Management of process control in innovative projects

Chapter 5
Development of an innovation project management plan

Lecturer: doc. Polishchuk Volodymyr, DrSc.

Lecture content

- Innovation project planning system
- Development of an innovation project management plan
- Characteristics of content management of an innovative project
- Directions of structuring the innovation project
- Coding system

01

Innovation project planning system

Planning is important for any project, especially for an innovative one. Whereas an innovative project contains things that have not been done before and includes many processes and stages of the project cycle: creating a project concept; choice of strategic decision on project implementation; development of project details; conclusion of agreements; completion of all works to complete the project. Some of the planning processes have clear logical and informational relationships, performed in the same order for almost all types of projects.

Definition 1. The project planning process is a process that involves defining the goals and parameters of interaction between works and participants of the innovation project, allocation of resources, and selection and adoption of organizational, economic, technological decisions to achieve project goals.

At the project planning stage, all necessary parameters of project implementation are determined, namely: duration of works, need for labor, logistical and financial resources, terms of supply of all types of resources, terms, and volumes of involvement of design, construction, and other organizations.

The main task of project planning - the project planning process should ensure the implementation of the project in a timely manner with a minimum cost of regulatory resource costs and declared quality.

Definition 2. The main purpose of project planning is to ensure the implementation of works to achieve the target results of the project.

The main steps in project planning:

1. *Install:*

   a) start and end dates, budgets, technical results. This contributes to the purposefulness of management and motivates performers;

   b) internal goals - checkpoints, timely achievement of which allows achieving the overall goal of the project;

   c) responsible persons or a team whose participation is the key to successful project implementation.

2. Develop a plan to determine:

a) all work on the project (this is each type of activity and its content);

b) project working structure (PWS);

c) logical sequence of works, including previous and subsequent, as well as parallel works.

3. Build a plan diagram (grid chart).

4. Determine the duration of work (calendar plan, Gantt chart).

5. Identify costs and resources (labor) for each type of work.

The planning process consists of basic and ancillary processes and is logically related to the initiation, monitoring, implementation, and completion processes.

The main planning processes include:

1. planning goals - development of the problem (project rationale, main stages, and objectives of the project);
2. decomposition of goals - decomposition of project stages into smaller ones, allows improving controllability and provides more effective control;
3. determining the composition of operations (works) of the project - a list of operations, which consists of the implementation of various stages of the project;
4. definition of interrelations of operations - drawing up and documenting of technological interrelations between operations;

The main planning processes include:

5. estimation of duration or volumes of operations - estimation of the number of time intervals or volumes of works necessary for the completion of separate operations;
6. determination of resources (people, equipment, materials) of the project - the total number of resources of all types that can be used in the project. It should be noted that all resources of the organization should be distributed centrally. Quite often, there is a planning error due to the fact that some scarce resources are used in several projects at the same time;
7. resource allocation - determination of resources required to perform individual project operations;

The main planning processes include:

8. cost estimation - determination of components of costs of project operations and estimation of these components for each operation, resource, and purpose. One of the common mistakes is that the budget is set without paying attention to the projected cost of the project;
9. drawing up a work schedule - determining the sequence of project work, the duration of operations, and the distribution over time of resource needs and costs, based on the restrictions and relationships;
10. budget assessment - assessment of the cost of individual stages, phases, terms of the project;
11. development of the project implementation plan - integration of the results of other subprocesses for the preparation of a complete document;
12. definition of success criteria - development of project evaluation criteria.

In addition to the main processes, there are **a number of auxiliary planning processes**, the need for which depends on the characteristics of a particular project:

1. quality planning - determining what quality standards to use in the project, as well as how to achieve these standards;
2. planning of the organization - definition, documentation, and assignment of roles, responsibilities, and relationships of reporting in the organization;
3. appointment of staff - assignment of human resources to carry out project work;
4. interaction planning - determining the flows of information and methods of interaction required for project participants;

5. risk identification - identification and documentation of risk events that may affect the project;
6. risk assessment - assessment of the probabilities of risk events, their characteristics, and impact on the project;
7. development of response - identification of necessary actions to prevent risks and respond to threatening events;
8. supply planning - determining what, how, and when should be delivered;
9. preparation of conditions - development of requirements for supplies and identification of potential suppliers.

If you consider an innovation project as an object of planning, then the processes of planning goals, results, and activities depend on external factors and stakeholders. As a result, there are assumptions and restrictions imposed on the project.

Definition 3. Constraints - external barriers beyond the control of the project team that needs to be managed from the outside.

Definition 4. The assumption is the factors (external conditions or events), taking into account which project will be implemented as planned.

02

Development of an innovation project management plan

Definition 5. Development of an innovation project management plan - is the process of documenting the actions required to identify, prepare, integrate and coordinate all support plans.

Definition 6. The development of an innovation project plan is an iterative process that has the nature of repetition several times.

For example, an initial plan may operate on aggregate resources and durations that are not tied to specific dates, while a final plan may operate on specific resources and exact dates.

The project management plan determines how the project will be implemented, how it will be monitored, controlled, and closed. The content of the project management plan varies depending on the application area and the complexity of the project. The project management plan is developed as part of a series of integrated project completion processes. The result of this process is a project management plan, which is gradually developed by updating, monitoring, and approving.

The development of project plans covers all stages of its life cycle. It begins with the participation of the project manager in the process of concept development, selection of strategic objectives, including contractual proposals, and continues with the conclusion of contracts, and ends only at the end of the project.

Such a system of plans has traditionally developed:

at the pre-investment stage as part of the project concept, business plan - a preliminary plan for project implementation, taking into account the needs of the main types of resources and justification of investment;

at the stage of development of design and technological documentation as part of the project implementation management plan.

Definition 7. Innovation Project Management Plan - a basic document that contains agreed upon by all participants and documented representation of the project.

The plan may be generalized or detailed and may include one or more management support plans and other planning documents. The components of the innovation project management plan are as follows:

1. Project content management plan - is a document that indicates how the content of the innovation project and its management will be determined, developed, and tested.
2. Calendar plan - is a document that sets indicators and actions for the development and management of the schedule of the innovative project.
3. Cost Management Plan - is a document that specifies the format and defines the operations and criteria for planning and managing the cost of the project.

4. Quality management plan - a document that defines quality standards and means of achieving these standards.
5. Personnel management plan - a document that describes how to meet the requirements for human resources, project team.
6. Interaction Management Plan - a document that identifies the information and communication needs of project participants.
7. Risk management plan - a document describing the organization and implementation of project risk management.
8. Supply Management Plan - a document that describes the management of supply processes at all stages of project development.
9. Change management plan - provided for the case when it is necessary to make changes to the project management plan. Such changes may be related to various modifications, additions and revisions of the project.

The project plan should not be confused with the base plan.

A project plan is a document or list of documents that change as additional information becomes available, while the base plan serves to monitor implementation and changes only when requests for changes are approved.

Project plans are classified according to the following characteristics:

- level of project management;
- management functions;
- degree of coverage of project works.

The level of innovation project management. In the management methodology of any project, a system of plans has been formed, which has the following levels of management: conceptual; strategic; tactical.

At the conceptual level, the goals, and objectives of the project are defined; alternative options for achieving the planned results are considered with an assessment of the advantages and disadvantages of each option; the conceptual directions of the project implementation are determined, including the description of the subject area, the enlarged structure of works, their interrelations and the preliminary assessment of the duration, implementation of the project, it's cost and resource needs.

The strategic plan defines the main stages of the project. It shows the logical scheme of project implementation. The strategic plan identifies the external and internal factors influencing the project, goals, and objectives for the project team and ensures the overall importance of the project.

At the tactical level, there are two types of plans:

- **current plan** - determines the timing of work complexes, the need for resources, identifies certain areas of work for which different organizations are responsible;
- **operational plan** - details the tasks for participants in the complex of works for a certain period: month, week, day.

Management functions. Functional plans are developed for each set of works (preparatory, design and research, supply of materials and equipment) or for a set of works performed by one organization of project participants.

Degree of coverage of project works:

- consolidated, complex, main - for all project works;
- detailed or partial - by participating organizations;
- detailed or partial - by type of work.

The stage of development of the project implementation plan is considered completed if and only if the following documentation is available:

- complex (consolidated, main, general) calendar plan;
- specific (detailed) calendar plans for performers;
- specific (detailed) calendar plans for work packages;
- information on resource needs;
- schedules of supply of technological equipment and materials;
- plan of concluding contracts;
- list of organizational and technological measures for project implementation;
- plan of control over the performance of works.

After the development of a comprehensive innovation project management plan, it is approved. The approved project management plan together with the calendar schedules form the project baseline.

Such a project management plan is a prerequisite for further successful project development.

03

Characteristics of content management of an innovative project

Content management of an innovative project includes processes that ensure the inclusion in the project of those and only those works that are necessary for the successful completion and achievement of project objectives.

The content of the project means the following: properties and functions that characterize the product, service or result, as well as their work.

Project content management is directly related to the definition and control of all stages included in the project.

The general scheme of project content management processes includes the following:

1. Content management planning - the process of creating a plan that sets out how the content of the project will be defined, validated and monitored.
2. Collection of requirements - the process of identifying and documenting the needs of project stakeholders to achieve project objectives.
3. Defining the content - the process of developing a detailed description of the project and product.
4. Creating a hierarchical structure of work - the process of dividing the results of the project and project work into smaller elements, which provides easier control of project implementation.

5. Confirmation of the content - the process of formalized acceptance of the planned results of the project.
6. Content control - the process of monitoring project status and product content, as well as managing changes to the baseline content plan.

These processes are interrelated, and each process involves the actions of one or more people, depending on the needs of the project. Each process takes place in the project at least once and is performed in one or more phases of the project if the project is divided into phases.

Definitions 8. Content Management Planning - The process of creating a content management plan that documents how project content will be determined, validated, and monitored.

A key advantage of this process is that it provides guidance and guidance on project content management throughout the project.

The result of this process is a content management plan - a component of a project management plan or program that describes how content will be defined, developed, monitored, controlled, and tested. A requirements management plan is a component of a project management plan that describes how to analyze, document requirements, and manage them.

Requirements collection is the process of identifying and documenting the needs of project stakeholders to achieve project objectives.

The success of the project is directly influenced by the thorough collection and management of project and product requirements.

Many organizations divide the requirements into "project requirements" and "product requirements". Project requirements may include business requirements, project management requirements, delivery requirements, etc. Product requirements may include information on technical requirements, safety requirements, performance requirements, etc.

The result of the collection of requirements is to obtain:

Requirements documentation - requirements documents describe how individual requirements meet the business needs of the project. Requirements can be first described at a high level, and then gradually detailed as additional information becomes available. Prior to inclusion in the baseline plan, the requirements should be unambiguous, measurable, verifiable, complete, consistent, and acceptable to all project stakeholders. The format of on-demand documents can range from a simple document listing all requirements, categorized by project stakeholders and priorities, to more elaborate forms that provide an overview of the work, detailed descriptions, and programs.

The requirements tracking matrix is a table that links the requirements to their origin and tracks them throughout the project life cycle. Using a requirements tracking matrix helps ensure that each requirement increases the value of the business by linking it to the goals of the business and the project. This allows you to track requirements throughout the project life cycle, which helps to ensure that the requirements approved in the requirements documents are met at the end of the project. The requirements tracking matrix provides a framework for managing changes in product content.

The next process of project management is to determine the content of the innovation project.

Definition 9. Definition of content - the process of developing a detailed description of the project and product.

The preparation of a detailed description of the project content is extremely important for the success of the project and is based on the main results, limitations documented during the project initiation. The content of the project is determined during planning and described in more detail as information about the project.

04

Directions of structuring the innovation project

Project structuring can be carried out in one, two or three directions. From practical experience, we can say that many developers use a "one-way" system to structure, manage, plan and control their projects. Success in planning and monitoring project implementation depends on how quickly and accurately the scope of work is determined. This task is solved with the help of PWS - the working structure of the project.

The concept of the structure of the division of works includes:

- structure - a set of relationships between elements of the system that are necessary and sufficient to achieve the project goal;
- division (decomposition) - division into constituent parts or categories, into simpler constituent parts, decomposition;
- work - long-term physical or mental effort, which is aimed at achieving results; activity, duty, function, operation performed by an employee or team; part of the labor process that requires time and resources.

Definition 10. Work Breakdown Structure (WBS) is a hierarchical structure built to logically divide all project work and presented graphically.

In other words, it is a set of several levels, each of which is formed as a result of the division of work of the previous level into its components.

WBS is a necessary tool for project management, as it allows:

1. to ensure the achievement of project objectives by comparing them with the elements of the tree of works of different levels;
2. break down a complex project into simpler and manageable components;
3. create a basis for network modeling, planning, division of responsibilities;
4. to define in more detail requirements to the resources necessary for the performance of works;
5. determine the structure of data required for the current assessment of the cost, duration, and quality of work;
6. create a basis for project risk management.

The main stages of WBS development:

1. determining the degree of detail of project work (so that they can be evaluated);
2. determining the number of levels;
3. development of the structure of each level (horizontal levels are formed);
4. preparation of the description of WBS elements;
5. formation of the coding system (all blocks are coded);
6. conducting inverse calculations.

As mentioned, for the same innovative project, you can create several WBS with different numbers of levels and elements at each level, depending on the principle underlying the division of the project into its components.

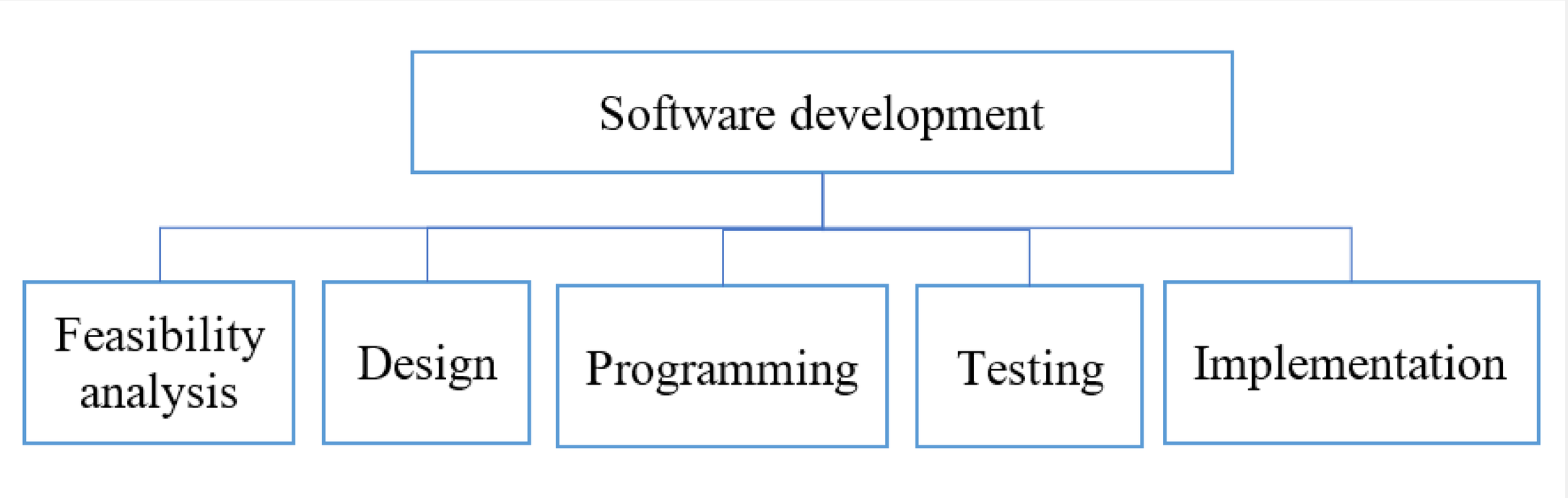
Therefore, it is advisable for project executors to create standard WBS formats for certain types of projects.

The level of detail is set taking into account the scale and content of the project, the degree of risk, complexity, and uniqueness of its tasks, and more.

Principles of formation of WBS levels:

- functional approach;
- effective (product) approach;
- by stages of the project life cycle;
- geographical approach;
- the structure of innovation project management functions;
- the structure of the organization.

For example, the principles of formation of WBS levels before the development of innovative software:



When choosing an approach to decomposition, you should focus on the following principles:

- the level of uncertainty and dynamism of the environment;
- practical possibility of clear structuring of the problem, the solution of which is aimed at the project;
- stability of the system of goals and objectives of the project;
- practical possibility of quantitative measurement of project results;
- practical possibility of formalization of all processes (project management processes and project implementation processes).

Each approach has its advantages and disadvantages. However, the objective criterion for evaluating the decision is the measure of achieving the required (desired) level of parameters (characteristics, indicators) of the future project management system, the main element of which is the organizational structure.

The decomposition approach determines the type of future project management structure:

1. Product - the structure of the project is based on the structure of the product.
2. Process (technological) - the structure of the project is based on the structure of the life path of the project.
3. Matrix - the structure of the project is based on the management structure of the existing organization.
4. Project-target - the structure of the project is based on a hierarchy of goals and objectives.
5. Hybrid - a combination of different approaches.

An effective organizational structure of management should take into account the specifics of the innovation project environment, the system of relationships between its participants, reflect the content of the project, and be based on available (available) means of formalizing internal and external communications.

Uncertainty and dynamism of the innovation project environment impose requirements on the level of adaptability (flexibility) of the organizational structure, which is determined by the degree of acceptable structuring of management processes and tasks.

The development of the structure of the division of works can be carried out by two main methods - deductive and inductive. In the deductive structuring of the project, the elements of the WBS are determined on the basis of a top-down approach. In the inductive structuring of the project, WBS elements consist of elements of the previous level based on the bottom-up approach. Most often, both methods are used alternately for the same project, this is WBS can be considered created when both approaches have been used.

To create a WBS structuring can be done at the following levels:
level 1 - project;
level 2 - stages or subprojects;
level 3 - systems or units;
level 4 - work packages.

The lowest level element - the work package is a group of works or operations that can be evaluated in terms of determining costs and allocating resources, duration of implementation and appointment of the person in charge and has the following characteristics: scope and list of work to be performed; responsible for the implementation of the work package; budget; required resources; start and end dates.

Creating a working structure for the project allows you to determine the full list of work that needs to be done, but does not answer the question of who will do this work and at what cost. Therefore, more and more often projects use two-way structuring, which combines working and organizational structures and provides:

- project working structure (PWS);
- the organizational structure of the project (OSP);
- cost accounting;
- description of work packages (activities);
- coding system;
- WBS usage dictionary (CTR directory "Costs - time - resources").

The organizational structure of the project concerns only the internal organizational structure and does not affect the relations of project groups or participants with parent organizations. OSP is built similarly to the working structure, namely: the first level reflects the organizational structure as a single element; at the second and lower levels the division of the structure into basic organizational elements continues.

WBS, OSP, and cost accounting set the framework for the project management system.

Accounting for the cost of each work is to determine it, plan resources and budget; these sets of plans are fundamental blocks or the lowest level in the hierarchical system of a two-way planning and control system.

Cost accounting is based on the following principles:

1. One person is responsible for them.
2. A detailed definition of the work to be performed and evaluated is carried out.
3. For each work package there are plans: calendar schedule; resource; cost budget.
4. Analysis is performed and reports are prepared.

The amount of work, resources, and costs required to carry out the whole project or its components are determined from the bottom up - by adding the value of indicators on the vertical axis, this is from the lowest - to the highest level of WBS. Similarly, for functional groups of the organizational structure, this is determined horizontally: for each higher level, costs are determined by adding at lower levels.

05

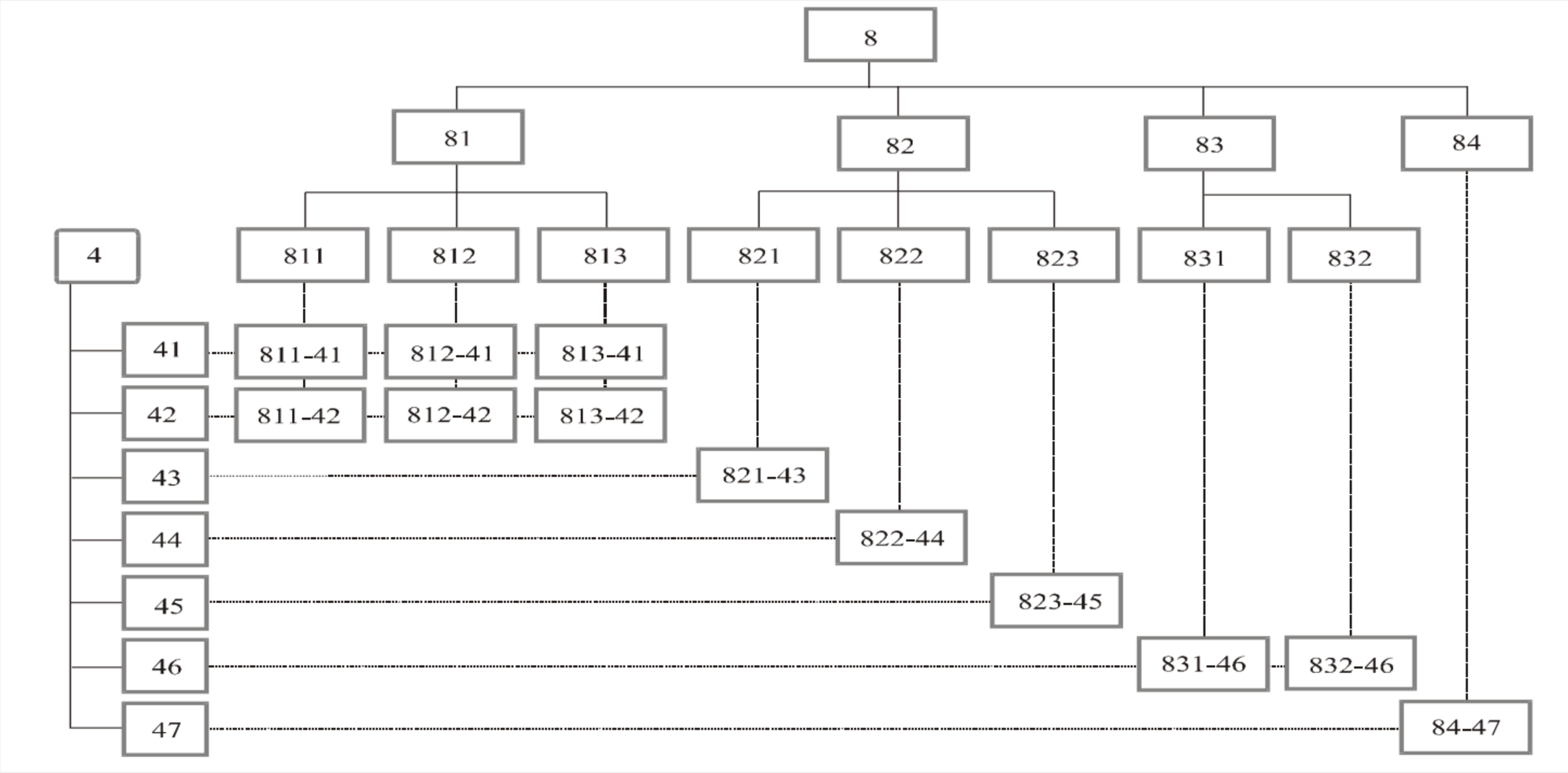
Coding system

The key to integrating individual project elements is a systematic coding system that helps structure the project, identify cost accounting elements, WBS and OBS, and establish their relationships. It is used to separate and at the same time combine everything: works, their planning, and control, resources and funds, accounting, evaluation, and more.

Coding is a vital component of a project management information system. Coding uses multi-digit numbers or combinations of numbers and letters, each of which has its own meaning, its own meaning.

Each code number corresponds to a specific cost, WBS or OSP level and element, and indicates the relationship in the WBS and OSP structures. Each level of the structure is represented by a piece of code. One part presents the structure of WBS, the other - OSP. By linking them, we get the costs inherent in these structures and their individual elements.

The construction of the coding system on the example of the project of creating a computer center is shown in Fig:



WBS encoding

1. Code of the first level

The project is usually encoded with a one- or two-digit number.

In our example, the project has the code 8, so all data encoded with the initial number "8" belong to this project.

2. Code of the second level

The next one or two digits of the WBS code represent the elements of the WBS second level. If we use numerical numbering - you can number nine elements, the letter - according to the letter of the alphabet.

In our example, a digital system is sufficient, the elements of which have the following codes:

Code
Selection and training - 81
Delivery and installation of equipment - 82
Software - 83
Project management - 84

All plans, budgets, costs, reports, estimates, materials, etc. for these elements WBS are given under this code, for example, under code 82 it will be possible to find any characteristics of works on deliveries and installation of the equipment.

3. Code of the third level

Another number is added for the next level. For example, for the supply and installation of equipment.

Code

Preparing the premises - 821

Placing an order - 822

Delivery and installation of equipment - 823

Coding OBS

This system is encoded similarly to WBS.

1. Code of the first level

This level may or may not have code. In our example, this is the number "4". It represents the overall structure of project "8".

2. Code of the second level

The second number (or two for a large project) represents the elements of the second level. In our example:

Code

Personnel selection specialist - 41

Group of teachers-trainers - 42

Repair crew - 43

Supply group - 44

Technical support group - 45

Software Group - 46

Thus, when coding the organizational structure, the first digit represents the organization as a whole; the second - departments; third - groups.

Cost accounting

When the two codes are combined, the costs for WBS and OBS are determined.

For example, cost code 82-43 provides the following information:

1. Indicates the costs required to prepare the premises for the supply and installation of equipment.
2. The first two digits determine the cost required to complete the part of the work that belongs to element 82 of the WBS, this is the supply and installation of equipment. The remaining costs with these two digits in the code also belong to this subproject.
3. Code 43 OBS defines these costs as the work and responsibilities of element 43 OBS, namely the repair crew.

Conclusions

Planning is important for any project, especially for an innovative one. At the project planning stage, all necessary parameters of project implementation are determined, namely: duration of works, need for labor, logistical and financial resources, terms of supply of all types of resources, terms, and volumes of involvement of design, construction, and other organizations. The main task of project planning - the project planning process should ensure the implementation of the project in a timely manner with a minimum cost of regulatory resource costs and declared quality. In the management methodology of any project, a system of plans has been formed, which has the following levels of management: conceptual; strategic; tactical. The content of the project is determined during planning and described in more detail as information about the project.

References

[1]. Polishchuk, V. (2021). Evaluation of start-up projects in conditions of risk and uncertainty, Publishing house "FOP Sabov AM".
[2]. Dovhan, L. YE., Mokhonko, H. A. & Malyk, I. P. (2017). Upravlinnya proektamy. K.: KPI im. Ihorya Sikors'koho.
[3]. Kelemen, M., Polishchuk V. (2019). Model of Evaluation and Output Rating of Start-up Projects Development Teams. CEUR Workshop Proceedings, Vol. 2353. – P. 674-688. http://ceur-ws.org/Vol-2353/paper54.pdf
[4]. Burmaka, M. M., & Burmaka, T. M. (2011). Upravlinnya rozvytkom pidpryyemstva na prykladi pidpryyemstv budivel'noyi haluzi. Kharkiv: KHNADU.
[5]. Rukovodstvo k svodu znaniy po upravleniyu proyektami, 5-ye izdaniye/ Project Management Institute (PMI). – Project Management Institute, Inc., 2012.

Thank you!