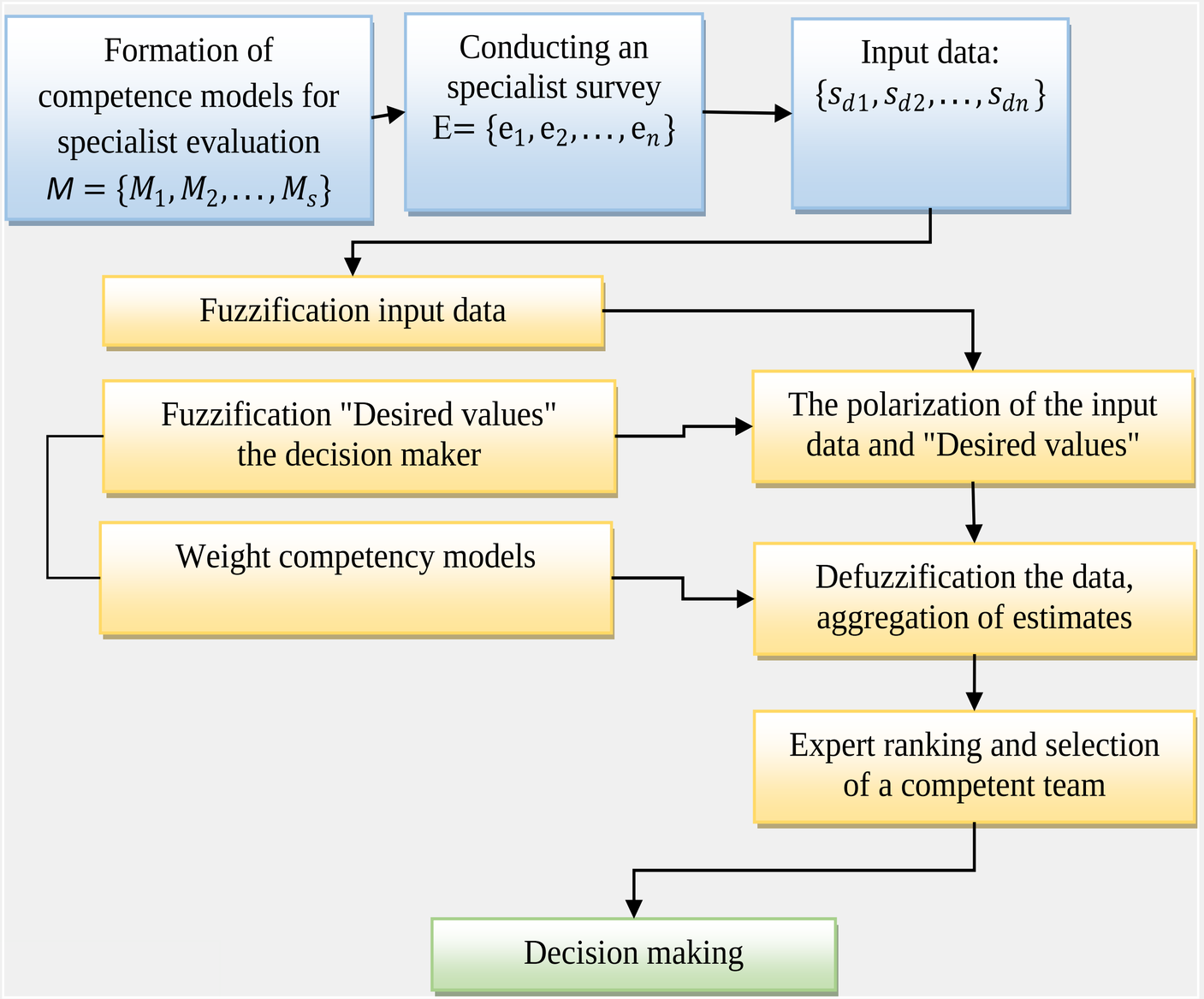
Consider for some model of competence M_d the set of criteria $K_d = \{K_{d1}, K_{d2}, \ldots, K_{dm}\}$, $d = \overline{1,s}$. Suppose that each criterion is a question to which you must choose the answer that is close to the truth. The answers to the question are denoted by Z_{djk}, $d = \overline{1,s}$, $j = \overline{1,m}$, $k = \overline{1,l}$, where the value of d is the evaluation model, j is the number of the criterion (question) in the corresponding model, k is the answer number to the question. According to each criterion, the specialist chooses one of the answer options, which is assigned the appropriate score b_{djk}. The answer of the i-th specialist to the j-th question on the model d is denoted by g_{dji}. As a result, for some M_d competency models, the specialist scores a total of s_{di} points.

The criterion set can be presented in the form of an expert evaluation questionnaire:

Evaluation model	The name of the criterion (question)	Reply to the question	Ball rating	Reply expert	Sum recruited points
M_d	K_{d1}	Z_{d11}	b_{d11}	g_{d1i}	s_{di}
		Z_{d12}	b_{d12}		
		…	…		
		Z_{d1l}	b_{d1l}		
	………				
	K_{dm}	Z_{dm1}	b_{dm1}	g_{dmi}	
		Z_{dm2}	b_{dm2}		
		…	…		
		Z_{dml}	b_{dml}		

Thus, according to specialists $\mathrm{E} = \{\mathrm{e}_1, \mathrm{e}_2, \ldots, \mathrm{e}_n\}$, we obtain the set of numerical variables $g(M_d) = \{s_{d1}, s_{d2}, \ldots, s_{dn}\}$ for the model of competencies M_d, which take values on a certain numerical interval.

The structural scheme of evaluation and selection of the team of developers of the innovative project is as follows:


Formation of competence models for specialist evaluation $M = \{M_1, M_2, \ldots, M_s\}$
Conducting an specialist survey E= $\{e_1, e_2, \ldots, e_n\}$
Input data: $\{s_{d1}, s_{d2}, \ldots, s_{dn}\}$
Fuzzification input data
Fuzzification "Desired values" the decision maker
Weight competency models
The polarization of the input data and "Desired values"
Defuzzification the data, aggregation of estimates
Expert ranking and selection of a competent team
Decision making

The general algorithm of the model of forming a team of developers of innovative projects.

1st step. Selection of models for evaluating and calculating the convolution of scores

For a specific innovation project, it is necessary to adequately select a model or models of competencies of developers that will reveal the qualitative features of the evaluated specialists for the successful implementation of the project. After that, we calculate the convolution of the sum of points according to the relevant models of competencies $g(M_d) = \{s_{d1}, s_{d2}, \ldots, s_{dn}\}$.

2nd step. Fuzzyfication of input data

The input data are presented in the form of questionnaires, which are used to score points that are subjective. Therefore, it is necessary to reveal the uncertainty of the input data. As a result, the obtained numerical variables $\{s_{d1}, s_{d2}, \ldots, s_{dn}\}$ take different numerical values, and to compare them you need to have normalized values. To do this, you need to use the membership function, for example, the quadratic s-spline and the harmonic s-spline are given by formulas (1) and (2), respectively:

$$\mu_{di}(s_{di}, a, b) = \begin{cases} 0, & s_{di} \le a; \\ 2\left(\frac{s_{di}-a}{b-a}\right)^2, & a < s_{di} \le \frac{a+b}{2}; \\ 1-2\left(\frac{b-s_{di}}{b-a}\right)^2, & \frac{a+b}{2} < s_{di} < b; \\ 1, & s_{di} \ge b. \end{cases} \quad (1)$$

$$\partial_{di}(s_{di}, a, b) = \begin{cases} 0, & s_{di} < a; \\ \frac{1}{2} + \frac{1}{2} cos\left(\frac{s_{di}-b}{b-a} \cdot \pi\right), & a \le s_{di} \le b; \\ 1, & s_{di} > b. \end{cases} \quad (2)$$

Where a is the convolution of the sum of the minimum scores, b is the convolution of the sum of the maximum scores of the grading scale according to the criteria in the model M_d, s_{di} is the convolution of the sum of scores of the i-th specialist in the competency model M_d. Thus, the obtained input data will be normalized and comparative.

3th step. Fuzzyfication of "desired values"

For each competency model, the decision-maker has his or her own reasoning, which should be the "desired values", ie the sum of the scores for the M_d model, respectively. We denote them by the vector $T = (t_1, t_2, \ldots, t_s)$ according to the models $M_d, (d = \overline{1, s})$. To compare the "desired values", calculate the value of the constructed membership function of the quadratic s-spline:

$$\delta_d(t_d, a, b) = \begin{cases} 0, & t_d \le a; \\ 2\left(\frac{t_d - a}{b - a}\right)^2, & a < t_d \le \frac{a+b}{2}; \\ 1 - 2\left(\frac{b - t_d}{b - a}\right)^2, & \frac{a+b}{2} < t_d < b; \\ 1, & t_d \ge b. \end{cases} \qquad (3)$$

4th step. Polarization of input data and "desired values"

Define the set of values that are the relative estimate of the proximity of the elements μ_{di} to the corresponding element "desired values" δ_d:

$$z_{di} = 1 - \frac{|\delta_d - \mu_{di}|}{\max\left\{\delta_d - \min\limits_i \mu_{di}; \max\limits_i \mu_{di} - \delta_d\right\}}, d = \overline{1, s};\ i = \overline{1, n}. \qquad (4)$$

The matrix $Z = (z_{di})$ defined in this way characterizes the relative estimates of the proximity of the corresponding specialist e_i to the "desired values" δ_d according to the competency models.

5th step. Scales of competency models

If we have more than one model of competencies, then they, of course, have different importance. In this regard, the decision-maker sets the weights for each model of assessing the competence of specialists $\{p_1, p_2, \ldots, p_s\}$, for example, from the interval [1,10]. For further calculations we carry out their rationing:

$$w_d = \frac{p_d}{\sum_{d=1}^{s} p_d}, d = \overline{1, s};\ w_d \in [0,1]. \qquad (5)$$

6th step. Data defuzzyfication

To construct an aggregate estimate, use a weighted average convolution:

$$a_i = \sum_{d=1}^{s} w_d \cdot z_{di}, i = \overline{1, n}. \qquad (6)$$

7th step. Ranking of specialists and selection of a team to develop an innovative project

On the basis of the received estimations a_i we build a ranking number of experts concerning competences on estimation models:

$$A = \{a_1, a_2, \ldots, a_n\}. \qquad (7)$$

Depending on the needs, a combination of the most competent specialists is selected to form a team to develop an innovative project. Thus, the constructed fuzzy model allows building different evaluation models, different number of indicators and different scales of scores. As a result, we have standardized data on the competencies of specialists, respectively, according to evaluation models and "desired values" of DM, which are aggregated into one initial assessment. The higher the score, the better the specialists are in terms of their competencies and "desired values" of DM for the successful implementation of the innovation project.

Conclusions

In this lecture, the important concept of forming a team of executors of an innovative project is considered. For this purpose, the human resource management processes of the innovation project were studied. The importance of the leader in the project and the manager, the criteria that an effective project manager must meet, is revealed. The importance of the concept of corporate culture and its function is investigated. Also, considerable attention was paid to the formation of the innovation project team. The types of project team in the organizational structure of large innovative projects and recommendations for small projects are given. Project team management processes are considered. Also, the model of forming a team of developers of innovative projects using the theory of fuzzy mathematics is considered in detail.

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Thank you!