UNIVERSITY OF BIORESURSES AND NATURE USE OF UKRAINE

Faculty of Agrarian Management
Department of Production and Investment Management

PROJECT APPROACH IN BUSINESS MANAGEMENT

METHODICAL MANUAL
to prepare for practical classes
and performing independent work
for students with
specialty 073 "Management"
specialization "Investment Management and
international projects »

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CONTENT

INTRODUCTION

Among the prerequisites that will contribute to the growth of the national economy, an important role is played by the formation in the new generation of knowledge leaders and the ability to use a modern project approach to solve the problems of development of management processes at different levels, orientation of these processes to achieve the end results with minimal time and cost, and mastering the methodology project management as a new progressive management toolkit.

The discipline "Project Approach in Business Management" occupies an important place in the structural and logical scheme of preparation of masters in the specialty 073 "Management". The study of this discipline is based on the concepts and concepts of management theory, financial management, strategic management, marketing, personnel management, macro and microeconomics and is aimed at forming a modern specialist.

The purpose of the course is to develop in the future professionals appropriate practical skills and skills to use universal tools for designing and implementing projects in order to achieve effective existence and development of the enterprise.

The main objectives of the discipline are to master the basic tools of effective project management in the organization, in particular:

- proving the prevalence of project activity of enterprises and organizations in the conditions of changing market environment and the need to use specific methods and tools in project management;
- presenting the characteristics of a generalized project management model as a system of interrelated goals, functions and tools that are defined, implemented and used in the course of project implementation;
- formation of a set of theoretical knowledge of the basic functions of project management;
- familiarization and practical testing of project planning and management software.

The tutorial consists of 7 topics that reveal the logic of teaching project management as a discipline from the origin of the idea, the implementation of research activities to the practical implementation of the project, the development and delivery to consumers of products that meet market requirements and ensure the sustainable development of the enterprise.

1. TASKS FOR STUDENTS PERFORMANCE DURING PRACTICAL LESSONS

THEME 1. CLASSICAL APPROACHES TO MANAGING ORGANIZATIONS

Issues to discuss

1.1. From the standpoint of school selection
1.2. Process approach
1.3. Situational approach
1.4. System approach

LECTURE
1.1. FROM THE SCHOOL SELECTION POSITION

To date, management theory distinguishes four classic approaches to management.

The efficiency of the management of an industrial enterprise is a manifestation of whether the set goals and objectives of functioning, which are aimed, as usual, at improving the efficiency of financial economic activity, are achieved. Performance indicators of the enterprise are directly dependent on the management decisions made, which must be qualified, timely, should correspond to the level of development of economic entities, the development of market relations in the country, taking into account the financial and economic state of the country's economy. In this connection, the problem is the choice of effective and efficient approaches to managing the enterprise in the current conditions of doing business.

With regard to the management of firms in management distinguish the following approaches: quantitative, process, systemic and situational [9, p. 70; 10, p. 353]; traditional, process, system and situational [1, p. 23]; systemic, complex, functional and historical [7, p. 39]; process, system and situational [2, p. 53; 8, p.78].

The approach from the standpoint of isolation of different schools in management includes four different directions, which were distinguished into independent schools - a school of scientific and administrative management, human relations, science of behavior in terms of quantitative methods.

From the standpoint of the selection of schools we will name the main ones:

School of Human Relations (1930-1950)

The movement for human relations emerged in response to the inability to fully understand the human factor as a fundamental element of management effectiveness. The major authorities in the development of this school are Mary Parker Follett and Elton Mayo. Miss Follett was the first to define management as "securing work with the help of others." Mayo found that well-designed work operations and good wages did not always lead to higher productivity, according to classical school officials. The forces that emerge from the interaction between people could exceed and often exceed the efforts of the leader. At times, workers responded much more strongly to peer pressure than group management and material incentives.

The School of Scientific Management (1885 - 1920) is closely linked to the works of Frederick I. Taylor, Frank and Lilia Gilbrett, Henry Hunt. They carried out research at the level of production organization - production management. Taylor and Gilbrett, who started their careers as workers, were observing, measuring and analyzing manual labor operations, stimulating labor input, normalizing labor, increasing labor productivity, reducing labor costs and resources. For example, in the early 1900's. The Gilbrett couple studied work operations using a micronometer and a movie camera at 1 / 2000sec intervals. They identified and described 17 major hand movements and called them "Terbligs".

Classical or Administrative School of Management (1930 - 1950)

This school was started by Henri Fayol, often referred to as the management father, and also by Lindalla Irvik, James. D. Mooney. A. Fayol and other authors, founders of the Classical School of Management, had direct experience in senior management. Henri Fayol ran a major French coal company, James Mooney worked under Alfred Sloan at General Motors, and Lindall Urvick was a management consultant in England. With the advent of the administrative school, specialists began to constantly develop approaches to improving the management of the organization as a whole. Supporters of the classical school were not very concerned with the social aspects of management.

1.2. PROCESS APPROACH

In the process approach, management is considered as the sum of interrelated functions (processes): planning, organization, motivation, control, etc. It should also be added that decision-making and communication processes, which are the processes that combine all management functions, are important in management. As noted in the source [10, p. 354], the use of a process management approach allows to increase the efficiency of information flows

between individual business processes (units) and to a greater extent to satisfy the needs of clients.

With the rise of industrialization and specialization, the need for specific use of management has become even more apparent. Harold Kunz has developed modern approaches to management, starting from the position of an effective manager:

An empirical approach - an effective manager - is one who has the knowledge needed to coordinate efforts.

An approach from the point of view of human behavior - an effective manager should constantly learn.

The approach from the point of view of the social system - an effective manager should know not only aspects of individual behavior of employees, but also understand the dynamics of the group.

An Approach in Decision Theory - Every Management Action is a Decision Action and Each Management Factor can be calculated and coordinated.

Mathematical approach - involves the need to define and characterize, to use functional symbols to ensure job responsibilities.

Operational approach - involves the need to assess the management situation and use any information or knowledge that will have the greatest effect in this case.

1.3. SITUATION APPROACH

The situational approach is based on the assumption that the suitability of different management methods is determined by the situation. The organization in its activity is constantly in such situations that need to be responded to. Because there are so many situations, there is no single "best" way to manage your organization. Therefore, the most effective method is the one that fits the situation. Management behavior in each situation depends on the circumstances.

Situational approach is a logical extension of systems theory, a way of thinking about an organization that deals with specific situations, namely: the selection of factors that created a situation and are most influential, identify the disadvantages and advantages, limitations and consequences of the situation, the choice of specific techniques and management methods for specific situation. Using this management approach contributes to a more effective achievement of the goal, especially in large enterprises with many tasks to solve.

According to A.V. Shegdi [9, p. 65], the systematic approach to management together with the situational are considered effective in changing

economic conditions, as they are able to align parts of the whole, to combine them.

1.4. SYSTEM APPROACH

The systematic approach is the most important contribution to the study of management. The organization is presented as an open system, which is a set of interdependent elements, such as people, structures, tasks and technologies, aimed at achieving the goals in a changing environment. The systematic approach is focused on achieving the goals of the system by selecting and implementing solutions based on the consideration and analysis of the whole set of factors, their relationships and interactions, which in one way or another affect the problem being solved.

The use of systems theory in management was the impetus for the formation of a systems approach as a method of knowledge, a way of thinking about the organization. According to this approach, all elements of management (tasks, functions, methods, etc.) are related and affect one another. In addition, the organization (enterprise, firm) is considered as a system with input (purpose of activity), exit (results of activity), internal and external relations, factors of influence. The system approach allows us to investigate the functioning, development, structure of the whole (object), to set the properties of its parts (elements), to trace interactions and relationships between them. According to the system approach, the efficiency of the whole depends on the efficiency of all its parts, not the individual parts with the best efficiency.

The conducted analysis of approaches to management allows to distinguish features of application of each approach in modern conditions of development of market relations, which is clearly shown in Table 1.1.

Table 1.1.

Features of approaches to management of the modern enterprise

The name of the approach	**Emphasis in management**	**The optimal period of application of the approach**	**The main purpose of the approach**
Process	Processes, functions, management	It depends on the duration of the process	Performance, efficiency, management
System	The activity of the enterprise as a system	Long-term	achievement of strategic goal of activity
Situational	Specific situations	Current	Optimization of management decisions

Therefore, the process approach to the management of an industrial enterprise focuses on important processes (production, marketing) in functional terms, which increases the efficiency of financial and economic activity management. The systematic approach considers the enterprise as an open system, which is influenced by many different factors, the consideration of which in the process of activity management is the key to the successful achievement of the long-term goals and objectives of the enterprise. The situational approach focuses on specific practical situations in order to optimize the decisions made and to increase the effectiveness of management in general.

Thus, in the process of managing a modern enterprise, different approaches to management should be applied simultaneously, depending on the goal, importance, complexity, ambiguity, contradictions of management tasks, internal and external circumstances.

Test tasks

1. Specify the main management schools:

a) school of scientific management,

b) school of administrative management,

c) school of human relations,

d) a school of behavioral science in terms of quantitative methods,

e) all answers are correct.

2. The following approaches are different in management:

a) quantitative,

b) process,

c) systemic,

d) situational,

e) all answers are correct

3. Specify the years of development for the School of Human Relations:

a) 1930-1950,

b) 1885 - 1920,

c) 1920-1950;

d) 1981-1990

4. Specify the years of development for the School of Scientific Management:

a) 1930-1950,

b) 1885 - 1920,

c) 1920-1950,

d) 1981-1990.

5. Specify the years of development for the "Classic or Administrative School of Management":

a) 1930-1950,

b) 1885 - 1920,

c) 1920-1950

d) 1981-1990.

6. Name the main representatives of the School of Human Relations:

a) Mary Parker Follett and Elton Mayo,

b) Frederick I. Taylor, Frank and Lilia Gilbrett, Henry Gantt,

c) Henry Fayol, Lindalla Irvik, James. D. Mooney.

7. Name the main representatives of the School of Scientific Management:

a) Mary Parker Follett and Elton Mayo,

b) Frederick I. Taylor, Frank and Lilia Gilbrett, Henry Gantt,

c) Henry Fayol, Lindalla Irvik, James. D. Mooney.

8. Name the main representatives of the "Classical or Administrative School of Management":

a) Mary Parker Follett and Elton Mayo,

b) Frederick I. Taylor, Frank and Lilia Gilbrett, Henry Gantt,

c) Henry Fayol, Lindalla Irvik, James. D. Mooney.

9. The empirical approach is:

a) An effective manager is one who has the knowledge needed to coordinate efforts;

b) An effective manager should be constantly trained.

c) An effective manager should know not only aspects of the individual behavior of employees, but also understand the dynamics of group work.

d) each management action is a decision-making action and each management factor can be calculated and coordinated.

10. The approach in terms of human behavior is:

a) An effective manager is one who has the knowledge needed to coordinate efforts;

b) An effective manager should be constantly trained.

c) An effective manager should know not only aspects of the individual behavior of employees, but also understand the dynamics of group work.

d) each management action is a decision-making action and each management factor can be calculated and coordinated.

11. The social system approach is:

a) An effective manager is one who has the knowledge needed to coordinate efforts;

b) An effective manager should be constantly trained.

c) An effective manager should know not only aspects of the individual behavior of employees, but also understand the dynamics of group work.

d) each management action is a decision-making action and each management factor can be calculated and coordinated.

12. The approach in terms of decision theory is:

a) An effective manager is one who has the knowledge needed to coordinate efforts;

b) An effective manager should be constantly trained.

c) An effective manager should know not only aspects of the individual behavior of employees, but also understand the dynamics of group work.

d) each management action is a decision-making action and each management factor can be calculated and coordinated.

13.The mathematical approach is:

a) An effective manager should be constantly trained.

b) An effective manager should know not only aspects of the individual behavior of employees, but also understand the dynamics of group work.

c) each management action is a decision-making action and each management factor can be calculated and coordinated.

d) implies the need to define and characterize, to use functional symbols to ensure job responsibilities.

14.The operating approach is:

a) An effective manager should know not only aspects of the individual behavior of employees, but also understand the dynamics of the group.

b) Each management action is a decision-making action and each management factor can be calculated and coordinated.

c) implies the need to define and characterize, to use functional symbols to ensure job responsibilities.

d) involves the need to evaluate the management situation and use any information or knowledge that will have the greatest effect in this case.

15. The situational approach is this

a) the need to assess the management situation and use any information or knowledge that will have the greatest effect in this case.

b) each management action is a decision-making action and each management factor can be calculated and coordinated.

c) logical extension of systems theory, way of thinking about the organization that deals with specific situations, namely: the selection of factors that created a particular situation and are the most influential, identify the disadvantages and advantages, limitations and consequences of the situation, the choice of specific techniques and management methods for a specific situation.

d) performance indicators of the enterprise in direct dependence on management decisions.

THEME 2. MODERN APPROACHES TO MANAGEMENT OF ORGANIZATIONS

Issues to discuss

2.1.Process - oriented approach to managing the organization

2.2. Targeted approach to management

2.3. Results management

LECTURE
2.1. PROCESS-ORIENTED APPROACH TO ORGANIZATION MANAGEMENT

In the process of transition of the Ukrainian economy to the market, it became obvious the need for new benchmarks and new methods of managing organizations that will accelerate economic transformation. One of the key problems in the business activity of enterprises was the inefficiency of management methods.

Management is a continuous process of acting on a management object to achieve its goals, while striving to reduce the cost of resources and time. Modern management is based on three basic principles of management: linear, functional and process.

Such an important management function - as an organization - is realized in the unity of two processes - the formation of structure (structuring of processes) and organization of processes (production, management).

Structuring processes of the organization is the establishment of the space-time structure of components of different nature (labor, means of production, materials, information, finance) and their interaction with the aim of obtaining maximum qualitative and quantitative results in the shortest time and with minimal expenditure of resources. The vertical distribution is determined by the number of levels of control. One of the main problems in the organization of the management system has gradually become the problem of flexibility.

A distinctive feature of modern approaches to managing a manufacturing enterprise is a systematic approach, that is, consideration of the activity of the enterprise as a single organism, consisting of a chain of closely related and interacting elements. Such components of the system - its elements - the modern concept of enterprise management are its business processes. All business processes of enterprises are focused primarily on the consumer. Activity that uses resources and is managed to convert inputs to outputs can be seen as a process.

Manufacturing companies that focus on the consumer are able not only to produce goods, but also to form relationships with those who buy them and those who organize their sale. The art of shaping the market, the demand for goods, such enterprises have the same degree as the art of creating products.

To effectively manage the business, you need to use a set of different management tools. The basic basis of modern approaches to management is the process approach, which involves defining a set of processes that are performed in the organization and further work with them.

Today's management systems are based on the following basic approaches:

- Total Quality Management - a system of general quality management;
- Process Integrated Quality System - a system of quality management, integrated with business processes;
- ISO 9000 Series ISO 2000 - regulatory requirements for quality management systems;
- Work Flow Management System - work flow management system;
- Manufakturing Resource Planning - planning of production resources;
- Knowlenge Management - knowledge management;
- Enterprise Resource Planning - a comprehensive system of planning and management of enterprise resources;
- Six Sigma - a model of breakthrough business process improvement;
- "20 keys of management" - business improvement system aimed at solving problems of production management and provision of services;
- Balanced Scorecard - Balanced Scorecard

Any manufacturing enterprise is nothing but a system of functioning of basic and secondary business processes. Moreover, any major business process is associated with the production of products or services to the end consumer, and, consequently, with the work of all or most of the functional units of the enterprise, whose main task is to service the business processes that take place in it.

The results of the analysis of business processes, presented today in a large amount of literature on the process approach clearly show that the responsibility for their flow, as a rule, is not assigned to a separate organizational unit of the organization, which has a very negative impact on the latter. The end consumer, whose satisfaction is the end result of business processes flowing at the enterprises, must rely on the quality and satisfactory completion of each stage of each business process, as well as on the well-established system of communication processes between all functional units involved in them.

Historically, the concept of a business process has emerged as a response to the organic shortcomings of functionally organized management. Traditional enterprise management is divided into functional areas for which departments are responsible: production, accounting, finance, supply, sales and so on. The fundamental inefficiency of such a system is due to the fact that in it everyone pursues the goals of his or her personal unit and no one is aimed at the end result - meeting the client's needs. Business Process Management is the way to solve this systemically. Business processes are intended to "break down walls between divisions" and subordinate the activity of the enterprise to the main, not local goals.

The essence of the process approach is set out in the international standards of the ISO 9000 Series: "The desired result is achieved more efficiently when activities and relevant resources are managed as a process." The following explains what should be understood as processes: "Any activity or set of activities that uses resources to turn inputs into outputs can be seen as a process. In order to function effectively, organizations must allocate and manage multiple relationships." Often, the output of one process directly forms the input of the next. Systematic identification and management of processes used by the organization and, above all, ensuring their interaction can be considered "process approach. "

In other words, any activity or complex of activities that uses resources to turn inputs into outputs can be seen as a process. The speed of processes and the variety of forms of information exchange in the presence of commodity markets and high competition almost leave no chance for those enterprises that build management process only on the basis of linear or functional management.

The purpose of the process approach is to promote the efficiency and effectiveness of the organization in achieving its objectives. Process management is different from functional in that it identifies the concept of "business process" as a sequence of actions aimed at achieving the final, measurable and concrete result.

The essence of the process approach lies in the organization of enterprise management as a network of interconnected processes. To improve the functioning of the enterprise on the basis of the process approach to management, it is necessary to: identify processes; describe processes; set goals and indicators (indicators) of process efficiency; identify resources; manage processes based on goals and indicators.

Process-driven, result-oriented management that is based on local achievement is now becoming preferred. This management of the enterprise leads to the reduction of "floors of power", accurate definition of the results of

activity, both general and personal. This approach can significantly reduce the amount of unnecessary work, give the enterprises the purposefulness and create a system of motivation of staff.

2.2. TARGETED APPROACH TO GOVERNANCE

Targeted approach is a system of methods and techniques that ensure the continuous orientation of management activities, planning and management decisions, the process of implementation of these decisions to the end results, taking into account the constantly changing socio-economic characteristics due to the development of the system of needs, quantitative and qualitative changes in the production potential of the system to which the targeted approach is applied.

This does not mean losing focus on current activity. If we do not pay attention to the intermediate goals, activities to achieve them, there is a danger that the end results from the efforts and investments made in the development of the enterprise will not be achieved.

Targeting requires and allows you to carefully understand the complex hierarchy of goals, to define the main goal and "working" on it, the goals (as ways to achieve them), to form a system of priorities for the implementation of goals, that is, to ensure control of the process of development and achievement of goals in the organization .

A targeted approach is a management approach that forces managers to determine:

• what needs to be done (in terms of analyzing why it should be done);

• how this should be done (setting priorities, measures to achieve the goals, determining the form of consolidation of the sequence of actions, ie developing plans, projects, programs);

• when it is done (achieving concrete results and evaluating individual steps in meeting the goals);

• how much it can cost (identifying funding needs and assessing opportunities to raise funds from different sources);

• what parameters of the result should be considered satisfactory (development of a system of criteria for achieving intermediate and final results);

• what, by whom and when corrective actions are to be taken (defining forms and control mechanisms, providing feedback).

"Target management," says J. Morrissey. "... it requires a clear and precise definition of the goals or desirable results of the work, the formation of real programs for their achievement and a clear assessment of the parameters of

work by measuring the concrete results by the stages of achievement of the set goals."

Currently, in practice, the most commonly used options are manifestation of the target approach in management, such as "target management", "management by goals" (MBO - Management by goals), "results management", "program-target management method" and others. Let's look at some of the most famous ones.

Management by goals (MBO)

The essence of an MBE can be determined by the following characteristics:

• simultaneous consideration and assurance of achievement of all goals in the organization;

• Each manager must be guided by clear goals within his / her responsibilities;

• reconciling the goals and objectives of managers at different levels is a prerequisite for ensuring their implementation;

Managers, contractors and subcontractors jointly form activities (functions), achieve their performance (using various consulting and cooperation measures)

The characteristics of the main stages of MVO are given in Table. 2.1.

Table 2.1

Goals management process

Steps of the management process	**Steps for each stage**
Definition of purpose	1.1. Formation of long-term goals of the organization. 1.2. Development of specific organizational goals. 1.3. Defining goals for units (units). 1.4. Defining goals and objectives for each employee
Event planning	2.1. Defining planned tasks (measures) to achieve the goals. 2.2. Relationship between these activities. 2.3. Delegating authority and defining responsibilities (responsibilities) for performing scheduled tasks. 2.4. Identify the resources needed to implement the activities
Self-control	3.1. Systematic tracking and evaluation of the progress of the achievement of the goals (through the fulfillment of the planned tasks) by the employees themselves without external intervention. 3.2. Implementation of remedial actions initiated by contractors within the authority

Periodic reporting	4.1. Evaluation by the manager of the degree of achievement of goals. 4.2. Evaluation of the overall goal. 4.3. Evaluating the overall performance of performers to enhance motivation through: - training and self-improvement for managers; - rewards of different types; - job planning, etc

Table 2.2

Advantages and Disadvantages of Goals Management

Advantages	Disadvantages
1. The efforts of managers and employees focus on actions aimed at achieving goals. 2. Improves performance at all levels of the organization. 3. Employees are motivated to achieve their goals. 4. The goals of departments and employees are consistent with the goals of the organization. 5. Helps to develop effective control methods (results are rewarded, not activity). The best benchmark for control is a set of clearly stated goals.	1. Frequent changes in the external and internal environment do not allow the use of MVOs as a basis for management, since the alternative to achieving the goals is not mandatory in this approach. 2. Poor employee-employee relationships reduce the effectiveness of MBOs. 3. The likelihood of conflict between operational and strategic goals is increasing. 4. It is sometimes difficult for managers to set goals that are quantified for each subordinate. 5. The MBA requires: the establishment of short-term goals, a significant "bureaucratic component", and highly qualified staff.

Software Target Management (PCC)

The most personalized approach is the goal-oriented approach in program-management, which has the following specific characteristics:

• defining management as “software” emphasizes such an important tool as a targeted integrated program that is used to solve interconnected large-scale problems;

• defining it as a "target" characterizes a clear focus on achieving the set goals, emphasizes the structural and functional subordination of the other controls.

Program-Purpose Management (PPC) - a way to develop and implement management solutions that are embodied in a complex of interrelated activities,

including justification of the initial need to solve, as a rule, a complex problem, common goals and objectives, works and resources, and united in the target comprehensive program, necessary and sufficient to solve the complex problem.

A PCA is a comprehensive method that, from the outset, has been regarded as complementary to existing management methods that do not replace them, but which can be combined based on a specific use within the system approach.

There are also many so-called "hybrid" models nowadays, in which, for example, MBO is used in conjunction with programmatic or performance management.

2.3. RESULTS MANAGEMENT

The concept of results management is developed by Finnish scientists and is based on theoretical and practical research, it is the result of the generalization of the Finnish management experience accumulated over the last decades. This concept is a kind of management school that is based on its own principles, needs, situations and environment. The authors of the concept have borrowed a lot of positive from foreign studies, generalizing national and international knowledge in the field of management.

The essence of results management is a consequence of the natural and continuous process of development of management systems. Based on the results, the Finnish-based management system aroused international interest. Goals management has been popular throughout the world for many years, but it has been poorly implemented. The search for new approaches has begun, resulting in the concept of results management. If target management places a major emphasis on planning, then results management places more emphasis on the actual management process, on the motivations and qualifications of managers. It is a practical management philosophy that integrates many modern areas - strategic management, situational management, integrated development of leaders and organizations, etc.

It is known that the essence of work always implies the effectiveness of working together. To achieve concrete results, a lot of different work is needed. For example, at an industrial plant, for example, someone has to take care of the uninterrupted supply of raw materials, at each site should have the necessary equipment and a sufficient number of workers. Each member of the labor collective contributes to the production process, which forms the final result. The work contribution of each worker, if properly planned, is an integral part of overall success. The smaller the workforce is, the easier it is to integrate it into a cohesive whole. There is no need for any special management here, because

each manages his own work in his own way, adding it to the whole. In a small organization, there is usually no one to perform only the functions of a manager; in it all participate in a specific work process. However, with the growth of the organization itself, there are people for whom the function of management becomes essential. It's about executives. However, each employee also manages his or her job as part of the whole. The better he manages, the less the need for special management.

Each organization has its own goals. The better they are known and understood by employees, the greater the likelihood that they will be implemented. According to the scheme, management is divided into two parts (conditional, since in practice they are interrelated): managing the activities of the organization and managing people.

Management of the organization is aimed at achieving the desired results in this particular environment. Through the management system, managers strive to influence the process of achieving the goal at all stages - at the stage of planning, execution and monitoring of implementation. In practice, this is an activity management job. If we clearly manage our activities, then there is less reason to interfere with others. This is provided that we are well aware of the goals that we have set for us. In practice, we need the support of our colleagues and our supervisor from time to time to carry out our work. The more people work in a team, the more important it is for someone to lead them - both as groups and as individual employees. That is, for effective management of the organization's activities it is necessary to manage people.

Usually, people management is divided into managing themselves, the group and the staff of the entire organization. Organization staff may mean employees of one department or workshop or all employees of an enterprise or government agency combined. When it comes to managing the activities of an organization, then this distribution at the level of the individual corresponds to the management of their work and use of their time, at the group level - managing the activity of the group and at the level of the organization - managing the activities of the organizational unit or the whole organization as a whole.

Managing people from the point of view of the organization's activities means striving for maximum results in their work. The work of a manager also aims to achieve people's personal goals, in particular those close to the interests of the workforce. Thus, the work of the manager matters not only by the results of the organization, but also from the standpoint of the personal life of employees.

Management is a harmonious combination of human and material resources in order to accomplish the tasks and achieve the goals that the organization faces. Based on this understanding of management, the people who work at the enterprise perform the tasks assigned to them by management. To summarize, one can say that the sole purpose of management is to achieve results. However, for this purpose it is necessary to have both management and people management issues.

The main task of the manager is to achieve results. their achievement implies continuous repetition of the basic elements of the management process: planning, implementation of plans and control. But these basic stages of the management process should be constantly updated to meet the requirements of future changes in the external environment and the corresponding changes in the organization itself, ie to strive for new results as a common denominator of the development process. A result-driven management system is results management. In order to be successful, it is important that the organization's leadership clearly understand for itself what it seeks and what it can achieve in this particular situation, that is, to clarify its goals. This gives management an opportunity to evaluate the strategic starting factors of the organization. Such factors can be, for example, the current level of tasks that are put forward, the effectiveness of commercial ideas, the intermediate goals and the order of their importance, as well as the nature of the strategy chosen.

In practice, the question constantly arises of how to bring the decisions made to all levels of the organization, which means annual determination of the most important goals and results.

The main results can be:

- business activities;
- functional activities;
- so-called results of support.

It is important to define the main goals and results of a business activity, rank them in order of importance and achieve their consistency at all levels of the organization. Business results are most evident when balancing or benchmarking. These can be turnover coverage, variable and fixed costs, capital use (investment, working capital, etc.), profitability, and more.

If, however, this unit is not engaged in commercial activities (although the costs are responsible for any unit), then it is possible to define its functional goals and results. It can be the quantity and quality of products produced, the degree of utilization of production capacities, the efficiency of raw materials, energy, etc. They are set and very specific measurable goals, the achievement of which can be determined by different indicators of efficiency, productivity and

economy. These main results usually correlate - positively or negatively - with different components of the balance.

The results of the support, by their name, contribute to the achievement of commercial and functional results. As an example of external support results, we can refer to the characteristics of the enterprise, groups and types of products, relations with external groups. The results of support from within the organization can be determined by the motivation of the staff, the atmosphere of the organization, the use of working hours and the passage of information.

The above examples show that in the management of results, the very concept of "result" is quite broad and multifaceted. The starting point here is that for each worker or group of workers, some important results and goals are set for them, through which the fulfillment of tasks and the use of working time and other resources can be directed towards the achievement of the main goals that are set for the organization.

The main stages of the results management process are the process of finding out the results, the process of managing the situation and the process of monitoring the results.

The process of elucidating the results begins with a thorough analysis of the directions on which the desired outcomes for the different levels are determined. This process ends with the definition of line of business and commercial ideas for their implementation. The results that are relevant to the direction of the organization are expressed in terms of specific goals, strategies, main outcomes and intermediate goals. Management-specific results are presented in terms of key outcomes, goals, and time plans. The direction of each member of the organization is manifested in turn in the form of promotion plans and in general in life.

The process of managing the situation can be called day management. The basis of this process is the organization of affairs, activities of people and the environment in such a way that plans turn into desirable results. Particularly difficult is managing people and the environment, which cannot be predicted in every detail. Knowledge of the art of situation management implies that managers have the ability to analyze and take into account significant external and internal situational factors. You must also possess different leadership styles and influences to use them to meet the requirements of the current situation. In addition, persistence and creativity are required when managing the situation.

In the process of control it is found out what results in the field of commercial activity have been achieved according to the plan and which are by accident. In addition, it becomes clear how staff plans are being implemented to promote the work and life of each employee. An essential part of the control

process is deciding on the results of the controls in order to undertake appropriate measures. These measures can be programmed to be implemented in the day-to-day management or during the next annual plan. If these measures are of a large-scale nature, then they are taken into account in strategic planning. The most important conclusions in the planning of career and life promotion are the goals of work and life motivation.

Based on the above, results management can be defined as a process aimed at achieving commercial and supportive results, in which:

• The planning process defines, at different intervals, the direction of the organization and its members (in other words, requirements for results and expected results);

• The persistent implementation of the plans is underpinned by the day-to-day management of affairs, people and the environment;

• The results are evaluated and decisions are taken on the next steps.

In the content management of results, the most essential is the focus on results, which is both fundamental and functional. In managing results, the capabilities of the organization are used in such a way that the plans of activity cover both the strategic level and the level of individual use of working time by individual employees. Already at the planning stage, the use of will and thinking of all members of the organization is activated. The implementation (operational management) of plans and control are assessed as equal steps in the results management process. Attentive attitude to the contingencies along with the planned and expected results is also considered a significant feature.

Based on the result obtained, it is necessary to draw appropriate conclusions to plan the activities of the organization and each of its employees. Particular attention is paid to the issues of staff training, evaluation of their work and promotion system. Results management is a balanced development of the organization and the quality of life of its employees.

The transition to results management means a large-scale process of improving the entire organization

As you know, the personal contribution of a person plays a crucial role in the successful operation of the organization. The effectiveness of performance management as a system will be negligible unless leaders improve themselves within the limits set for them by the organization. Thus, development by results management means the formation of purposeful and professionally trained leaders.

Table 2.3

General characteristics of management and results management

Characteristic	Management [2]	Results Management
Overall focus	Unclear (or unconscious) management system aimed at achieving results that are not clearly defined	The results management system is the process of finding results. It includes: definition of results, operational management, control over results
Planning	There is a danger of being limited to “budgetary” goals. There is no clear link between the tasks of individual groups and individual employees. The initiative may be left unattended by the leader	Budgets, activity plans and development are drawn up. Presence of a specific result and focus on it. Consideration in planning the interests of all groups and individual workers. Achievements of "calendar certainty". Use of strategic management. Man, his will, desire are at the heart of everything
Operational management	Weak focus of current activities on achieving expected results; performance is imperfect due to insufficient attention to work time planning; it is believed that the results should come about automatically, thanks to the work of subordinates	Organization and ongoing planning of activities based on close relationship with the expected results; conscious stimulation for the results achieved; providing support to performers; permanent intermediate control, in particular the execution of schedules defined for individual works
Control	Targeting a narrow range of available criteria; attempts to replace the analysis with general explanations; “Control for control”; often - lack of conclusions on the state of affairs and validity of corrective measures	Emphasis is placed on commercial activity and support activities; advanced analysis of current results (including random ones); the conclusions for the implementation of measures are substantiated; "Victories" and "defeats" are seen as lessons for the future
Consequences of use	In the development of negative sides, there is a possibility of: one-sided development; use of "trendy" currents and standard solutions; belief in	Using the benefits - there is an opportunity for improvement through managed processes of change that are carried out comprehensively, constantly, at all organizational levels, taking into

	the possibility of abrupt development by finding a "panacea" without profound transformation in the organization	account the accumulated positive and negative experience, the basis for the further development of strategic management

Test tasks

1.Modern management is based on the following three basic principles of management:

1. Linear, functional and process;
2. Linear, functional and systemic;
3. Linear, functional and situational;
4. There is no right answer.

2. Such an important management function - as ..... - is realized in the unity of two processes - the formation of structure (structuring processes) and the organization of processes (production, management).

1. Planning;
2. Directing;
3. Control;
4. Organization.

3. The process management approach focuses on the study of:

1. Ways to improve the productivity of workers;
2. Ways to make decisions;
3. Interconnection of management functions;
4. Motives of human behavior in the organization.

4. Purpose of the process approach:

1. To promote the efficiency and effectiveness of the organization in achieving its tasks;
2. To be involved in the control and effectiveness of the organization in achieving its tasks;
3. To promote control and efficiency of the organization in achievement of the set tasks;
4. There is no right answer;

5. The concept of results management is developed:

1. American scientists;
2. Finnish scientists;
3. French scientists;
4. Australian scientists;

6. What is the goal management?

1. Achieving the goals and objectives of the organization;
2. Achieving the totality of goals and objectives facing the organization;
3. Defining the powers and responsibilities of all company executives;
4. Drawing up realistic plans to achieve the set goals.

7. To share the advantages and disadvantages of "goal management":

A. Advantages	1. The likelihood of conflict between operational and strategic goals is increasing;
	2. The goals of departments and employees are consistent with the goals of the organization;
B. Disadvantages	3. Employees are motivated to achieve goals;
	4. Allows to achieve improvement of performance at all levels of the organization;
	5. Managers sometimes find it difficult to set quantified goals for each subordinate.

8. Arrange the stages of the management process by goals in the correct order:

1. Planning events;
2. Periodic reporting;
3. Definition of purpose;
4. Self-control;

9. The essence of the process approach is set out in international standards:

1. ISO 9000 series;
2. ISO 14000 series;
3. OHSAS 18000 Series;
4. SA 8000 and ISO 26000 series.

10. To put in the right order the basic approaches of the management system

A. Total Quality Management	1. knowledge management;
Б. Manufakturing Resource Planning	2. work flow management system;
B. Work Flow Management System	3. general quality management system;
Г. Knowlenge Management	4. production resource planning;

11. The essence of an MBE can be determined by the following characteristics:

1. simultaneous consideration and assurance of achievement of all goals in the organization;

2. Each manager must be guided by clear goals within his / her responsibilities;

3. reconciling the goals and objectives of managers at different levels is a prerequisite for ensuring their implementation;

4. all answers are correct.

12. The system of methods and techniques that ensure the continuous orientation of management activities, planning and management decisions, the process of implementation of these decisions to the end results, taking into account the constantly changing socio-economic characteristics due to the development of the system of needs, quantitative and qualitative changes in the the production potential of the system is:

1. Process approach;
2. Targeted approach;
3. Process-oriented approach;
4. Systematic approach.

13. Currently, in practice, the most commonly used options are the manifestation of a targeted management approach, such as:

1. Target management;
2. Management by purpose;
3. Results management;
4. All answers are correct.

14. To put in the correct order the general characteristics of "results management":

A. General orientation	1. Budgets, plans of activity and development are drawn up. Presence of a specific result and focus on it. Consideration in planning the interests of all groups and individual workers;
B. Operational management	2.When using the benefits - there is an opportunity for improvement through managed processes of change, which are carried out comprehensively, constantly, at all organizational levels, taking into account the accumulated positive and negative experience, the basis for the further development of strategic management;
B. Consequences of use	3.The main attention is paid to commercial activity, as well as activities in support of it; advanced analysis of current results (including random ones); the conclusions for the implementation of measures are substantiated; "Victories" and "defeats" are seen as lessons for the future;
G. Planning	4.Organization and ongoing planning of activities based on a close relationship with the expected results; conscious stimulation for the results achieved; providing support to

	performers; permanent intermediate control;
D. Control	5. The results management system is the process of finding the result. It includes: definition of results, operational management, control over results.

15.The complex method, which from the outset was considered as complementary to existing management methods, which does not replace them, but allows to be combined based on some use within its systematic approach, is:

1. Results management;
2. Management by purpose;
3. Program-target management;
4. Target management.

THEME 3. PROJECT MANAGEMENT METHODS

Issues to discuss

3.1.Classic (traditional) or Waterfall (streaming method) Waterfall.

3.2.Adaptive Project Management (APF) is AGILE.

3.3.SCRUM

3.4 Lean (lean) production (LEAN).

3.5 Kanban Kanban Project Management (KANBAN).

3.6 SIX SIGMA Method

3.7.PRINCE2 Project Management Methodology (Projects in Controlled Environments).

3.8 The Program Evaluation Review Technique.

3.9.Critical Chain Project Management (CCPM) project management.

3.10 Critical Path Method (CPM).

3.11 Extreme project management (EPJ)

3.12.Theory of Constraints.

3.13. PRINCE2 Project Management Methods (Projects in Controlled Environments).

LECTURE

3.1.CLADICAL (TRADITIONAL) OR WATERFALL (FLOW METHOD) WATERFALL

The most common method of project management, based on the so-called "Waterfall" or cascade cycle, in which the task is transmitted sequentially in stages resembling a flow, schematically depicted in Fig. 3.1.

anagement

This approach is focused on projects that have strict constraints on the sequence of tasks. For example, building a house - it is impossible to erect walls without a foundation.

Usually there are 5 stages of classic project management, but additional stages can be added if required by the project.

5 stages of traditional management:

Stage 1. Initiation. The project manager and team determine project requirements. At this stage, meetings and brainstorming sessions are often held to determine what the product of the project should be.

Stage 2. Planning. At this stage, the team decides how it will achieve the goal set in the previous stage. At this stage, the team specifies and details the goals and results of the project, as well as the composition of the work on it. Based on this information, the team formulates a schedule and budget, assesses the risks and identifies stakeholders.

Stage 3. Development. This stage is not implemented for all projects - as a rule it is part of the planning phase. In the design phase characteristic of technological projects, the configuration of the future project and / or product and the technical ways of its achievement are determined. For example, in IT projects, the programming language is selected at this stage.

Step 4. Implementation and testing. At this stage, the main work on the project - writing code, building construction and so on. Following the developed plan, the content of the project is created and the selected criteria are monitored. In the second part of this phase, the product is tested and tested for compliance with customer and stakeholder requirements. In the testing part, the defects of the product are identified and corrected.

Step 5. Monitoring and completion of the project. Depending on the project, this phase may consist of a simple transfer of project results to the customer or a lengthy process of interacting with clients to improve the project and increase their satisfaction and support the project results. The latter relates to projects in the field of client service and software.

Different projects require different phases of implementation - some have enough and three phases, others much more. Sometimes it is called the so-called "iterative waterfall", in which each stage is a subproject, during which the tasks are implemented by fixed iterations. But the essence remains one - the project is divided into stages, which are carried out in a strictly defined sequence.

Due to the fact that classical project management is strictly tied to the time of execution of tasks, as a rule, predetermined at the planning stage, tools for calendar and network planning are perfectly suited for the implementation of projects under this approach.

The most common scheduling tool for network scheduling is the previously mentioned Gantt chart. There are many tools for building it - from simple spreadsheets such as Excel to professional software packages such as Microsoft Project and Primavera.

Strengths of classic project management

The advantage of this approach is that it requires the customer and company management to determine what they want to get, already in the first stage of the project. Early inclusion brings some stability to the project, and planning allows you to streamline the project. In addition, this approach involves monitoring indicators and testing, which is absolutely necessary for real projects of various sizes.

Potentially, the classic approach avoids stress due to the availability of spare time at each stage, laid out in case of any complications and risks. In addition, with a proper planning step, the project manager always knows what resources he has. Even if this estimate is not always accurate.

Weaknesses of classic project management

The main weakness of classic project management is intolerance to change. The classical approach is now used in the implementation of construction and engineering projects, in which the content of the project remains virtually unchanged throughout the project.

3.2. ADAPTIVE PROJECT FRAMEWORK ADJUSTABLE PROJECT FRAMEWORK AGILE.

Flexible iterative-incremental approach to project and product management, focused on the dynamic formation of requirements and ensuring their implementation as a result of continuous interaction within self-organized working groups consisting of specialists of different profiles. There are many methods based on the ideas of Agile, the most popular of which are Scrum and Kanban.

Not all projects can be structured in such a way that they can be implemented according to the classic project approach. For example, cooking one dish is ideally suited to a "waterfall" approach, but to prepare and serve a four-course dinner on time will be almost impossible if you have to wait each time to finish cooking one to start preparing another. In this case, you can use Agile. According to this approach, the project is not broken down into successive phases; it is divided into small subprojects, which are then “assembled” into the finished product (Fig. 3.2).

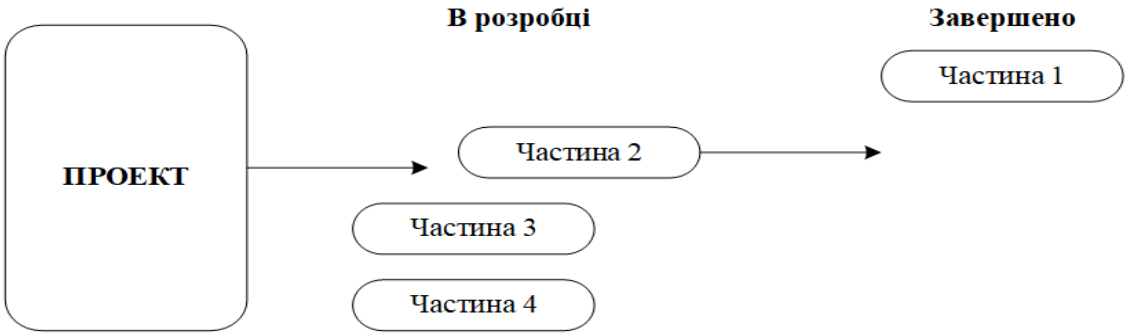


Fig. 3.2. Agile project management scheme

Thus, the initiation and planning are carried out for the whole project, and the following stages: development, testing and others are carried out for each mini-project separately. This allows the results of these mini-projects to be transmitted more quickly, and by embarking on a new sub-project (iteration), it can add changes at great cost and without affecting other parts of the project.

Named as Agile Manifesto in 2001, the family of flexible methodologies was named after the publication of Agile Manifesto.

Agile itself is more a set of ideas and principles for how projects should be implemented. Already, based on these principles and best practices, some flexible methods have been developed or, as they are sometimes called, frameworks: Scrum, Kanban, Crystal, and many others. These methods may be quite different from each other, but they use the same principles.

Agile Strengths

Agile's strength is its flexibility and adaptability. It can adapt to almost any conditions and processes of the organization. This is what determines its current popularity and how many systems for different areas have been created on its basis.

One of Agile's principles is: "Responding to change is more important than passing the plan." In addition, Agile is well-suited to open-end projects - such as launching a service or blog, developing new, innovative products. Such projects have a high degree of uncertainty and product information is disclosed as the project progresses. In such circumstances, it becomes impossible to implement the waterfall project.

Agile weaknesses

Agile is a set of principles and values. The downside is that each team will have to build its own management system based on Agile principles. This is a difficult and time-consuming process that requires change across the organization, from procedures to basic values. Not all organizations can handle it.

3.3.SCRUM

Scrum breaks down the project into parts that can be used immediately by the Customer to obtain values called product backlogs. These parts are then prioritized by the product owner - the customer representative on the team. The most important "parts" are first selected for sprinting (iterations in Scrum), lasting from 2 to 4 weeks. At the end of the sprint, the customer is given a working increment of the product - the most important "parts" that can already be used. For example, a site with some functionality or an application that is already running, even if partially. After that the project team starts the next sprint. The duration of the sprint is fixed, but the team chooses it independently at the beginning of the project, based on the project and its own performance.

To ensure that the project meets the requirements of the customer, who have the ability to change over time, before each sprint is reassessed not yet completed content of the project and making changes to it. The whole project team is involved in this process. The Scrum Master aims to help project participants better understand and embrace the values, principles and norms of Scrum practice. He is a leader and mediator between the outside world and the team. His task is to make sure that nobody interferes with the team independently and comfortably to work on the tasks set. The team is also responsible for ensuring that at the end of the sprint all necessary tasks are completed and deliveries are completed (Figure 3.3).

e Scrum process

The basic structure of Scrum processes revolves around 5 major meetings (phases / processes): backlog ordering, sprint scheduling, daily flying, sprint summation and sprint retrospectives.

- Backlog Refinement Meeting: This meeting is similar to the planning phase in classic project management, and is held on the first day of each sprint. It looks at - what has already been done on the project as a whole, what remains

to be done and a decision is made on what to do next. The product owner determines which tasks are most prioritized at this stage. This process determines the effectiveness of the sprint, because it depends on what value the customer will receive according to the sprint.

- Sprint planning: After the product owner has identified priorities, the team decides jointly what exactly they will do during the upcoming iteration, how to achieve the goal at the previous meeting. Teams can use different planning and evaluation tools at this stage so that they do not contradict Scrum principles and logic. The sprint scheduling is done at the very beginning of the iteration, after the product ordering meeting.

- Daily Fliers: Each day of a sprint, ideally, at the same time, team members spend 15 minutes sharing information about the status of tasks and the status of the project. It does not discuss problems or make decisions - if there are issues and conflicts after the meeting, the Scrum Master and the involved participants discuss them separately. The flyer is also needed to share information and provide all team members with up-to-date information on the status of the project.

- Sprint Summary: The purpose of the stage is to review and adapt the product being created. The team presents the results of the activity to all interested parties. The main task is to make sure that the product of the stage meets the expectations of the participants and is consistent with the goals of the project.

- Sprint Retrospective: conducted immediately after summarizing the sprint and planning the next sprint. The team finds out how well and smoothly the process of the stage implementation took place. The survey is exposed to problems that have arisen in the work, methodology and interaction. It is this stage that allows the team to reflect and make the next sprint more efficient.

Scrum is a flexible and structured approach to project implementation that, unlike Agile's blurry and general principles, will not allow the work to go wrong.

Strengths of Scrum

Scrum was designed for projects that need "quick wins" coupled with tolerance for change. In addition, this framework is suitable for situations where not all team members have sufficient experience in the area of the project - constant communication between team members allows to reduce the lack of experience or skills of some employees at the expense of more qualified colleagues.

Weaknesses of Scrum

Scrum is very demanding of the project team. It should be small (5-9 people) and cross-functional - that is, team members must have more than one competency needed to implement the project. For example, a software developer must have knowledge of testing and business intelligence. This is to ensure that part of the team does not "stand idle" at different stages of the project, as well as to allow staff to help and replace each other.

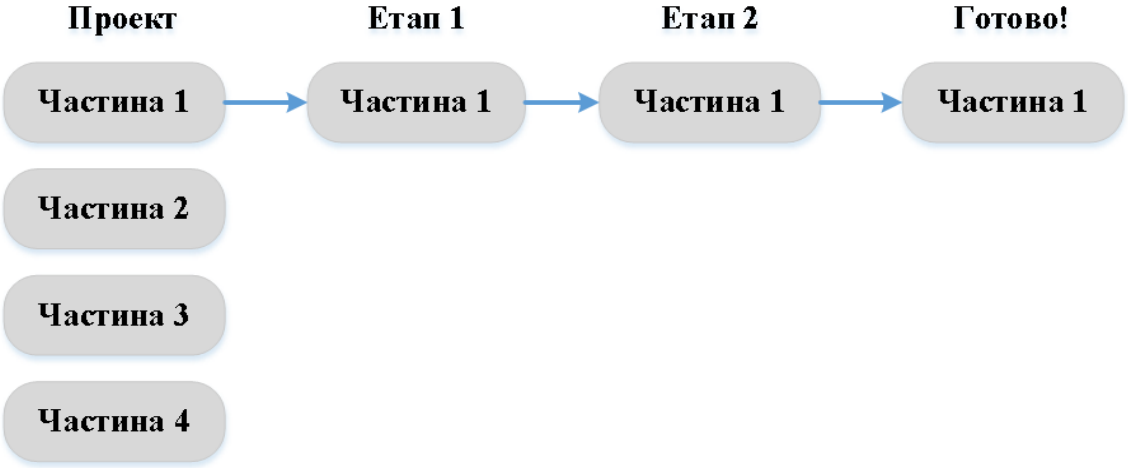
In addition, team members should be "team players", actively take responsibility and be able to organize themselves. It is very difficult to find such a mature team.

Scrum is not suitable for all teams and organizations also because the proposed process may not be suitable for the development of a specific product - such as an industrial machine or building construction.

3.4. TURING (LEAN)

Agile tells us we need to break it into small managed work packages, but it says nothing about how to manage the development of that work package. Scrum offers us its processes and procedures. Lean, in turn, adds to the Agile principles a workflow scheme for each of the iterations to be performed equally qualitatively.

At Lean, as in Scrum, work is broken down into small packages that are sold separately and independently. But in Lean, there is a flow of steps to design each supply package. As with classic project management, these can be the planning, development, production, testing and delivery phases - or any other stages required for quality project implementation.



ean process

The Lean stages and their flexibility allow you to make sure that each part of the project is implemented as needed. There are no clear milestones in Lean, as in Scrum there are restrictions on sprints. In addition, unlike classic project

management, Lean allows you to perform multiple tasks in parallel at different stages, which increases flexibility and speeds up project execution.

Like Agile, Lean is more of a concept, a mindset than something carved in stone. Using the ideas of Lean, you can independently create a system that meets the requirements of project management.

Lean strengths

If the project requires very high quality and clear execution, then Lean provides a set of tools to meet these requirements. Lean combines flexibility and structure like Scrum, but in a slightly different way.

Weaknesses of Lean

Not every part of the project requires equally detailed work and attention. Lean envisions this approach to every task and stage. This is a major disadvantage of using Lean for large and heterogeneous projects. Also, Lean does not offer a clear workflow for the implementation of "parts" of the project, which contributes to the extension of the project. This problem can be solved with effective guidance and clear communication - the main thing to keep in mind.

3.5. KANBAN KANBAN PROJECT MANAGEMENT (KANBAN).

Lean looks a little abstract in itself, but in combination with Kanban, it becomes much easier to use to build your own project management system. Created by an engineer at Toyota Taiichi Ono in 1953, Kanban is very similar to an industrial manufacturing scheme. At the entrance to this process comes a piece of metal, and at the exit is finished piece. Also in Kanban, the product increment is passed from step to step, and at the end comes an item ready for delivery.

Kanban is allowed to leave an unfinished task at one stage if its priority has changed and there are other urgent tasks. An unedited blog article that has been posted without publication date, or a piece of feature code that may not be included in the product - all of this is fine for Kanban.

Kanban does not limit sprints, there are no roles except the product owner. Kanban even allows a team member to do several tasks at once, which Scrum does not allow. Also, there are no regulated meetings on the status of the project - you can do it as convenient, but you can not do it at all.

To work with Kanban you need to define workflow steps. In Kanban, they are displayed as columns and assignments are assigned special cards. The card moves in stages, like the details of a factory moving from machine to machine, and at each stage the percentage of completion is higher. On the way out, we get a ready-made item for the customer. The column and card board can be both

genuine and electronic - even here Kanban does not impose any restrictions on users.

Fig. 3.5. Schematic of the Kanban process

Kanban has 4 pillars that support the whole system:

Cards: An individual card is created for each task, which contains all the necessary information about the task. Thus, all the necessary information about the task is always at hand.

Limit on the number of tasks per stage: The number of cards in one stage is strictly regulated. Due to this, it becomes immediately apparent when there is a "mash" in the flow of operations, which is quickly eliminated.

Continuous Flow: Backlog jobs get flowed in order of priority. That way, the work never stops.

Kaizen Continuous Improvement: The concept of continuous improvement emerged in Japan at the end of the 20th century. Its essence is the constant analysis of the production process and finding ways to improve productivity.

Kanban's strengths

Like Scrum, Kanban is well suited to a fairly cohesive team with good communication. But unlike Scrum, Kanban does not have a clear deadline set, which is well suited for motivated and experienced teams.

With proper setup and management, Kanban can greatly benefit the project team. Accurately calculating team workload, setting the right limits, and concentrating on continuous improvement all help Kanban seriously save resources and fit into deadlines and budgets. And all this combined with flexibility.

Weaknesses of Kanban

Kanban is best for teams whose members' skills overlap. In this way, they can help one another overcome the challenges of solving problems. Without it,

Kanban will not be as effective as it could be. Kanban is better suited when there are no hard deadlines. For hard deadlines, the classic approach or Scrum is better suited.

3.6. SIX SIGMA METHOD

Six Sigma is a methodology used in corporate management to improve production and eliminate defects. A strategic approach to business improvement that takes action to identify and eliminate the causes of errors or defects in business processes by focusing on those baselines that are critical to the consumer.

Initially, the method was developed by Motorola and its engineer Bill Smith (since 1986), but now many companies use it. Its development has been greatly influenced by previous product quality improvement concepts such as Total Quality Management (TQM) methodology and zero defects.

This is a more structured version of Lean than Kanban, which adds more planning to save resources, improve quality, and reduce defects and defects.

The ultimate goal of the project is to satisfy the customer with the quality of the product, which can be achieved through a continuous process of improvement of all aspects of the project based on careful analysis of indicators. Concept 6 sigma pays particular attention to eliminating emerging problems.

For this, a 5-step process known as DMEDI was proposed:

Define: The first stage is very similar to the early stages of other project management systems. It defines the content of the project, gathers information about the preconditions of the project, sets goals.

Measurement: 6 sigma focused on collecting and analyzing quantitative project data. At this stage, it is determined which indicators will determine the success of the project and what data should be collected and analyzed.

Research (Explore): At the research stage, the project manager decides how the team can achieve its goals and meet all requirements on time and within budget. At this stage, it is very important to think outside the box of the project manager when solving problems that have arisen.

Develop: At this stage, plans and decisions made in the previous stages are being implemented. It is important to understand that a detailed plan is needed at this stage, outlining all the steps needed to achieve the goals. Also at this stage the progress of the project is measured.

Control: a key step in the 6 sigma methodology. Its main task is to improve the implementation of projects in the long term. This stage requires careful documentation of the lessons learned, analysis of the data collected and

the application of the knowledge gained both in projects and throughout the company as a whole.

6 sigma is very similar to Kanban, only with the set stages of the task implementation - planning, goal setting and quality testing. Team meetings with 6 sigmas will be much larger than Kanban, but the project implementation process is more structured and more difficult for the team to get out of the way. 6 sigma can be easily adapted to the needs of a particular company or team. A rigorous requirement is only a careful measurement and monitoring of project performance during the implementation stages - without this, permanent long-term improvement of project implementation processes is impossible (see Figure 3.6).

Strengths 6 sigma

The 6 sigma concept provides a clear outline for project implementation and continuous process improvement. By defining goals, then carefully analyzing them and reviewing, we gain quantitative data to gain a deeper understanding of the project and make better decisions. Although data collection and analysis may take some time, it will improve and optimize project implementation processes and thus save future resources.

Fig. 3.6. Schematic of the Six Sigma process

6 sigma is suitable for heavy projects with many new and complex operations. This approach allows you to implement project elements, learn from mistakes, and improve quality in the future.

Weaknesses 6 sigma

The problem 6 sigma is that the main declared goal is to reduce costs and increase efficiency, but customer satisfaction is often foregrounded. Given some of the differences in goals at different stages of the project, teams are often confused about priorities, and it is not easy to avoid them.

Unless the project is one-on-one and the company does not plan to implement such projects in the future, all the costs of analyzing and taking lessons may be futile.

3.7. PRINCE2 PROJECT MANAGEMENT METHODOLOGY (PROJECTS IN CONTROLLED ENVIRONMENTS).

The British Government has long evaluated the effectiveness of project management, and in 1989 the British methodology PRINCE2 was created. The name comes from the acronym "PRojects IN Controlled Environments version 2", which translates as "Projects in a Controlled Environment Version 2". Unlike flexible methods, PRINCE2 does not use an iterative approach to the project. Comparing PRINCE2 with other methods, it can be compared with a hybrid of the classical approach to project management and concentration on quality with 6 sigma (see Fig. 3.7).

Unlike PMBOK, PRINCE2 does not include:

- specialized aspects of project management, for example, sectoral ones;
- specific project management practices and tools, such as Gantt chart, WBS, etc.

PRINCE2 focuses on the management aspects of the project, expressed in 7 principles, 7 processes and 7 project themes.

Fig. 3.7. Scheme of the PRINCE2 process

7 principles define general project management rules for PRINCE2, determine methodology base;

7 processes determine the steps of promotion over the project cycle;

7 topics are aspects that are monitored for the success of the project.

In addition, PRINCE2 recommends adapting the methodology to each organization.

At the beginning of the project, PRINCE2 proposes to identify 3 main aspects of the project:

- Business aspect (Will this project benefit?)
- Consumer aspect (What product are we going to do?)
- Resource aspect (is there enough for us to reach the goal?)

In PRINCE2, the project team structure is more clearly defined than in most project management approaches. This is due to the fact that PRINCE2 is focused on large-scale government projects and large organizations.

According to PRINCE2, each team member has a clear role to play in each of the 7 processes (see Figure 3.8):

- Starting up a project: During this process, a project manager is appointed and the general requirements for product characteristics are determined. The project manager, whose primary focus is attention to detail, reports to the project steering committee responsible for overall project management. It is the steering committee that ensures that the project does not stray, and it is fully responsible for the success of the project.

- Initiation a project: During this process, the project manager draws up a "Project Initiation Documentation", which contains the project plan by stages. The stages may take different amounts of time, but like in the classical approach, they follow one another strictly.

Fig. 3.8. Role diagram in PRINCE2

- Directing a project: This process enables the steering committee to be jointly responsible for the success of the project without delving into the details that fall within the remit of the project manager.

- Controlling a stage: certain changes will be made during the project implementation, even under ideal conditions. The Stage Control process implements one of the PRINCE2 principles - the exception management principle. It is the responsibility of the project manager to monitor the progress of the deviation from the planned project parameters in terms of terms, content, budget, etc. If these deviations exceed the authority of the project manager (in terms of PRINCE2 - tolerances), the project manager is obliged to inform the management committee and suggest ways to overcome the situation.

- Managing Product Delivery: The process of managing a product production is the interaction of a project manager and a team manager to create one of the project products. It is the responsibility of the project manager in this process to delegate the authority to create the product to the team manager and to accept the created product.

- Managing a stage boundary: During this process, the project manager provides the Steering Committee with all the information necessary to evaluate the results of the stage that has been completed and to decide on the next step.

- Closing a project: One of the differences with PRINCE2 is that the process of completing a project is not separated into a separate step or stage, as in the classical approach, but is performed within the final stage of product creation. The purpose of the process is to confirm that the product of the project has been accepted or that the project cannot do anything useful.

PRINCE2 can be adapted for projects of any size and any subject area. The methodology offers specific guidance on changing the project life cycle, role model, and set of required documents according to project needs.

Strengths of PRINCE2

- Adaptability to the features of the organization;
- having a clear description of roles and responsibilities;
- focus on project products;
- certain levels of management;
- focus on economic feasibility;
- sequence of project work;
- an emphasis on fixing experience and continuous improvement.

Weaknesses of PRINCE2

- Lack of industry practices;
- lack of specific tools for project work.

Project management is a science, but science is not the most accurate. There are no fixed foundations and universal solutions in this field. If a project manager is able to find a method that is perfect for the project, one can assume that he is lucky, because most less fortunate executives have to make efforts to

create and set up their own project management systems. These systems can be made up of elements of existing systems or even created entirely from scratch

3.8. THE PROGRAM EVALUATION REVIEW TECHNIQUE

Program (Project) Evaluation and Review Technique (abbreviated PERT) is a project evaluation and analysis method used in project management.

PERT is designed for very large-scale, one-off, complex, non-routine projects. The method implies the presence of uncertainty, enabling the working schedule of the project to be developed without the precise knowledge of the details and the time required for all its components.

PERT was designed primarily to simplify paper scheduling and schedule large and complex projects. The method is specifically aimed at analyzing the time required to complete each individual task, as well as determining the minimum time required to complete the entire project.

The most popular part of PERT is the critical path method, which relies on building a network graph (PERT network diagram).

In 1958, the Navy Division and the consulting firm Booze, Allen and Hamilton established PERT (Program Evaluation and Validation Method) to develop a schedule for more than 3,300 Polaris submarine contractors to solve the uncertainty in the calculations The PERT time is almost exactly the same as the critical path (CPM) method, except that PERT considers that the duration of each operation has limits that go beyond the statistical distribution.

PERT uses 3 estimates of time calculation for each operation:

optimistic (best); average; pessimistic (worst).

PERT developers decided to choose the beta distribution to express the duration of the operation.

In Fig. 3.9 (A) presents a beta distribution for the duration of a right-deflected operation and is a job that tends to fall behind the schedule

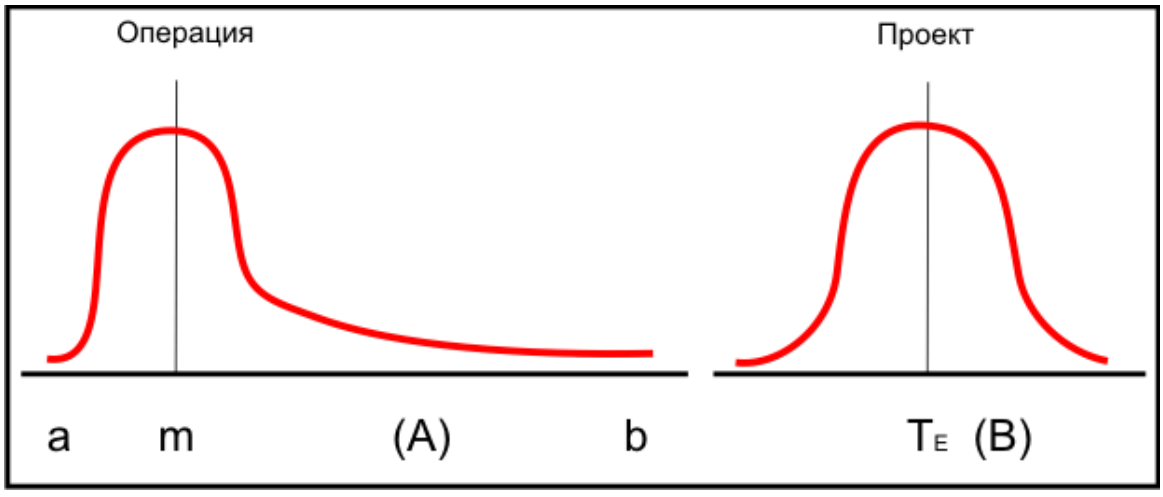


Fig. 3.9. Operation and project distribution density

The distribution of project duration is shown in symmetry in Fig. A5-7 (B).

The distribution of the project is the sum of the weighted average of operations on the critical path.

The average weighted operation time is calculated by the following formula:

$$t_e = \frac{a + 4m + b}{6} \quad (3.1.)$$

where te is the average weighted operation time;

a - optimistic time of surgery (1 chance out of 100 that under normal conditions the operation will be completed earlier than the term);

b - pessimistic time of surgery (1 chance out of 100 that under normal conditions the operation will be completed later);

m is the most probable operation time.

The average (deterministic) value is imposed on the project network, as with the use of CPM, and then calculate the early, later, standby and completion time of project work, as specified in the CPM.

Deviations in time estimates of operations are determined using the following equations. Equation 3.2 represents the standard deviation for the operation.

$$\sigma_{t_e} = \frac{b - a}{6} \quad (3.2)$$

$$\sigma_{T_E} = \sqrt{\sum \sigma_{t_e}^2} \quad (3.3)$$

Equation 3.3 represents the standard deviation for the project.

This amount includes only types of transactions on a critical or proven path.

The average duration of a project (TI) is the sum of all average time spent on operations on a critical path (the sum of te), and it follows a normal distribution.

Knowing the average duration of the project and the variance (mean deviation) of operations, it is possible to calculate the execution of the project (or project segment) up to a specific time using statistical tables.

Equation 3.4 is used to calculate the value of Z given in the statistical tables (Z is the number of standard deviations from the mean):

$$Z = \frac{T_S - T_E}{\sum \sigma_{t_e}^2} \quad (3.4)$$

where TE is the duration of the critical path;

TS - duration of work on a schedule;

Z - probability (execution of the graph), determined by the statistical

A hypothetical example of using the PERT method

The network of the project is presented in fig. 3.10

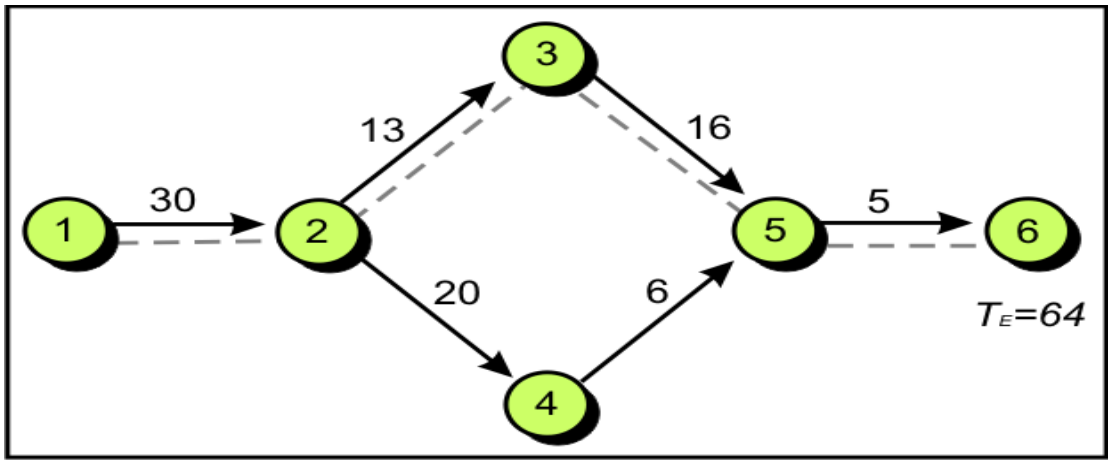


Fig. 3.10. hypothetical network

The estimated life expectancy (TI) is represented by 64 units of time;

Critical path - 1, 2, 3, 5, 6.

With this information and using standard statistical methods, it is easy to calculate the probability of project completion up to a specific time.

For example, how likely is the completion of the project to the specified time (Ts) of 67?

The usual project curve will be as in Fig. 3.11

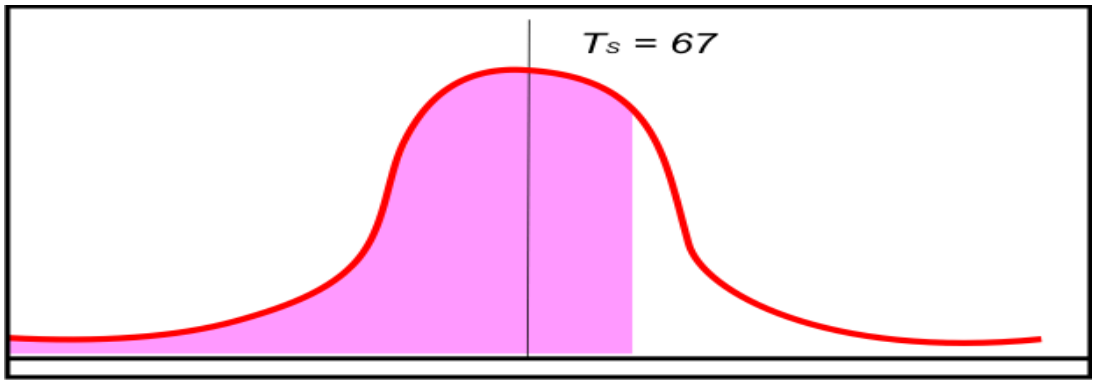


Fig. 3.11. Duration of the project is possible

Using the formula for the value of Z, you can calculate the probability as follows:

$$Z = \frac{T_S - T_E}{\sum \sigma_{t_e}^2} = \frac{67 - 64}{\sqrt{25 + 9 + 1 + 1}} = +0.50$$

$$P = 0.69$$

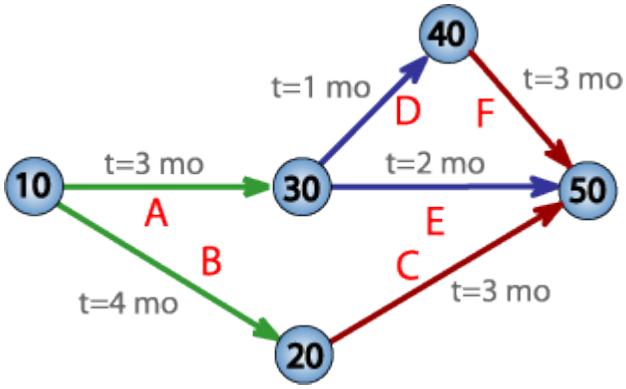
The probability of project completion up to a time period of 60 is calculated as follows:

$$Z = \frac{60 - 64}{\sqrt{25 + 9 + 1 + 1}} = \frac{-4}{\sqrt{36}} = -0.67$$
$$P = 0.26$$

A similar calculation method can be used for any path or section of path in the network.

The most famous part of PERT is the work-event diagram. Suggests to use graphs with nodes, arrows (network graphs), and Gantt charts.

Example of a PERT network diagram for a seven-month project with five intermediate points (10 to 50) and six activities (A to A)



The PERT diagram with the robots on the arrows is the set of vertices (events) together with their connected arcs (robots). Any quantifiable arc considered to be some of the work required by the project. This is the amount of resources allocated to this work and, accordingly, its expected duration (arc length). Any vertex is interpreted as the event of the completion of the work represented by the arcs that enter it, and at the same time the start of the work, which is reflected by the arcs emanating from there. Thus, it reflects the fact that none of the works can be started before all the work preceding it according to the technology of the project implementation will be completed. The beginning of this process is a vertex without inputs, and the end is a vertex without output arcs. The other vertices must have both arcs.

The sequence of arcs, in which the end of each previous coincides with the beginning of the next, is treated as the path from the starting vertex to the final, and the sum of the lengths of such arcs - as its duration. Usually the beginning and the end of the project implementation are connected by many ways, the lengths of which differ. The largest determines the duration of the entire project, the minimum possible with the fixed characteristics of the arcs of the graph. The appropriate path is critical, that is, the duration of the components of the project depends on the overall duration of the project, although changing the duration of any project work may be critical.

3.9.CRITICAL CHAIN PROJECT MANAGEMENT (CCPM) PROJECT MANAGEMENT

The Critical Chain Method (MCC, SSRM) was proposed by Eliyahu Goldratt in 1997. CCPM is a project planning and management method that focuses more on the constraints associated with project resources. It is based on methods and algorithms of constraint theory. This method differs from the Critical Path or PERT methods in that it does not imply rigid task sequencing and rigid scheduling. SSRM has developed a step-by-step method that allows you to objectively prioritize tasks, depending on the goals your organization is looking for. The notion of a critical task chain or simply a critical chain is introduced. A critical chain is a sequence of tasks, the duration of which depends on the total duration of the entire project.

You will probably agree that no matter how long it takes to complete each individual task within a project, it is important to complete the entire project on time. Regardless of the type of activity, there is always a need to complete several projects faster and with less cost. The acceleration of construction projects allows new factories and stores to be repaid faster and faster. Accelerating the development and launch of a new product expands market share, increases sales, and can be decisive for many companies as they compete for market leadership. In the field of information technology, the rapid introduction of new online systems means enhanced customer service, inventory management and a number of other important management tools. For most companies involved in strategic projects, accelerating projects is not just important, it is crucial.

Despite the wide range of different types of projects, there is a common list of problems:

- The projects take longer than planned
- Constant budget overruns
- Payments are not received on time -
Too many fixes and alterations
- Too much overtime
- Too often resources are unavailable on time (even if promised)
- The required documents are not available on time (information, specifications, materials, design, permissions ...)
- Permanent change of priorities
- It takes a lot of effort to achieve intermediate results
- Management requires increasing the number of projects in the work.

The fact that this list is so widespread suggests that the overall problem is much more related to how companies manage projects than to any technical or

specific factors. But there is also a positive point. The existence of a common problem kernel also gives companies a great opportunity to take a typical approach to solving a problem and implement more projects faster and with less resources.

The principles of TOC (Theory of Constraints) are based on the development of SSRM - the same sequence of ordering that allows prioritization of work. It must always be understood that at the moment it is holding back the organization from advancing to getting a better result. SSRM and TOC are fairly symmetrical technologies, although there are significant differences. There is no bottleneck in project management. Here, managers manage the points at which tasks intersect, where the individual branches of work are synchronized. This is a limiting factor, but not a bottleneck. In manufacturing processes where there are constraints within the company, there is definitely a bottleneck through which management takes place. It can be said that the fundamental principles of the two approaches are the same. The philosophy is the same. But the real tool is different, and there are nuances in what managers manage in projects or production.

The Limitations Theory of Project Management The Critical Circuit identifies three factors in project management that almost inevitably cause the negative effects listed above:

Bad multitasking,

Student Syndrome,

Parkinson's Law

Bad multitasking is the process of stopping a task before it is completed in order to do other work that is perceived as more urgent or important. Every time a task is stopped, there is a direct loss of efficiency due to the need to remember the details and "return" to the task from the same place when it recovers. Complex mental tasks may require extra time to get back to work. To make matters worse, stopping a task will delay subsequent tasks that will not be able to start until the previous one ends. As a result, the overall project implementation time is increased. Most companies readily acknowledge that bad multitasking takes place and that people tend to have many open tasks at the same time. This practice quickly leads to a "cascading effect". In other words, the delay propagates as a domino effect within the project, increasing the overall duration and delay of the project.

The second and third factors are directly related to how companies manage extra (spare) time in projects

Student Syndrome is associated with the phenomenon that most people begin to fully engage in the task at the very last moment before the end of the

term, as the student begins to study the subject before the exam. Student syndrome is a form of time delay (procrastination).

Parkinson's Law discloses the observation that "work expands, filling in all the time remaining until its completion." Every employee strives to be busy all the time so as not to look like a lazy person. And bureaucracy will generate enough internal work to keep itself "busy" and justify its existence without creating additional utility. Uncertainty is the reality of projects. Some measures to reduce uncertainty can be applied, but complete elimination of uncertainty and variability is simply not possible. Project management can be compared to driving a car in a million city. No matter how well you drive your car, there is always a chance of a delay (traffic jam, accident, road repair). No one can say exactly how long it will take to get from one place to another.

You can only leave earlier "with a stock", not to be late. Recall Murphy's Law (the law of meanness): if there is a likelihood of some trouble, it is bound to happen. Most companies often act as if they can eliminate variability and uncertainty inherent in project work. They do this in an effort to improve the quality of their assessment of the timing of the task. The goal is to learn how to set deadlines that can actually be achieved, while at the same time not have too much stock, and then to put people in charge of doing those assessments. The logical response of people in charge of meeting deadlines is to give their estimates of the deadlines in which they are confident. This means that people have to evaluate the duration of tasks with a sufficient safety margin, taking into account the significant number of things that can "go wrong" along the way.

Student Syndrome. While making time is meaningful, it is done with the best of intentions, and its impact on the project is devastating. If this safe time is embedded in the evaluation of individual tasks, the student syndrome immediately arises. Initially, students require extra time to prepare for the test, and when they receive it, it seems to them that a lot of time and urgency are taken off, they do not prepare until the test date approaches. The same goes for projects. When people are busy and their estimates say that there is enough time to complete the task, they will have no real reason to get started. As a result, most of the spare time built into the task is wasted at the beginning of each task. Student Syndrome contributes significantly to project delays and time increases. This spare time is not really used for the job, despite the best intentions of the people. And very often the situation arises: the stock that was consumed by "students" at the outset is necessary at the end to overcome some unforeseen obstacles. But it is gone. As a result, the task is delayed, despite the fact that enough time has been allocated for it, even with the necessary safety margin.

Parkinson's Law. On the other hand, every task is affected by Parkinson's law. It guarantees that if security time is added and not expended, the task will still not be completed before the scheduled time, even if there were no obstacles.

There are actually two nuances.

First, when people have extra time to complete a task, they often use that time to "perfect" or "polish" it. In this way, the work expands to fill all the time available.

Secondly, leaving early is a negative incentive for people. Completing a task well in advance of a scheduled date signals to management that the timing estimate is too large and that it can actually be done much faster. Next time, this task will be reduced to reduce the overall duration of the project. Understanding that this time of security may well be needed to address unforeseen problems, people will not be notified of the early completion of their tasks. As a result, most companies may notice that most tasks are usually close to estimates, and some tasks are completed later than planned. From this, it can be mistaken that the company is doing an excellent job of correctly estimating the duration of the tasks, and thus does not have much room for improvement through better synchronization. But this is very far from reality. The very nature of project implementation and its tasks lies in variability. It can take up to 10 days to complete one task, but for some obstacles or problems, 15 days next time. Therefore, in reality, trying to predict the duration of the task, however, to predict the travel time in a busy city on a daily basis. It is clear that the trip will take different times on different days. This means that if the evaluation of a task or project proves to be very reliable (that is, it is carried out in most cases), considerable (or hidden) time is lost in the process.

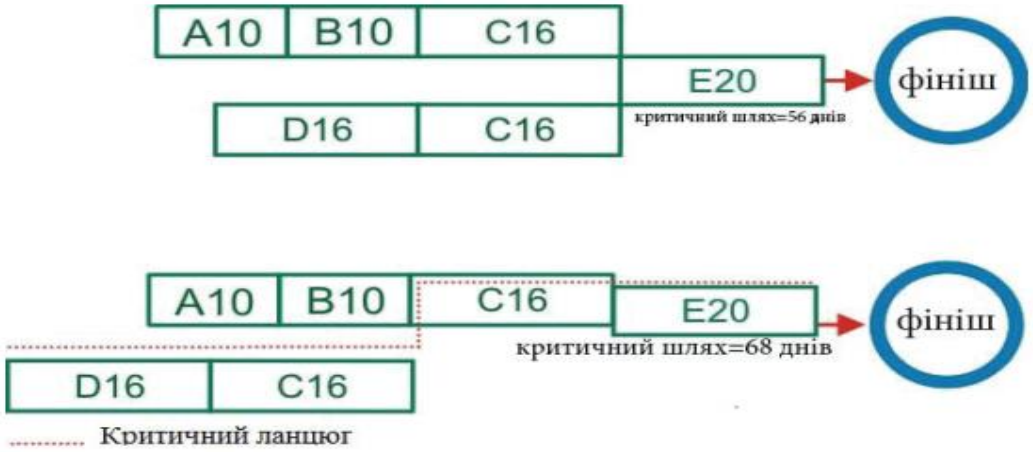
Therefore, it is possible to significantly shorten the duration and increase the number of projects without adding resources.

Critical Chain Method To make changes to the process of managing each project in a multi-project environment, you must first make the environment transparent. To do this, we need to reduce the number of concurrent projects and processes so that the remaining projects can focus the maximum attention on management. It is important to get objective information that is actually happening in the organization. This is very similar to managing the production process. If the production process is littered with work in progress, the first logical step will be not to put raw materials into the production process. You need to let the system unload, look at the bottleneck, and only then restart the process, depending on how much spare capacity is available on the limited resource.

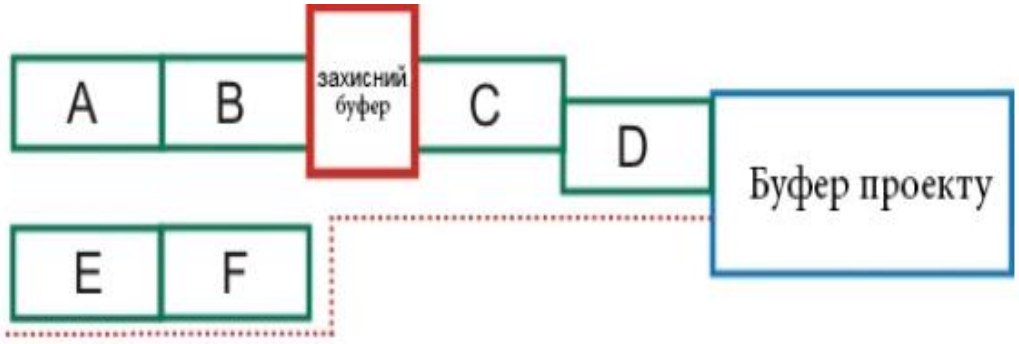
According to Theory of Limitations, the Critical Circuit method eliminates the impact of these major drivers of negative consequences. In order to reduce the effect of poor multitasking, the company must reduce the amount of work available on the conveyor. The sheer presence of many tasks on each desktop creates too many opportunities for poor multitasking and incorrect job prioritization. Project managers, motivated to complete their projects on time, will persuade them to devote resources and change priorities. Customers and management will be on their own to push resources. Performers will also be able to choose between different tasks based on their own preferences or motivation. All this ensures that bad multitasking will take place. The critical chain stimulates the reduction of the number of active projects by freezing a large part of the projects on the conveyor. While reducing multitasking, people stay focused and complete tasks much faster, allowing them to move faster from stage to stage, meeting much smaller work queues.

Freezing 25% of projects is usually sufficient to speed up the workflow and therefore the project completion time. When active projects are completed, frozen projects can be activated and completed much faster. This mechanism by itself leads to a significant increase in the number of completed projects on time, without delay of any projects. Coordination of the pipeline of projects with restriction. Once the freezing tool has been introduced into the process, it is important to ensure that new projects are started in metered volumes in order to achieve operating mode. In this way, the number of projects in the work will remain relatively low and poor multitasking will be reduced. The theory of constraints indicates that the conveyor in any system or project can leave as much work as it can through the weakest link (constraint) in the chain of operations. Running more work than can be done through a narrow neck will only result in a pile-up of work before the restriction, not an increase in the completed projects. The critical circuit requires that the work be started according to the capacity of the weakest link in the system (the most downloaded resource) and at a time agreed with the release of capacity on that resource. Planning the project implementation time. The second important aspect of the Critical Circuit is to plan protective time in projects so that extra time is not wasted and so that the planned project timeframes are as short as possible while ensuring their reliability. This can be achieved by defining at the beginning of the design the longest chain of interdependent tasks and resources for the project. This is very similar to the widely known Critical Path method. However, the Critical Path for multiple projects does not allow for the situation where the same resource is required for concurrent tasks. As a result, the Critical Path may provide a more optimistic forecast for the completion time of the

project compared to the Critical Chain, but the real time, as seen in the figure, will increase and will be consistent with the Critical Chain plan.



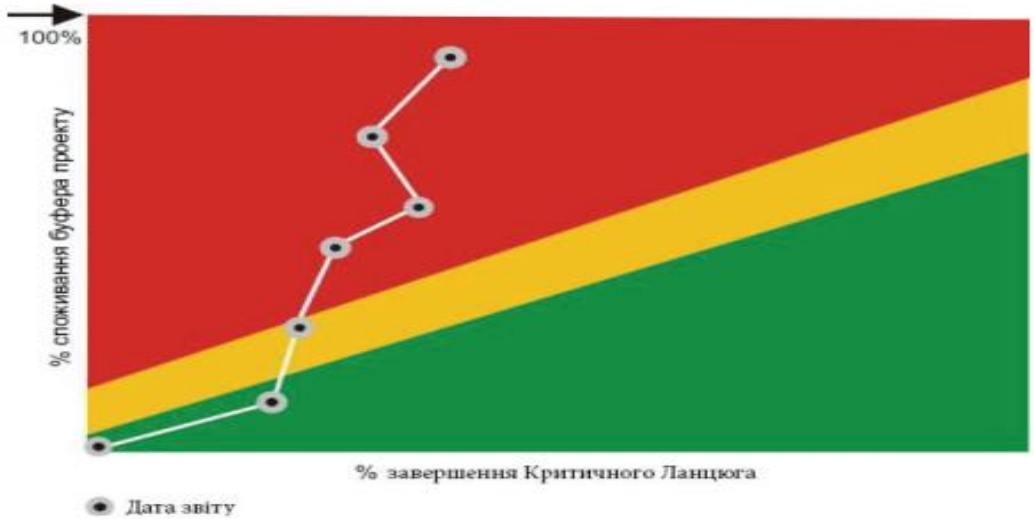
If, however, the planned timeframes for the Critical Path are realistic, they will be greater, because for all tasks on the Critical Chain, the estimated time of task fulfillment is usually reduced by 50%, and this shortened time is moved to the end of the project, into the overall project buffer. and into the small auxiliary task buffers contained at the end of each auxiliary path at the points of its integration into the Critical Circuit. Shortening much of the estimated task time and moving it to the end makes the buffer time much more suitable for project management purposes and accessible for any mission on the Critical Chain that may be delayed.



If the buffer is common to all tasks, the time for the individual task becomes much shorter (hence, the likelihood of causing a student's syndrome or Parkinson's is reduced). As a result, the delays resulting from multitasking are reduced, and therefore the required total protection time is significantly reduced. The probability of encountering delays at any particular stage of the task remains high, but the likelihood of encountering a delay on all tasks is reduced. The critical chain advocates halving protective time through the overall project buffer twice. Experience shows that virtually every organization at this time of protection is sufficient to complete the project on time.

Using Buffers to Make Management Decisions The last key element of the Critical Chain methodology is how these buffers are used to make

management decisions during project implementation. If delays occur on the Critical Chain, time will be consumed from the buffer at the end of the project. By observing the percentage of work done on the Critical Chain and the percentage of time spent on the project buffer, managers can more clearly assess the risks for the whole project and for the parallel ones as well. However, if the project buffer is consumed at a faster rate than the work on the Critical Chain, the buffer changes color to red (the project risks being late). If both the buffer and the Critical chain are moving at the same speed, the buffer will remain yellow (good indicator). If the work is done at a faster rate than the buffer is consumed, the project is ahead, the buffer is green. In this way, the project manager can clearly assess which projects are going well, are at risk, and therefore decide where and when to intervene. It is the responsibility of project managers to complete projects on time, and therefore it is important to see what task consumes the buffer faster than the project implementation is moving; which task delays work to begin the necessary steps to return projects back to the yellow / green area. By monitoring the trend detection buffer (it becomes greener or redder), the manager can easily see the effect of the corrective action they have taken. For unit managers, the key is to prioritize and load properly. Given that each task will be reinsured through the project buffer, the manager will see that if the stage progresses normally, the buffer will remain green, but if problems arise it will change to red. Project stages marked in red will receive a higher priority and the greens will wait, so they will have some protection time. Heads of units can thus allocate their resources depending on the status of all projects and eliminate the ongoing priority wars. Looking at the future tasks of their department and their status, managers can properly plan and allocate resources for tasks based on load and relative urgency.



The Critical Chain method provides a model of work for the resources themselves and the people who work on projects. Monitoring the state of the

buffer for each task allows you to evaluate which of the tasks are most important and make informed decisions about priorities without the help of senior management. They can also decide when it is important to seek help. Of course, it is very important to provide additional information about the projects to make sure it is up-to-date and accurate. Most project management approaches use job performance as a percentage of work completed, or based on time spent. Unfortunately, these figures do not indicate how long it takes to complete the task. In most cases, in practice, it takes the same amount of time as the first 90% to complete the last 10% of the project. To deal with this problem using the Critical Chain method, managers control the time remaining until the task is completed. In most cases, this is much easier and more accurate than using a percentage of time or time spent. There are several software packages on the West market that automatically provide the information and reports described above, making it much easier to apply the Critical Chain to your organization.

Conclusions. This method focuses the project manager's attention on team performance, proposes a new method for monitoring project progress based on the use of time and resource buffers. MCL can be used in almost any field where project management methodology is applied. Therefore, a significant acceleration of workflow and timely completion of the project can be achieved with the implementation of three key steps: the implementation of the project is consistent with the limitation of the system; project planning using the Critical Chain with Buffer method; making management decisions based on the state of the buffer. Companies that implement these measures typically complete more than 95% of projects on time, with project duration reduced by 25-50%. They achieve these results thanks to the synchronization of workflows across resources without additional involvement of people or investment in their systems. Shortening the duration of projects means completing more projects over the same timeframe, significantly increasing the return on investment in projects and accelerating the flow. Although the need for the proposed changes is conceptually difficult to understand, their implementation in practice is fraught with a number of serious problems. A great deal of confidence and commitment are required to change the existing system of work, procedures and activities at all levels. Moving from project startup mode as soon as possible (hoping to be implemented as soon as possible) to startup with restrictions means forgetting the widespread belief that the sooner you start a project, the sooner it is completed. On the other hand, the introduction of the practice of using buffers in projects requires support at the executive level and understanding of the fundamental principles, otherwise it will destroy the buffers and launch unrealistic plans. Project management and setting priorities

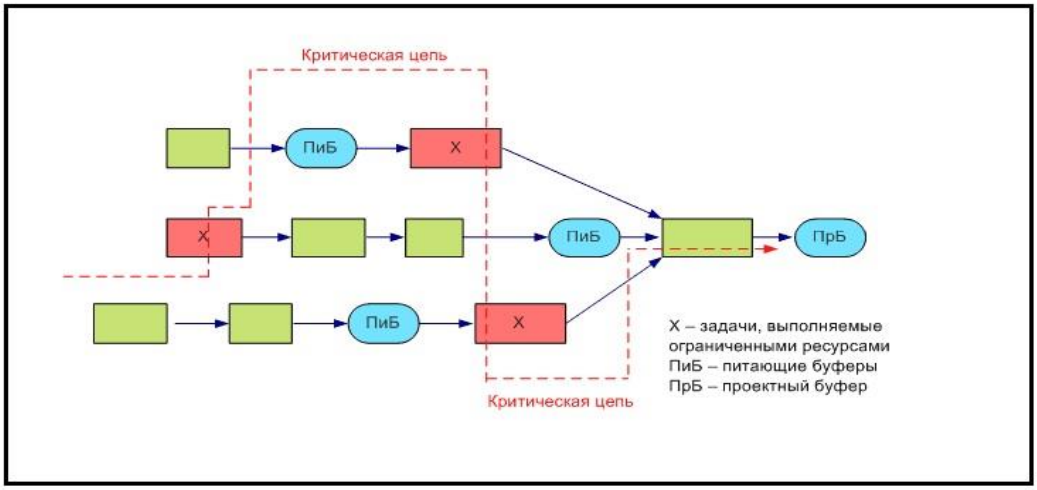
according to buffers means allocating resources between tasks depending on the status of the buffer of each task as the primary source of information for the manager. The significance of these cultural changes cannot be underestimated, as each change requires overcoming the inertia of existing practices and beliefs, each of which is capable of undermining the process of change. Elijah Goldratt, in his work, clearly states that it is an obstacle for the organization to implement a particular progressive technology.

In fact, there are three questions that each manager needs to think about. First of all, it is necessary to determine what needs to be changed in the existing management system and how to justify it. When a manager wants to show all staff or owners that existing technology does not suit the company, then a causal analysis should be made. Such an analysis must clearly prove that these elements of processes or procedures need to be modified if the company is to fulfill its strategic objectives and mission. The second thing to determine is how to change the situation. After all, if a person disagrees, but does not know what to change the situation, then this is futile criticism. For such an explanation, in the same way, the manager must have a cause and effect sequence of factors. Through this sequence, the manager "leads" the organization and explains why the new management model will be a factor of competitive advantage for the company. Typically, at this stage, the developers of theories in management stop. Goldratt, observing the processes of implementation of Theory of Limits, came to the following conclusion. It is wrong to ignore another question: how to implement this change? And for a more successful change process, in the same way, there must be a cause and effect model that will show you where to start and what the manager will do as a result. And if the manager does not reach the goal, then this model should show that it needs to be corrected. When a manager traces this cause-and-effect chain, he sees the whole logic of transformation, much better can convey the importance of change to subordinates who understand the logic. This is a good motivating factor - people become more proactive, proactive, accelerating transformation.

3.10. CRITICAL PATH METHOD (CPM).

You can only determine what CPM is by dividing the contexts for applying the term. In the context of the topic of project management, the CPM method is considered as one of two types of traditional sequential management, which, along with the Waterfall method, began to be developed in the mid-20th century in the United States. Here, the abbreviation CPM stands for Critical Path Method, which means "Critical Path Method".

In another sense, CPM is seen as one of the main indicators of the effectiveness of an online advertising campaign. Here, CPM stands for Cost Per Mille (rarely Cost Per Millenium) and stands for CPM. Specifically, it's about an advertiser engagement model that calculates based on a fixed payment for 1,000 ad impressions. It was about impressions, not subsequent clicks, that saw the ad person. In CPM, CPC - Cost Per Click - is not counted as a standalone value (free click-to-pay). But here we must also take into account the statistics of Internet sites, which show different characteristics of the target audience. Because we are dealing with a random coincidence of abbreviations in the definition, the second CPM in the article is not considered.



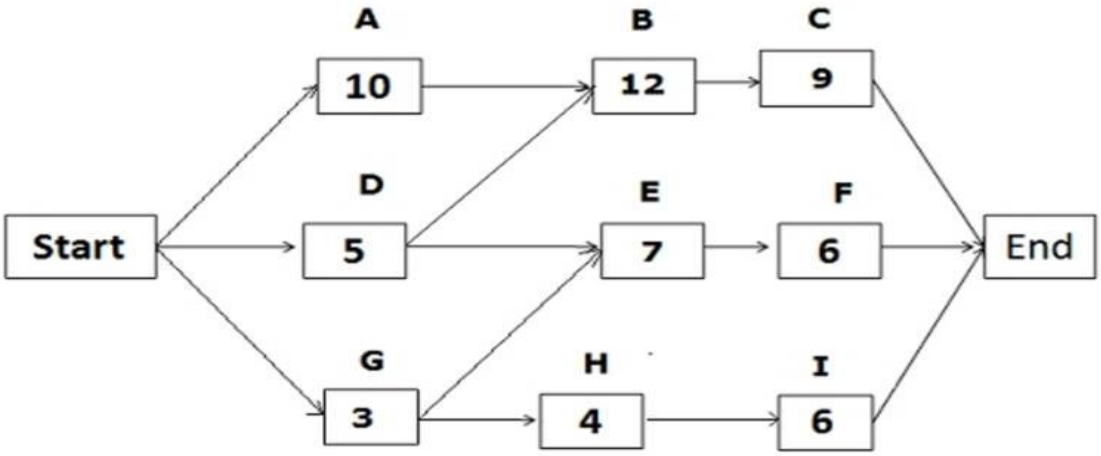
6 stages of time management of CPM project.

The process of building a critical path consists of 6 stages:

1. Specify and structure tasks. Tasks can look like lists or tables.

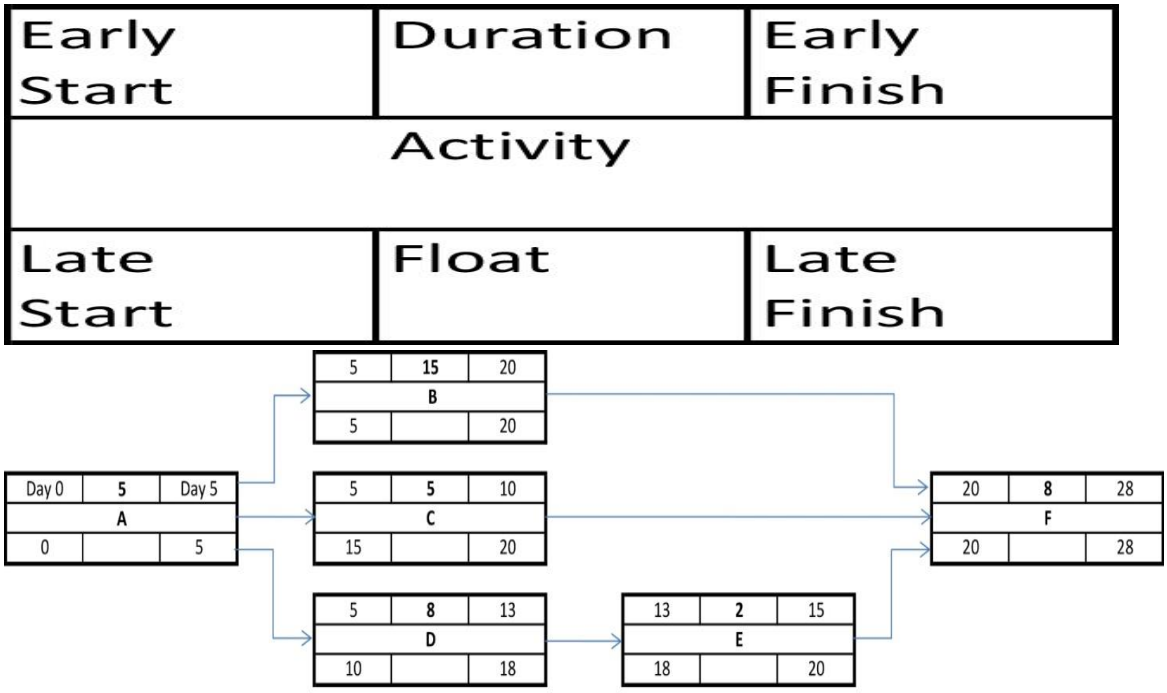
2. Establishing dependency between tasks.

3. Visualization of the critical path. This stage involves various forms of visual demonstration. Yes, project planning is done by executives using Gantt charts or a graphical diagram that includes numbered cells connected by arrows. Each task is given a name, and all possible paths are crossed out. This can be done using programs (including Excel) and on paper.



4.Evaluation of the period of completion of activities. Such assessment is carried out in hours, days, weeks, etc. depending on how large the project is conceived.

5. Choosing a critical path. From the possible project development options, a chain of critical tasks is selected and the longest sequence is established. Multiple critical paths increase the likelihood of schedule changes.



6. Updating the scheme depending on updates to the list of critical tasks.

CPM is a good tool for evaluating priorities, resources, and concurrent activities.

The main advantages of critical path analysis

How does the CPM method help project managers succeed?

 Displays each project graphically.

 Helps identify the most important tasks that you need to manage.

 Helps to save time and optimize project timing.

 Helps to compare planned result and actual status.

 Helps to make dependencies transparent and clear.

 Helps plan, schedule and control your projects.

 Helps to identify any critical activity that needs particular attention.

Why do project managers use the critical path method?

Managers receive the necessary information about the actual duration of the project.

They can manage tasks that need to be tightly controlled.

They can add limited resources to project tasks and list the importance of the critical path.

In case of non-compliance, they can quickly analyze, make changes and meet the deadlines.

The process of defining a critical path in projects is becoming easier. When the CPM method was developed, managers calculated it manually. Today you save your time without drawing tables and columns, using special programs and applications to determine the critical path.

Calculating the critical path using Excel

If you have planned a small project and need to determine the critical path, Excel can help. The following simple steps will help you calculate the critical path and create a graph.

Build a diagram.

Prepare the spreadsheet in Excel.

Identify the critical path in the project.

Create a Gantt chart.

Learn more about Critical Path Planning with Excel:

https://blog.ganttpro.com/en/metod-kriticheskogo-puti-critical-path-method-i-upravlenie-srokami-proekta/

Critical Path Method CPM with GanttPRO

How to determine the critical path of a project with GanttPRO?

Apparently, planning projects with Excel does not save you time. Creating a Gantt chart takes some effort here. GanttPRO can do the job for you. Just a few clicks will help you quickly identify the critical path of your project.

First, create a project and set up all the tasks with GanttPRO tools. Open any task, define start and end dates, duration and all previous tasks.

Then click the Settings button. Open the critical path in the GanttPRO diagram. So you will see the shortest time for which the project can be completed and the most important tasks.

3.11. EXTREME PROJECT MANAGEMENT (EPJ)

Extreme project management (XPM) - A method of managing very complex or uncertain projects. XPM differs from traditional project management methods in an open, flexible and non-deterministic approach. The focus is on the human factor in project management, rather than following complex techniques and rigorous formalism. XPM is a generalization of extreme programming techniques.

When managing extreme projects, we understand that the plan must change according to the state of the outside world. If the world changes tomorrow, then our plan will change. Change is the norm. The uncertainty is obvious. Stability is a deviation from the norm. -

Traditional project management is focused on the past. Extreme project management is forward-looking.

Jim Highsmith writes about this in his book, Adaptive Software Development (2000). He argues that the purpose of traditional project management is to achieve truth in the first stage, and the purpose of flexible or adaptive management is to achieve truth in the last stage. And this is more important.

The "prepare-fire-aim" approach characterizes a high-speed, fast-paced process. The focus is on a customer whose active involvement in the project is invaluable. The customer is the main stakeholder and, together with the project manager, constantly directs the progress of the project to the goal, which is constantly changing and becoming more clear with each iteration.

To survive in such a dynamic environment, the team must anticipate change, using a minimalist approach at every stage. If you do not know the future, why spend time planning it? Extreme project management does not do this. At the same time, extreme projects are aimed at achieving the expected value within the set terms in the amount of invested funds. This is quite obvious, as the extreme project is under constant consideration by the client and the project manager. -

Traditional project management forces people to serve the process. Extreme project management forces the process to serve people.

Traditional project management is a set of practices, approaches and methods that make people servants of the process. Gantt charts, protocols, reports, and other processes are designed to limit people's activities. Extreme project management is based on the assumption that people are the key to success: thoughts, emotions and interpersonal contacts are the basis of creativity. If the team is demoralized, the project will drop out of schedule, exceed the budget and worsen the result.

Thus, extreme project management pays serious attention to quality of life and gives project participants control over the process, not the other way around.

-Traditional project management centrally controls people, processes and tools. In extreme projects, control is evenly distributed.

Traditional management seeks to minimize change and establish tight control over processes. The manager of extreme projects is aware that something unknown and unpredictable can not be managed by the same methods as before. Trying to make reality fit with the project plan means wasting time. In properly organized no one is in control of the extreme project. On the contrary, they control everything.

- Traditional management challenges the world (objects, people, time). In extreme projects, the challenge is first and foremost to himself, his attitude, his approach to the Khmer.

Traditional project management seeks to get people, the budget, and the schedule in line with the plan. Extreme project management involves change, using a minimalist approach to planning and allocating control. At the same time, project managers should first and foremost focus on themselves, developing a mindset that is compatible with continuous change and innovation, and even wanted them. -

Traditional project management - manages. Extreme project management leads.

Traditional management stamps - working on a plan, minimizing change, tight control - are purely administrative functions. Traditional project managers are reminiscent of supervisors and only suitable for managing stable processes. In a world of extreme projects, where planning is minimized and changes are permanent and unpredictable, the project manager plays the role of leader more quickly. As it will be seen later, a good leader who heads an extreme project will allow people to find the best solution and perform constant self-correction.

When working on very complex projects, extreme management techniques work to your advantage as they focus on managing the energy field of the project: thoughts, emotions, and relationships that produce the end result. Extreme project management is the science and art of channeling thoughts, emotions and relationships to achieve meaningful results in difficult conditions, characterized by high speed of work, constant change, extreme uncertainty and extreme stress.

In his book Agile Software, Development Ecosystems 2002, Jim Highsmith uses the term ecosystem to describe a holistic environment consisting

of three interconnected components: "orderly-chaotic perspectives, shared values and fairly successful methodology. "

The term orderly-chaotic refers to an enterprise or organization that has signs of both chaos and order, and conducts its work in a way that does not allow management to get into the usual rut of causation.

Extreme project management is successful for three reasons. First, the manager of such a project is aware that something unknown and unpredictable can be managed by the same methods that govern something known and predictable. This makes it possible to make constant adjustments in real time. Second, extreme management focuses on establishing and maintaining the commitment of the project mission through the creation of strong trusting relationships between the main project participants. Third, extreme project management is more than just using proven methodologies, software tools and templates: extreme management adheres to a holistic, humanistic, business-centric, reality-based approach. -

Extreme project management is a holistic process. It is the only model built on mutually-integrated principles, values, and practices that increase productivity at three levels: private, team, and organizational.

It uses certain methods, tools and techniques; but if they do not yield seedlings on the fertile soil of a quantum worldview, then the benefits will be no greater than from a rolling ground wandering the wasteland. Don't get caught up in the tools and avoid the pitfalls of methodologies. Project management is not about filling in reporting forms. –

Extreme project management is human-centered. It focuses on managing the dynamics of the project, that is, on the relationships between its participants and on their changing expectations. The inability of a team to achieve technically achievable results rarely causes a project failure. Many beautiful solutions, systems and products still have dust on the shelves for the sole reason that they do not meet the real needs of a particular customer. The lack of management software tools is also not a major cause of failure.

The inability of a team to achieve technically achievable results rarely causes a project failure.

The way they poison the energy field, shocking the entire enterprise in a bad mood. -

Extreme project management is focused on business. The project is the first, if not the most important, business enterprise. The project team focuses on the rapid and frequent achievement of valuable results. And extreme project management implements project teams in practice. -

Extreme project management is reality based. It uses tools and methods that have real practical value in the project environment, characterized by constant change and high uncertainty. It tells you that if you try to force reality to fit your plans, you are wasting your time. Byron Katie, author of the book 41mm HWWM (2002), says at his seminars, "When you argue with reality, you lose one hundred percent of your time." The motto of extreme project management is "Rule Reality."

Since extreme project management is focused on people and clients, it is not surprising that its success is as follows: -

Customers are pleased with the pace of progress and temporary re-zul-tatami. There is a general feeling that the project is moving in the right direction, despite the instability of the environment.

There are specific results that customers can see and evaluate. Customers are satisfied with the end result. It meets all the success criteria that have been developed during the project implementation.

There are indirect (post-project) benefits.

The initial purpose for which the project was initiated has been achieved and can be measured. Team members are satisfied with the quality of life during the project implementation period. If you ask them if they are willing to participate in similar projects in the future, most will answer "yes".

In other words, the customer (client) receives valuable results throughout the project lifecycle, and team members gain valuable experience.

The main elements of an extreme model of success.

Anyone who wants to succeed in implementing an extreme project must maintain the commitment of project mission participants throughout the project lifecycle. This involves the use of quantum thinking: it is necessary to manage the project according to principles, values and practices compatible with variability and uncertainty. Using this approach forms the basis of extreme project management and is embodied in the following basic elements:

4 Accelerators are principles of motivation disclosure and innovation creation

10 Common Values - The components of the value system that establish the trust necessary for success among participants

4 Business issues are issues that, when they are frequently consumed, give confidence that the customer will get the desired result at every stage of the project.

5 Critical success factors are key tools and skills, as well as conditions that make it possible to achieve valuable results in the eyes of project customers

Taken together, these elements will allow you to maintain control in the face of volatility and significantly increase the chances of customers achieving the results quickly and often.

The 4 Accelerators and 10 Common Values are primarily human-centered and are fundamental fundamentals of extreme project management. Until this foundation is laid, 4 business issues and 5 Critical Success Factors will be shaky on the sand. All these elements must work simultaneously to maintain the project's energy field in an active and productive state.

4 Accelerators

(The principles of motivation and innovation creation)

1. Keep up with the changes.

2. The game is not the passion of people.

3. Make Lodev the master of the results achieved.

4.Do not complicate the process.

10 Common Values

(Creating Mutual Trust for Success) Free Communication, Beer - People, Quality of Life. Courage, Customer Interaction, Quick Bounce. Transparency, Goal Clarity, Outcome Orientation.

The 4 Accelerators and 10 Common Values are primarily human-centered and are fundamental fundamentals of extreme project management.

Principles of disclosing motivation and innovation: 4 Accelerators

4 Accelerators accelerate the flow of positive energy flows through the project energy field. They allow project participants, especially the project team, to adapt to change. Following these basic principles will help keep the project in good shape and the team in creative action. By this I mean, above all, a sense of responsibility for the results achieved. But most importantly, these Accelerators prepare a rich soil for innovative products and solutions.

A full description of the 4 accelerators will be given in Chapter Five, while we will only limit ourselves to a brief overview of them: 1.

Keep making changes. Changes have a negative impact on the project. They violate the order of things. Change is usually cautious, which is why traditional management places such great importance on managing change.

Extreme project management requires a different attitude to change - one in which change is perceived as a new opportunity, and acceptance of change increases the chances of achieving the desired result (which may be significantly different from what is planned).

In practice, the phrase "Keep changing" means that you have to accept change and move on.

2. Play on people's passions. I do not think that in the morning many people are excited by the idea that they need to return to work on the project. In fact, the word project contains some depressing implication. People will be very enthusiastic if they know that they are fulfilling a mission; if they consider the project not as a "project" but as the cause of their actions. Putting a second accelerator into practice means that you have to show people that their work is part of something bigger, giving them a clear idea of goals and means. 3.

Make people master results. People care about what they create. Suppose I like to feel part of an important project, but if it is a risky venture, like any extreme project, then I would like to influence the progress of the project. Putting this principle into practice means that you have to trust people's professional abilities and enable them to influence the success of the whole project, including measuring project performance. 4.

Do not complicate the process. For an extreme project, the good old principle of "less is better" is not an empty sound. This is very serious. In practice, less becomes bigger: fewer processes, less governance, less policies and standard procedures.

Building Mutual Trust for Success: 10 Common Values

It is a value system based on the unwavering belief of the project participants that, working together, they will surely succeed, even in adverse changing circumstances. Henry Ford once said, "If you think you can, then you can. If you think you can't, then you can't. In any case you are right.

These values are directly related to people, processes and business (for a more detailed description, see chapters five through seven):

Human values 1.

The main thing is people: remove all obstacles and give people the opportunity to perform their work qualitatively. 2.

Free Communication - Act consistently and openly speak the truth about the good, the bad and the terrible without fear of punishment. 3.

Quality of life - Make sure that the right balance between work and personal life is maintained. 4.

Courage - act in spite of your fear; act against fear if you know what you are doing right.

Process Values 5.

Customer interaction - continuous interaction and communication with customers throughout the enterprise, as opposed to simply receiving the requirements and lack of feedback. 6.

Quick failures - Finding the shortest path to project failure by performing the most difficult, risky or important work early in the project. 7.

Good visibility - Keep everything you can in mind: project plans, progress made, products developed, reports, and responsibility for the work done.

Business Values 8.

Clarity of goals - it is necessary to see not only the purpose of the project, but also the whole picture as a whole: why the project was initiated in the first place. 9.

Outcome Orientation - Focus on achieving results, not current tasks. 10.

The early result is to give the customer something he can use as soon as possible.

4 Business issues

4 Business issues constantly remind all participants that a project is first and foremost a business enterprise: the main goal is to achieve meaningful results at every stage, including the implementation phase, which comes after all project results have been achieved. 4

Business issues are as follows (for a more detailed description, see chapters 5 through 8): 1.

Who needs it and why? 2.

What to do? 3.

Can we handle it? 4.

Is it worth it?

Putting four business issues into practice means constantly updating your business plans to reflect your current expectations and prospects.

3.12. THEORY OF CONSTRAINTS

Theory of constraints is a holistic and effective methodology for managing any system in any activity that was developed in the 1980s by Eliach Moshe Goldratt. Restriction theory is based on finding and managing the key constraint of the system, which determines the success and efficiency of the whole system as a whole. The main feature of the methodology is that, by making efforts to manage a very small number of aspects of the system, an effect is achieved that far exceeds the result of simultaneously affecting all or most of the problem areas of the system at once or in turn.

Types of restrictions

The constraint theory approach is based on identifying these constraints and being able to manage them to increase the effectiveness of achieving the goal (for businesses to accelerate and maximize profit generation). Where efficiency is the speed of achieving a goal at the lowest possible cost, without reducing the goal by content. Methodologically, restriction theory includes a number of logical tools to find constraints, identify the managerial contradictions behind it, prepare solutions, and implement them with the interests of all stakeholders in mind. Targeting the end result allows you to achieve extremely fast results (for businesses 2-3 months), the focus on mutually beneficial solutions allows to increase the level of interaction and motivation of the staff.

Eliahu Goldratt has developed and published applied Theory Restrictions for operating processes and production management, financial management and metrics, project management (new product development, construction), logistics and supply chain marketing, all sales, personnel management, tactics and system development strategies.

Among the limitations of the methods offered by the theory are a set of rules for checking the logicality of statements about the work of the organization and cause and effect relationships between them, algorithms for constructing cause and effect diagrams, the drum - buffer - rope method, as well as the critical chain method for project management.

One of the methods of constraint theory widely used in manufacturing is the drum-buffer-rope method, which defines the following principles:

1. "drum" - production must work in some rhythm;

2. "buffer" - before the restriction, there must be some buffer of material stocks, which protects the restriction from idle time;

3. "rope" - materials should only be put into production when stocks have reached a minimum before the restriction, not earlier, so as not to overload production.

Restriction theory also offers a more general systematic approach to finding and removing constraints, which can be applied not only in production, but also in other, most diverse systems. This approach consists of sequentially constructing analytical schemes of the following types:

• Current Reality Tree (DDA, similar to the current state chart used by many organizations) - to identify cause and effect relationships between undesirable phenomena and the root cause of most of these undesirable phenomena.

• Conflict Resolution Chart (PEC) - to resolve system conflicts that are often the cause of an unwanted system situation. The method of eliminating contradictions is commonly called injection.

• Future Reality Tree (DMR) - When some methods (injections) for resolving the root causes of a problem or conflict identified in the DPR are selected in the diagram, a tree is displayed to show the future state of the system. This is necessary to identify the negative branches, that is, the possible negative consequences of the selected injections and the choice of preventive actions to prevent the occurrence of these negative branches.

• Transition tree - to identify possible obstacles to the transformation and eliminate them.

• Transformation plan - to produce specific instructions for contractors to implement planned changes.

This approach is described in the art form in the book "Meta-2. It's not about luck. " A more formal academic language is that of W. Detmer's Theory of Goldratt's Limitations.

The Goldratt Thought Process Method, unlike many similar information visualization techniques (such as Ishikawa diagrams, mental maps), offers a set of rules that allow for the validation of cause and effect relationships. The following rules are called Categories of Legitimate Reservation Criteria (CATP) - these are eight provisions that can be used to verify, prove, or disprove the correctness of a cause and effect relationship:

• Clarity - Everyone clearly understands the statements used in the diagram.

• Presence of affirmation - the statement contains a finalized opinion.

• Is there a cause and effect relationship - does the named cause cause the effect?

• Sufficiency of the reason given - the reason given is sufficient to cause the said effect in this context.

• Checking for an alternative cause - can't the cause be named just one possible one?

• Inadmissibility of substitution of cause by consequence - a confusion of cause and effect.

• Finding a test consequence - if the named cause is present, it must have not only the specified consequence, but also some other, incidental, consequences (which need not be indicated on a specific chart).

• Lack of tautology - the consequence is suggested as a justification for the existence of a cause.

3.13. PRINCE2 PROJECT MANAGEMENT METHOD (PROJECTS IN CONTROLLED ENVIRONMENTS)

Projects in Controlled Environments (PRINCE) is a project management method. The method involves managing, controlling and organizing the project.

PRINCE2 is the second release of the Office of Government Commerce (OGC), a registered trademark of the United Kingdom Treasury, a registered trademark of the United Kingdom Treasury.

PRINCE2 comes from the earlier PROMPT method and the PRINCE project management method, which was developed in 1989 by the Central Computer and Telecommunications Agency (CCTA) as the UK's standard for information technology project management. technology (IT). Soon, the standard began to be used outside the IT field. In 1996, PRINCE2 was recognized as a universal project management method. PRINCE2 has become extremely popular and is now the de facto standard of project management in the UK.

The latest version was released in 2009 as a result of the Prince2: 2009 Renewal of the UK National Chamber of Commerce and Industry.

PRINCE2: 2009 Update: Since 2006, the method has been revised, and on June 16, 2009, it was published under the title "PRINCE2: 2009 Update". The name "PRINCE2" (instead of "PRINCE3" or similar) was used to demonstrate compliance with the principle of the method. Still, this is the most significant revision of the method since 1996 in order to adapt it to the changing business environment, simplify and "facilitate" it, as well as better integrate with other methods of the UK Chamber of Commerce (ITIL, P3O, P3M3, MSP , etc.). The main difference between the 2009 release and earlier releases is the appearance of two directories instead of one. Managing Projects Using PRINCE2 is an updated management technique designed for project managers whose project management is a daily activity. "Strategic Project Management Using PRINCE2" (New Directing Projects Using PRINCE2) is a new document for the Project Manager and the Project Management Board, ie project sponsors / clients.

The Theoretical and Practical Exam will be based on the new Project Management Handbook and will not include materials from the Strategic Project Management Handbook. The passing score for Theoretical Exam will remain unchanged. The entrance exam score will increase from 50% to 55%. Practical exam duration will be reduced from 3 hours to 2.5 hours.

PRINCE2 is a structured project management approach that focuses on project management within a well-defined organizational structure. PRINCE2 describes the procedures for coordinating people and tasks in the project, how to

create / plan the project and what to do if the project needs to be modified due to the inconsistency of the actual status of the project implementation plan. Each process is identified with key inputs and outputs, as well as specific goals and objectives to be fulfilled, which generally allows for control of deviations from the plan.

Separation of the method into manageable parts ensures effective control of resources, making it possible to carry out controlled and organized monitoring of the project. PRINCE2 provides a single terminology for all project participants. The various roles of managers and areas of responsibility are fully described and can be adapted to the complexity of the project and the competencies of the organization.

However, PRINCE2 is considered inappropriate for very small projects because of the amount of work required to create and update documents, protocols, and registers. Quite often, this is due to a misunderstanding of which parts of PRINCE2 to use, as PRINCE2 can be fully scaled.

Of course, all this is fine, but the perception of PRINCE2 is compounded by the fact that for every effective project that uses the PRINCE2 methodology, there are a number of ineffective projects that use the so-called PINO methodology (literally, PRINCE In Name Only - literally, PRINCE in name only)).

Common problems are:

• The project start stage is lowered / pushed, and the organization proceeds immediately to the creation of a Project Initiation document (PID).

• The project council is not effective - escalations go into the "black hole" and the like.

• Missing Product Description (PD), without which quality management in PRINCE2 does not work.

• Tolerances are not set, or set only for lead time and cost - it is not clear to what extent the authority is delegated to contractors or when escalation is needed (to raise decision-making levels).

• The project actually consists of a single stage (or "phases" are used to avoid the End Stage Review).

• Project Initiation Documents are actually copy-paste Project Initiation Documents from the last project - they are not followed and are created because they are "required".

• Low level of involvement of “business”, as PRINCE2 is considered “technical” method - project outputs may not produce the desired results.

• The successes and failures of using PRINCE2 were one of the reasons for the creation of the PRINCE2 Maturity Model - P2MM.

The PRINCE2 Maturity Model describes a set of Key Process Areas (KPAs) that are required to effectively implement and use PRINCE2 in an organization. The PRINCE2 Handbook describes project management and does not include a description of PRINCE2 implementation processes in an organization, while P2MM describes PRINCE2 implementation processes.

P2MM describes the key practices that are attached to PRINCE2 processes and components to ensure repeated method use (Level 2 KPAs), as well as key practices required to implement the method (Level 3 KPAs) as a standard business project management process, including: owner (3.1), adaptation of method (3.2), training (3.3), integration with other management systems (3.4), quality assurance mechanism (3.5).

Flowchart of PRINCE2 Processes. Arrows mean flows of information. PRINCE2 is a procedural method of project management as opposed to adaptive methods such as Scrum. PRINCE2 2009 identifies 40 individual activities (tasks) and combines them into seven processes.

The beginning of the project

At this stage, the project team members are identified and a brief project description is prepared (description of project objectives and commercial justification of the project). According to the general principles of the method, the next stage of the project is planned at the same stage. After the completion of these works, the Project Board must agree on the next stage of the project - the initiation of the project.

The main tasks include: appointing a project manager and project manager, defining and appointing a project management team, creating a brief project description, defining a project management method, planning the next phase of the project (initiation).

Initiation of the project

This stage is based on the results of the tasks of the project start phase. The brief description of the project is extended to the business case. The points of quality control of the project are consistent with the points of control of the status of project implementation. A plan for the next phase of the project is created. The results of the stage are submitted to the approval of the Project Council in order to agree to continue the work on the project.

The main tasks include: planning quality indicators, creating a project plan, detailing the business plan and risks, identifying project control points, creating a Project Initiation Document.

Strategic project management

This process determines how the Project Board (which defines the role of project sponsor) will control the project as a whole. The project council allows /

authorizes the project initiation phase as well as the project itself. The strategic management also determines how the Project Board should coordinate the milestone, including the approval of any milestone that may alter the existing project plan due to any changes in project timelines or key indicators.

It also determines how the Project Board can change the project plan, how the project is closed.

The main tasks include: means of project initiation approval, project approval, stage approval or deletion of project stage, confirmation of project completion.

Control

PRINCE2 provides for the division of the project into stages to be monitored. It is generally determined how the task packages are assigned and agreed. It also determines how the status of task completion is monitored and how that status is reported to the Project Board. Means for monitoring and evaluating project implementation are provided along with ways to apply corrective action. Methods of escalation of a certain range of problems for the Project Council are also fixed.

Main tasks include: assigning and agreeing task packages, evaluating task accomplishment status, reporting task accomplishment status, applying corrective action, escalating project problems, confirming completion of task pack.

Stage Border Management

The monitoring of the implementation of the project stages is the definition of the list of tasks that must be completed within the stage. Stage Border Management determines what must be done when the stage is completed. At the completion of the stage, you must create a plan for the next stage. The overall project plan, project risk list and business plan are reviewed and updated as necessary. It also defines a list of actions in case the stage does not meet performance metrics. Generally, it is determined how the stage completion is reported.

The main tasks include: planning a stage, updating a project plan, updating a business plan for a project, updating project risks, reporting on the completion of a stage, creating a contingency plan for not fulfilling certain project tasks.

Completion of the project

The tasks to be completed when the project is completed are identified. The project must be formally completed (resources must be released for other tasks), the outcome of the tasks must be determined and the project itself must receive a formal evaluation.

The main tasks include: completion of the project, determination of the outcome of the tasks, evaluation of project implementation.

Test tasks

1. A project management method whereby a task is transmitted sequentially in stages resembling a stream - it is…

a) methods of group management;

b) methods of group and process management;

c) Classic (traditional) or Waterfall (streaming method) Waterfall;

d) methods of social regulation

2. Sequential scheme of classical project management:

a) Initiation-Planning-Development-Implementation-Testing-Monitoring and Completion

b) Initiation-planning-monitoring-development-implementation and testing-monitoring and completion of the project

c) Initiation - monitoring - planning - development - implementation and testing - project completion

d) Initiation - monitoring - development - planning - implementation and testing - monitoring and project completion

3. Stage 2 of traditional management (Planning) is characterized by:

a) The project manager and team determine project requirements. At this stage, meetings and brainstorming sessions are often held to determine what the product of the project should be.

b) This phase is where the main project work is done - code writing, building construction and so on. Following the developed plan, the content of the project is created and the selected criteria are monitored. In the second part of this phase, the product is tested and tested for compliance with customer and stakeholder requirements. In the testing part, the defects of the product are identified and corrected.

c) Depending on the project, this phase may consist of a simple transfer of project results to the customer or a lengthy process of interacting with clients to improve the project and increase their satisfaction and support the project results. The latter relates to projects in the field of client service and software.

d) At this stage, the team decides how it will achieve the goal set in the previous stage. At this stage, the team specifies and details the goals and results of the project, as well as the composition of the work on it. Based on this information, the team formulates a schedule and budget, assesses the risks and identifies stakeholders.

4. In what year was the current name for the Agile Manifesto family of flexible methodologies published in:

a) 2000

b) 2001

c) 2002

d) 2003

5. What is the classic project management method otherwise called?

a) Adaptive

b) Waterfall

c) Critical

6. The basic structure of Scrum processes revolves around MANY major meetings (phases / processes):

a) 3

b) 4

c) 5

d) 6

7. The classic approach avoids stress through:

a) A clear commitment to the timing of tasks

b) Availability of spare time at each stage

c) Accuracy of estimation of predicted results

8. Originally Six Sigma was developed by…

a) Motorola

b) Prestigio

c) Nokia

d) Samsung

9. A 5-step process known as DMEDI was proposed:

a) Planning, definition, research, development, control.

b) Definition, measurement, organization, development, control.

c) Organization, definition, measurement, control, development.

d) Definition, measurement, research, development, control.

10. Project evaluation and analysis method used in project management?

a) Classic (traditional) or Waterfall (streaming method) Waterfall

b) PRINCE2 project management method

in the SIX SIGMA Method

d) Program (Project) Evaluation and Review Technique (abbreviated PERT)

11. The weighted average time of the operation is calculated by the following formula:

а) $t_e = \frac{a + 4m + b}{6}$

б) $\sigma_{t_e} = \frac{b - a}{6}$

в) $\sigma_{T_E} = \sqrt{\sum \sigma_{t_e}^2}$

г) $Z = \frac{T_S - T_E}{\sum \sigma_{t_e}^2}$

12. The most famous part of PERT is…

a) is the sum of all average time taken for operations on the critical path (the sum of te), and it follows a normal distribution.

b) it is a diagram of the relationship of works and events.

c) - project evaluation and analysis method used in project management.

d) rather it is a set of ideas and principles of how projects should be implemented.

13. By whom was the critical chain method proposed:

a) Went Bention Moiseyevich

b) Elijah Goldratt

c) Ivan Bardin

d) Ernest Rutherford

14. Unlike PMBOK, the PRINCE2 methodology does not include:

a) defined general requirements for product characteristics;

b) specialized aspects of project management;

c) long-term improvement of project implementation processes;

d) specific project management practices and tools, such as the Gantt chart.

15. Theory of constraints -

a) a holistic and effective methodology for managing any system in any activity that was developed in the 1980s by Eliach Moshe Goldratt.

b) Development of optimal methods of work performance through scientific study of time, labor and effort of employees;

c) a special social layer specializing in management

d) the idea that any organization, as an open complex system, tends to adapt to a rather complex external environment, and the main causes of what is happening in the system should be sought outside it.

THEME 4. PROJECT APPROACH TO ORGANIZATION MANAGEMENT

Issues to discuss

4.1.The concept of the project, the general characteristics and types of projects.

4.2. Project management in the operational and production management system and its main phases.

4.3.Business design in the production management system.

LECTURE

4.1. THE ESSENCE OF THE PROJECT, THE GENERAL CHARACTERISTICS AND TYPES OF THE PROJECTS

The project is a set of interrelated activities that are developed at different levels of management in order to accomplish specific tasks and achieve clearly defined results within a given time with set resource constraints.

The purpose of the project is a desirable and justified result that must be achieved within a certain timeframe under the given conditions of implementation. The purpose of the project (its mission) has a structure that can be represented as a hierarchy of project goals.

At the same time, defining the purpose of the project requires justification of the task, which requires: defining the results of the activity for a certain period; quantitative evaluation of the results of these activities; proving that these results can be achieved; determining the conditions under which these results can be achieved. The main properties of the project, by which they can be classified into types, include: scale (cost), complexity, quality and duration (lead time). A specific analysis of these properties does not relate to the objectives of this topic, so we will give a generalized description of them.

1) The scale of the project is divided into small, medium, large and large. In practice, small projects include projects worth up to $ 10 million, medium-sized projects range from $ 10 million to $ 50 million, large projects range from $ 50 million to $ 100 million, and large projects exceed $ 100 million.

2) By complexity projects are divided into monoprojects, multiprojects and megaprojects.

A monoproject is a separate project of a certain type and scale, with relatively small costs and implementation time.

A multiproject is a complex project that consists of several monoprojects, which requires a lot of project management.

Megaprojects are a complex project of development of regions, sectors of the economy, etc., which consists of several mono- and multiprojects, combined for one purpose.

3) By quality, projects are subdivided into projects of ordinary quality and defective. Unlike conventional, defective projects, special quality requirements are imposed and their cost can be quite significant.4) By duration (deadlines) projects are divided into short-term (from several days to 2 - 3 years), medium-term (from 3 to 5 years) and long-term (more than 5 years).

By nature and scope of activity projects can also be divided into different types: industrial, research and development projects, organizational, economic and social, projects implemented in the framework of operational and production activities.

1) Industrial projects are projects aimed at launching and selling new products. They are usually associated with the construction of structures, the improvement of technology, the expansion of market presence and more.

2) R&D projects are focused on research activities, development of software tools for processing information, new materials and designs, etc.

3) Organizational projects are aimed at reforming the management system, creating a new organization, holding conferences, seminars, etc.

4) Economic projects aim at privatization of state-owned enterprises, development of the capital market, reform of the tax system and other macroeconomic transformations.

5) Social projects are related to the reform of the social protection system, health care, overcoming the consequences of natural, economic and social shocks and other factors of social nature.

6) Projects of operational production systems are associated with the implementation of specific operations and works that require a long enough execution time and that do not "fit" in the normal mode of management of the production system.

4.2. PROJECT MANAGEMENT IN THE SYSTEM OF OPERATION MANUFACTURING AND ITS MAIN PHASES.

Almost all managers, at least from time to time, are charged with project management. Such a need for production management may arise, for example, in the creation of new facilities or processes. The main requirement for all projects is to ensure that they are clearly managed and managed.

Project management is the process of coordinating all types of resources (human, material, financial) over the life cycle of a project based on modern management techniques (techniques) in order to execute the works, volume, cost, time and quality of work and to satisfy the interests of project participants.
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In order to effectively manage projects, it is necessary to understand their life cycle and the main stages of its development.

The project life cycle is the time from the first cost to the last benefit of the project. It envisages the development of the project, the work that is carried out at various stages of preparation, implementation and operation of the project.

It is proposed to consider three phases of the project - conceptual, contractual and project implementation phase.

1) In the conceptual phase, the concept of the project is developed, its viability is assessed, project planning, development of project requirements, selection and acquisition of land, etc. are carried out.

2) The contract phase covers the development of qualification requirements, preparation of a preliminary task, selection of potential contractors, contracting with selected contractors, selection and approval of the final version of the project, the start of the project.

3) The project implementation phase has two stages - detailed design and delivery; construction or installation. Another option for identifying work related to the different phases and stages of Project Management is the World Bank approach. It identifies six stages that play an important role in most projects. These are identification, development, expertise, negotiation, implementation and final evaluation. These stages are combined into two phases: the design phase - the first three stages, the implementation phase - the last three stages. The project management phases of the production and operating system are divided into three main phases: project planning, scheduling, control of project implementation.

Project planning involves, first and foremost, the creation within the firm of appropriate design organizations to perform work, which generally goes beyond the ordinary management of the production system.

A project organization is an effective way of combining the people and physical resources needed to complete the original project or achieve the required result within a specified timeframe.The project organization achieves certain results through the use of qualified specialists from any other department of the firm.

Such an organization successfully works, provided that: clearly defined the result of the work and the duration of its execution; the job is new and to

some extent unfamiliar to the existing organization; the work brings together a set of interrelated tasks that require specialist knowledge to solve them; the project is temporary but needs to be organized.

The project manager coordinates his activities with other departments and sends results reports to top management, often to the president himself. Project managers are given the opportunity to use extensive company information and control key elements of project planning and development.

When planning projects it is necessary to go through the following stages:

definition of the idea (mission, necessity) of the project;

definition of project goals;

selection of the best project options;

feasibility analysis of the project.

Setting goals is the next step in project planning. Projects can have many goals, but in defining them, particular attention should be paid to the views of all project participants.

The idea of the project may be driven by different circumstances:

Initiative of firms seeking to take advantage of new opportunities;

the unused or underutilized material or human resources and the ability to use them in more productive industries;

Need to make additional investments;

M the desire to create favorable conditions for the formation of appropriate production infrastructure, etc.

When identifying the best project option, it is important to consider a wide range of possible alternatives. It is very important to include all possible options in the initial list of ideas discussed, and then to reject the worse options in the logical selection scheme. Reasons for rejecting project options may be: excessive costs and risks compared to expected benefits; unsuitable technology for the project purposes; large scale of the project, which does not correspond to the existing organizational and management capacities, high costs for operation of the project in comparison with the available financial resources or in comparison with alternative solutions, etc.

The preliminary feasibility analysis of the project helps when the selection of project ideas failed to reduce the number of submitted options to several that merit detailed study. With this approach, you can find out what options the project needs to be left for further detailed consideration, and at the same time provide compelling reasons for rejecting other options.At the project planning stage, the team managing it also determines the sequence of work (s)

and associated costs, assesses the overall need for staff, suppliers, equipment and more.

The next phase of project management involves working out clear timetables for its implementation. The need for project schedules is due to the fact that they:

Establish links of each work with other works and the project as a whole; Identify the sequence of connections among works;

facilitate the establishment of realistic time and monetary estimates for each job;

They help improve the use of human, monetary and material resources by identifying project bottlenecks.

One of the popular means of working out project schedules is Gantt charts. They reflect time estimates and are easy to read. Gantt's charts do not require significant expense, but help managers to make sure that: all necessary work is covered by the plan; the order of their execution is calculated; duration of work is set; overall track time of project implementation. In today's context, in addition to Gantt charts, project schedules are widely used to use two network project management methods: the critical path method and the plan evaluation and revision method. There are various aspects of project control.

First, it is the engineering and technical supervision of the technical aspects of the project. It is carried out by technicians who check that the production capacity, products and services meet the technical requirements.

Second, it is the customer's control over the progress of the project as a whole. This aspect of control includes monitoring the progress of the project and proposing any necessary changes to the design or implementation plan of the project. The task of such control is threefold: it protects project participants from unexpected unpleasant surprises; contributes to the existing amount of knowledge about different approaches to the problem; gives the opportunity to avoid similar problems in the development and implementation of other projects.

Third, the control of any project as a managed system involves the immediate and rapid management of resources, monetary costs, quality and budget. Modern computer software and software packages allow you to receive various messages to effectively implement this aspect of control

Fourth, monitoring at this level also means using feedback to evaluate the state of implementation of the project plan and to move resources to where they are most needed. This makes it necessary to monitor the progress of project implementation work and to compare them with the relevant standard.This

standard is a detailed work plan for the project, which includes a schedule, cost estimate and quality specification.

4.3. BUSINESS DESIGN IN PRODUCTION MANAGEMENT SYSTEM

The essence of business planning is to develop a kind of document that covers all major aspects of the enterprise: its production, commercial and social problems.

Due to the fact that the business plan is the result of extensive research and organizational work to determine the specific direction of the firm in a certain market and in certain organizational and economic conditions, it relies on: specific project for the production of a specific product (service) or creation a new type of product or service; comprehensive analysis of the organization's production, business and commercial activities aimed at identifying its weaknesses and strengths; Study of specific financial, technical, economic and organizational mechanisms used in the economy.

The need for business planning (in a generalized sense) is that it helps: prevent making the wrong decisions due to the entrepreneur's incompetence; integrates production, sales and business development into a single system of functioning; enables to make gross mistakes in the absence of business experience; forms the business character traits of a successful entrepreneur who possesses the art of business and the ethics of a businessman. More specific reasons that necessitate business planning may be:

First, our economy is comprised of a new generation of entrepreneurs, many of whom do not have the experience of leadership in market conditions, and therefore have little understanding of all the problems that await them.

Secondly, a dynamic and changing business environment also requires experienced executives to re-calculate their actions in the market and prepare for such unusual activities as the fight against competitors.

Third, the business plan allows the entrepreneur to see a clear perspective of his business, to assess the current economic situation and its capabilities, to determine the effective directions of development of the company and all necessary actions to achieve the set goals, to analyze their own ideas, to check their realisticness.

Fourth, the business plan will be a standard for the entrepreneur and employees, against which they will compare the results of practical activities for its implementation and make the necessary adjustments in this activity. This will allow you to clearly understand your tasks and see your own personal

perspectives related to the business, evaluate the personal contribution of each employee.

Fifth, a business plan is the link between the production organizer and the investor.When he wants to raise funds from an outsider, for example, by contacting a bank or another investor, he has to work out a business plan, get this potential investor interested in investing in the proposed business, prove the effectiveness of this investment and the reality of return.

Business planning is an integral part of any enterprise, regardless of its size. The business plan should provide a generalized analysis of the opportunities for starting or expanding a business in a particular situation and clearly showing how the management of the company can use this potential. Hence the basic functions of the business plan

The main functions of the business plan

The first is the ability to use a business plan to develop and implement a business strategy. This function is vital during the creation of the enterprise, as well as the development of new areas of activity.

The second function is that the business plan is a tool by which the entrepreneur can evaluate the possibilities of developing a new line of business, see the actual results of that activity for a certain period and control the processes within the firm.

The third function is to attract funds (loans, loans), which are quite difficult to obtain. Banks require different guarantees, but a decisive factor in granting a loan is having a well-developed business plan.

The fourth function of business planning is that it helps to attract to the plans of the company potential partners who wish to invest in the production of equity or technology in them. The issue of providing capital, resources or technology is also solved only if there is a business plan that reflects the course of development of the company for a certain period of time.

The main purpose of developing a business plan is to plan the business activities of the firm for the near or long term in accordance with market needs and opportunities to obtain the necessary resources. Other business planning goals may be: clarifying the extent to which the results are achieved; substantiation of economic expediency of directions of development of the firm (strategies, concepts, projects); proving to a certain circle of persons the expediency of reorganizing the work of an existing firm or creating a new one; conviction of the employees of the firm in the ability to achieve the qualitative and quantitative indicators defined in the project.

Thanks to business planning, you can also solve a number of tasks, the main of which are the formation of long-term and short-term goals of the

company, strategies and tactics for achieving them.Identification of persons responsible for implementation of the strategy; identifying specific areas of activity of the firm, target markets and firm's place in these markets; calculation of the expected financial results of the activity, first of all sales, profit, capital income; selection of employees (teams) who are able to implement this plan; determining the composition of marketing activities of a company for market research, advertising, sales promotion, pricing, sales channels, etc .; analysis of the financial condition of the firm and the correspondence of available financial and material resources to the ability to achieve certain goals; calculating risks and anticipating difficulties that may impede the implementation of the business plan.

Neglecting to draw up a business plan, an entrepreneur can face the troubles that await him on the road to success. Therefore, it is better not to spare time and seriously develop a business plan. Business planning gives the company a number of benefits, including: Forcing managers to fundamentally explore the prospects of the firm; Allows for a clearer coordination of the efforts undertaken to achieve the set goals; determines the performance of the firm required for subsequent control; Encourages managers to more specifically define their goals and ways to achieve them; Makes a firm more prepared for sudden changes in market situations. The main advantage of business planning is that a properly worked out such plan gives the prospect of development of the firm, that is, ultimately, answers the most important question for the businessman: whether it is necessary to invest money in this business, whether it will bring income that will pay off all the expenses of energy and means. Therefore, considering the essence, necessity, functions, goals and objectives of business planning, we can conclude that business plan is an integral part of internal planning, one of the most important documents that are developed in the enterprise.

Test tasks

1.Define the concept of "project" is ...

a) the need to assess the management situation and use any information or knowledge that will have the greatest effect in this case;

b) each management action is a decision-making action and each management factor can be calculated and coordinated;

c) logical extension of systems theory, way of thinking about the organization that deals with specific situations, namely: the selection of factors that created a particular situation and are the most influential, identify the

disadvantages and advantages, limitations and consequences of the situation, the choice of specific techniques and management methods for a specific the situation;

d) it is a set of interrelated activities that are developed at different levels of management in order to accomplish specific tasks and achieve clearly defined results within a given time with the set resource constraints.

2. The goal of the project is: (choose a bigger painkiller)

a) The desired and justified result to be achieved within a certain timeframe

b) Desirable and justified result that must be achieved within a certain timeframe under the given conditions of implementation

c) Desirable and justified result that must be achieved under the given conditions of implementation

3. By scale projects are divided into:

a) Small and large

b) Small, medium, large and extra large

c) Small, medium and large

4.Confirm the concept and definition:

A. Monoproject 1. is a complex project of development of regions, sectors of the economy, etc., which consists of several mono- and multiprojects, combined for one purpose.

B.Multiproject 2. is a separate project of a certain type and scale, with relatively small costs and timeframes.

V.Magaproject 3. is a complex project consisting of several monoprojects, which requires a lot of project management.

5. Considering the project phases:

a) Conceptual, contractual and project implementation phase

b) Design, project implementation phase and implementation control

c) Conceptual, contractual and control

6. The project organization is…

a) organization and ongoing planning of activities based on a close relationship with the expected results; conscious stimulation for the results achieved; providing support to performers; permanent intermediate control;

b) systematic monitoring and evaluation of the progress of the achievement of the goals (by performing the planned tasks) by the employees themselves without external intervention.Implementation of remedial actions initiated by contractors within the authority

c) promote the efficiency and effectiveness of the organization in achieving its objectives;

d) an effective way of combining the people and physical resources needed to complete the original project or achieve the required result within a specified timeframe.

7.Choose the conditions of successful work of the project organization:

a) clearly defined result of the work and duration of its execution

b) the work has already been done and there are clear methods of its implementation

c) the work integrates a set of interrelated tasks that require the knowledge of specialists

d) work involves unrelated tasks

8. Set the correct sequence of steps to be followed when planning projects:

a) selection of the best project options

b) defining the project objectives

c) definition of the idea (mission, necessity) of the project

d) project feasibility analysis

9.What is the need (in a generalized sense) for business planning?

a) To be involved in the control and effectiveness of the organization in achieving its tasks;

b) Promote control and effectiveness of the organization in achieving its objectives;

c) Achieving the goals and objectives of the organization;

d) helps to prevent making wrong decisions due to the entrepreneur's incompetence; integrates production, sales and business development into a single system of functioning; enables to make gross mistakes in the absence of business experience;

10.Find the conformity:

A. Industrial projects 1. aimed at reforming the management system, setting up a new organization, holding conferences, seminars, etc.

B. R&D projects 2. focused on research activities, development of software tools for processing information, new materials and designs, etc.

B. Organizational projects 3. These are projects aimed at launching and selling new products.

11.Install the conformity:

A. Economic projects 1. are related to the implementation of specific operations and works that require a sufficiently long lead time and that do not "fit" into the normal mode of production system management.

B. Social projects 3. related to the reform of the social protection system, health care, overcoming the effects of natural, economic and social shocks and other factors of a social nature.

B. Operational Production Systems Projects 3. aim at privatizing state-owned enterprises, developing the capital market, reforming the tax system, and other macroeconomic transformations.

12.Define the concept of "project life cycle" is ..a) involves the need to assess the management situation and use any information or knowledge that will have the greatest effect in this case.

b) predicts the effectiveness of information flows between individual business processes

c) implies the need to define and characterize, to use functional symbols to ensure job responsibilities

d) the time from the first cost to the last benefit of the project. It envisages the development of the project, the work that is carried out at various stages of preparation, implementation and operation of the project.

13. Establish a correspondence between the project phase and its characteristics:

A.Conceptual 1.detailed design and delivery; construction or installation.

B. Contract 2. development of the concept of the project is carried out, its viability is assessed, project planning, development of project requirements, selection and acquisition of land etc.

V.Phase of project implementation 3.companies elaboration of qualification requirements, preparation of a preliminary task, selection of potential contractors, execution of a contract with selected contractors, selection and approval of the final version of the project, start of project implementation.

14. The project environment is:

a) a set of factors and objects that do not directly participate in the project, but that affect the project and interact with the project and its individual elements;

b) the totality of all project participants and other individuals and entities interested in its results;

c) a set of independent business entities that interact directly with the project participants;

d) the set of factors and objects that directly affect the project.

15. The initiator of the project is:

a) the entity interested in achieving the main objective of the project results;

b) the project financing participant and interested in achieving the financial results of the project;

c) the entity that is the bearer of the main idea of the project and the initiative for its implementation;

d) the head of the enterprise, institution or organization.

THEME 5. PROJECT RESOURCES MANAGEMENT

Issues to discuss

1. Describe the basic cost management processes of the project.
2. Define the project resource, specify its classification.
3. Describe the methods of equalizing the resource conflict.
4. List and briefly describe the types of calendar schedules.
5. Define resource histograms in projects.
6. Describe the construction of resource histograms.
7. Expand the process of aligning resource histograms.
8. Describe a cost planning map (CPLM).
9. Give a brief description of the methods for calculating project cost estimates.
10. Describe the procedure for identifying and planning resource requirements.
11. Provide a classification of project costs.
12. Describe planning approaches with limited resources and limited time.
13. Explain the content of the project cost estimate.
14. Define the project budget.
15. Describe the types of project cost estimates.

LECTURE

5.1. PROJECT MANAGEMENT PROCESSES

Project Cost Management integrates the processes involved in planning, developing a budget, attracting funding, financing, managing and controlling costs that ensure the implementation of the project within the approved budget.

Project cost management includes the following processes (Table 5.1):

- cost management planning - a process that establishes policies, procedures and documentation for project planning, management, spending and cost control;

- cost estimation - the process of approximate estimation of the cash resources needed to carry out the project operations;

- budgeting - the process of consolidating the estimated values of individual operations or work packages to create an authorized cost base plan;

- cost control - the process of monitoring the status of a project to update the project cost and manage changes to the base cost plan.

Table 5.1.

№ п/п	Process	Exit	Tools and methods	Exits
1	Cost Management Planning	- Project management plan - Project charter - Enterprise environment factors - Assets of organization processes	- Expert evaluation - Analytical methods - Meeting	- Cost management plan
2	Rating	- Management plan cost - Basic content plan - Project schedule - Human resources management plan - Risk registry - Environmental factors enterprises	- Expert evaluation - Evaluation by analogy - Parametric estimation - Bottom-up rating - Three point estimates - Analysis of reserves - Quality cost - Project management software used for evaluations - Analysis of suppliers' proposals - Group decision-making methods	- Cost estimates operations - The basis for estimates - Updates documents project
3	Cost	- Cost management plan - Estimates of transaction costs - Basis for estimates - Basic content plan - Project schedule - Resource calendars - Contracts - Assets of organization processes - Consent	- Cost summation - Analysis of reserves - Expert evaluation - Historical interconnections - Harmonization of financial constraints	- The basic plan implementation cost - Requirements for financing project - Updates documents project
4	Definition	- Project management plan - Project financing requirements - Information on the execution of works - Assets of organization processes	- Volume management - Forecasting - Performance-to-completion index (EITI) - Performance analysis - Analysis of deviations - Project management software	- Measurement results execution of works - Budget forecasts - Process asset updates organization - Change requests - Updating the project management plan - Update project documents

Cost management of the project should take into account the cost information requirements of the project stakeholders. Different project stakeholders can calculate the cost of the project in different ways and at different times. For example, the price of the item being purchased may be estimated at the time of the decision or confirmation of the purchase, at the time of placing the order, at the time of delivery, or its actual cost is taken into account and recorded when managing project costs.

Project cost management concerns, first and foremost, the cost of resources required to carry out project operations. In addition, cost management should take into account how decisions made will affect subsequent recurring costs for the operation, maintenance and technical support of a product, service or project outcome. For example, limiting the number of inspections of design drawings may reduce the cost of the project, but it may increase the customer's operating costs.

5.2. RESOURCE PLANNING OF THE PROJECT

Project resources are what is needed to execute project operations.

Resources: manpower, machinery, equipment, materials, cash, energy resources, information resources, computer and office equipment, manufacturing space, knowledge and funds.

Resources can be:

- Renewable (called "capacity", simply referred to as resources) are people, materials, and mechanisms that can be reused after the operation. They recover, do not accumulate and do not accumulate. If these resources are not used, their functional capacity cannot be offset in the future, cannot be accumulated.

- non-renewable (called "energy", also called materials) are materials and equipment that are consumed in operations. Such resources are not reproducible, cumulative, stored, and consumed in full, without reuse. If such resources turn out to be unused at this time, they can be used further. The project's need for a non-renewable resource is described by:

- a cost intensity function that shows the rate of resource consumption depending on the phase of work;

- a cost function that shows the total accumulated amount of required resource depending on the phase.

Workforce. Manpower consumes time (in hours or days) to complete tasks. Manpower is characterized by the maximum number of resource units (max. Units) available for simultaneous use in a project. The number of resource units refers to the amount of time a resource has been operating. For example, if

one programmer is involved in a project, the maximum number of resource units will be 100% for the corresponding resource, in the case of two programmers, the maximum number of resource units will be 200%, etc. If, however, only one programmer is involved, who will be able to devote only half of his project time to the project, the maximum number of resource units will be 50% for such a resource.

Material resources are various materials, components and other consumables that are used to fulfill the project's objectives.

When using material resources, the project spends not the working time of the resource, but the resource itself. Material resources are characterized by a unit of measure of a resource (Material Label), for example, units, m3, etc. Material resource cannot be specified maximum amount.

Expenditure - This type of resource describes the various ways in which the project is financed or used. This resource is often used to describe contractors or project investors. The amount of funding is indicated when the resource is assigned to the project.

Cash is a Cost type. These resources can be assigned to a project task and have a financial dimension (in monetary terms).

Using resources in project planning allows you to:

- to track the amount of work performed by people and equipment, as well as the amount of materials spent to complete the tasks;

- ensure a higher level of accounting and understanding of the project plan.

- improve the accuracy of calculation of project schedule details.

One of the important issues in project management is the issue of resource planning. Sometimes there is a situation where companies do not plan properly and do not provide the project team with the proper resources, which ultimately leads to negative results.

Resource planning - determining what resources and how much will be used in the project.

Resource planning is an iterative process. This process is closely linked to operations planning, cost planning, and project timetable, for which the results of resource planning can be reviewed.

Resource planning involves the following steps:

1. Resource needs assessment.
2. Drawing up a table of needs for work resources.
3. Drawing up a table of availability of resources.
4. Building a resource histogram.

5. Comparison of needs and availability of resources, determining their scarcity or excess.

6. Drawing up a new plan using the “what… if…” forecast.

7. Smoothing resource histograms by offsetting work within time.

8. If you need to use scheduling techniques with limited resources or limited time.

9. Rescheduling the calendar plan.

10. Control and construction of new resource plans and histograms.

Resource planning also involves identifying project resource suppliers; consideration of factors that affect the availability of the project resources; scheduling the delivery of resources.

In general, the project resource planning algorithm includes three main steps:

- definition of resources (description of the resource and determination of the maximum available amount of this resource).

- matching resources to tasks.

- analysis of the project timetable and resolution of contradictions that have arisen between the required amount of resource and its available quantity.

Because the availability of the resources needed to perform the work is often a key factor in project management, a manager can develop a realistic plan only if a set of available resources is described.

The amount of resource requirements depends directly on the scale of the project, ie on the amount of work to be done.

Typically, the main problem is matching the available and required workforce, since other types of resources are easier to provide at the required level. Ideal situation - when the needs for resources match their availability. Unfortunately, this happens very rarely in project management, so a compromise must be sought.

If the need for resources outweighs the possibilities, there are three ways to solve it:

• postpone (delay) work within the time limit;

• adjust the timing of their implementation according to the limited resources (ie if the resources are limited, limited in advance, the calendar plan needs to be changed);

• adjust the resource utilization rate within the set time (if the date cannot be changed, for example, we increase the duration of the working day).

Estimating the amount of resources required depends directly on the amount of work that needs to be expressed in the complexity. The number of employees is determined by the formula:

$$K_{\text{р}} = \frac{T}{\Phi_{\text{кор}}},$$

(5.1.)

where T is the complexity of the work; Fcor is a useful employee's time fund.

A resource conflict is a situation where the need for any resource exceeds its maximum consumption limit.

They use various methods of resource conflict settlement. Resource equalization eliminates peaks in resource utilization and sets the level of resource utilization within their availability. The choice of a method for resolving resource conflicts depends on the situation.

ResourceLeveling - The process of equalizing the loading of contractors assigned to a project. Equalization of resources usually leads to an increase in the duration of the work and the overall duration of the project. Alignment is a time-consuming operation and is usually done using software.

Result of resource planning is:

- Assignment of resources for project operations. The main output of the resource planning process is a list of types and amounts of resources required to complete all WBS elements. These resources will be refined as a result of the following planning stages (project schedule and cost planning) and plan analysis.

- Resource calendars. Specifying the resources used in the project allows you to define their calendars as well. For example, a 5-day work week with an 8-hour work day and a set vacation.

The resource allocation process is the definition of the resources required and the amount of resources required for each job.

Once the resources have been identified and coordinated with the calendar, they should be compared with the firm's available resources.

You need to take into account:

- normal productivity (taking into account the level of training and qualification);

- existing commitments for other projects (if workforce is taken from one source);

- expected level of absenteeism (due to illnesses and other causes, which sometimes account for about 25%);

- increasing the amount of resources that is possible due to:

a) after-hours;

b) use of subcontractors;

c) changes in the mode of work on the project, which will cause a change in plans for resources.

These paths require a great deal of expense, which must be taken into account when evaluating them.

The availability of resources is advisable to submit using table 5.2. and Figure 5.1. Table 5.2.

Table 5.2.

Calendar and volumes of available resources [3, p.115]

Type of resource	Availability per day, pers.	Start date	End date
Painter	12	1.12	30.12
-	12	9.01	31.01

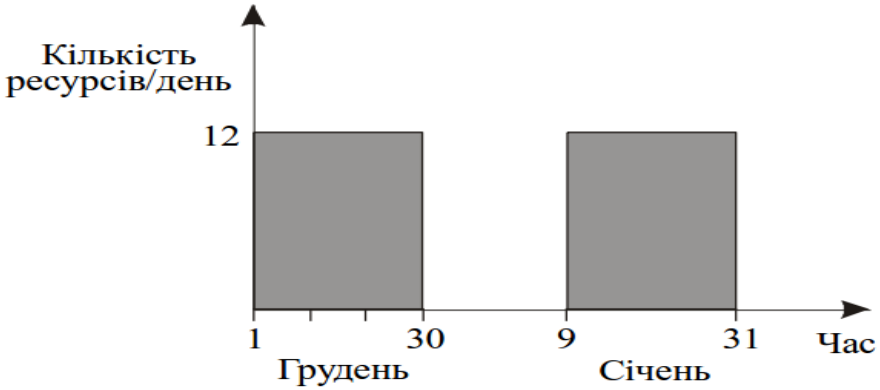


Figure 5.1. Resource availability histogram

Therefore, the table and the bar chart do not relate to the work, but simply capture the amount of resources available in terms of calendar time. They allow you to control whether any work is planned during periods when there are no resources available (national, religious holidays, etc.).

When we need employees for different jobs, it is advisable to build a histogram of resource requirements.

The histogram of resource requirements is similar to bar charts, with horizontal terms indicating calendar times, and vertical ones - the daily amount of resources required to perform all the work of resources in each profession separately.

It is very widely used in project planning because it is visual, easy to understand and integrate with other aspects of planning. For its construction it is necessary to have:

- an early calendar schedule (assuming that we try to do all the work as early as possible);

- projection of resource requirements by section of work.

Resource histograms are constructed based on the need for all additions (Table 5.3).

Table 5.3

Need for painters

Work	Start date	End date	Resource required per day, pers.	Stock
A	1	2	8	
B	3	4	4	4
C	3	4	12	
D	5	6	10	4
E	7	10	2	
F	11	11	4	

Based on the indicators of this table, a calendar schedule of the need for a particular resource for all works (Fig. 5.2.)

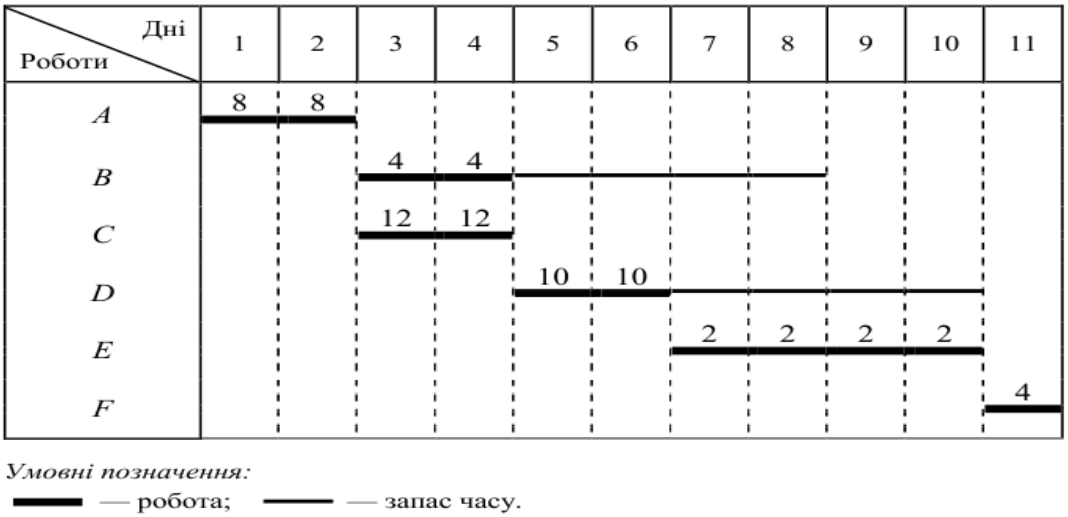


Fig. 5.2. Calendar schedule for resource requirements

Comparing required and available resources allows you to identify the shortage or excess of them. In the example above, during the third and fourth days, when work B and C are performed in parallel, the lack of resources is 4 people. (required number - 16 mall, available - 12), in other days there is an excess of available resources (Fig. 5.3)

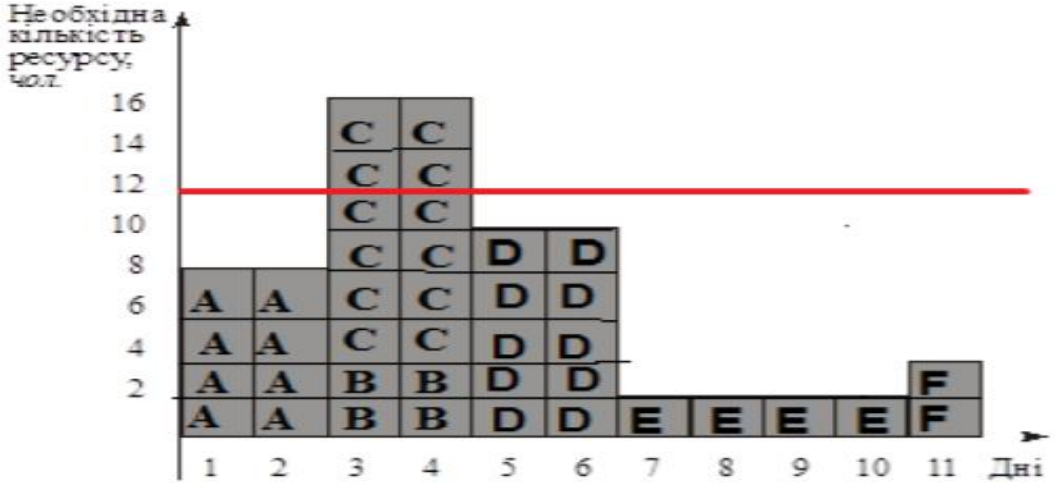


Fig. 5.3. Resource Need Diagram

The company's profitability in the long run depends on resource efficiency.

Resource optimization involves:

- smoothing (optimization of resources within the time reserves of tasks) - equalization of resources (leads to change of the critical path).

Tools and methods for resource optimization: job transfer, job break, job stretch, change in resources, change availability.

Ресур The resource optimization process is iterative. May be repeated throughout the project

Зав Each assignment must be provided with a resource or the cost needed to purchase the resource must be determined

✓ Long term resource overload is not allowed.

Ресур Resource calendars and resource availability for the project must be considered

✓ When aligning resources, the project priority matrix should be guided

Smoothing resource histograms

The purpose of smoothing resource histograms is to improve the loading of resources (especially when they are lacking) by shifting the calendar timeframe for work within the time limit.

The first step is to select the resource to be smoothed, since it is not possible to change more than one resource at a time.

At the same time it is necessary to pay attention to:

- the resource that is most congested;

- the resource most used in the project;

- the least flexible resource (which we hire from another company or even the country);

Is the resource that needs the highest cost of hiring.

After smoothing the histogram of the corresponding resource, it is necessary to reschedule the work schedule and the need for the resource.

Ways of smoothing: changing logical connections; displacement of non-critical works within the time limit.

Referring back to the previous example, work B has four days of stock and can be moved by two days, which requires a shift of work D also by two days (Figs. 5.4, 5.5.).

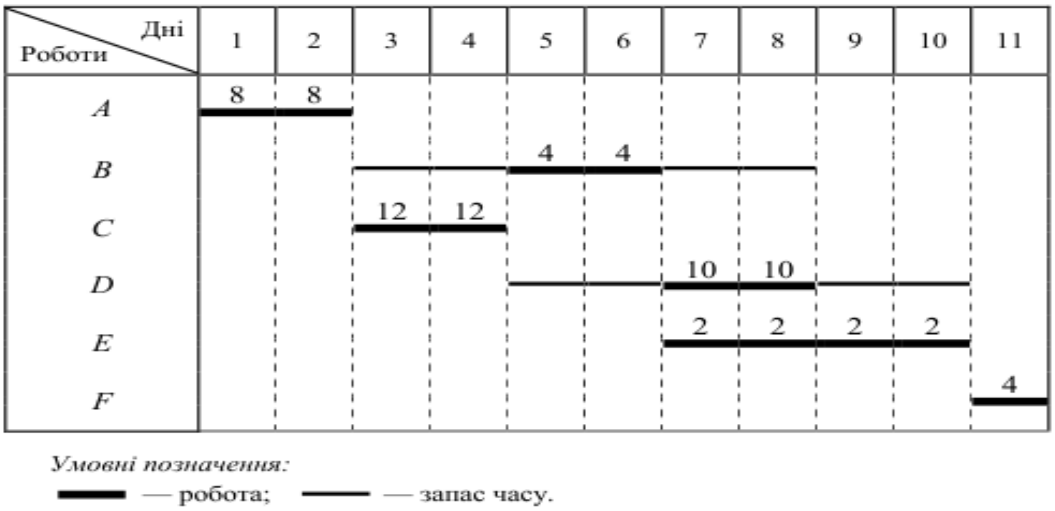


Fig. 5.4. Calendar schedule for resource requirements after changing calendar terms within the time limit

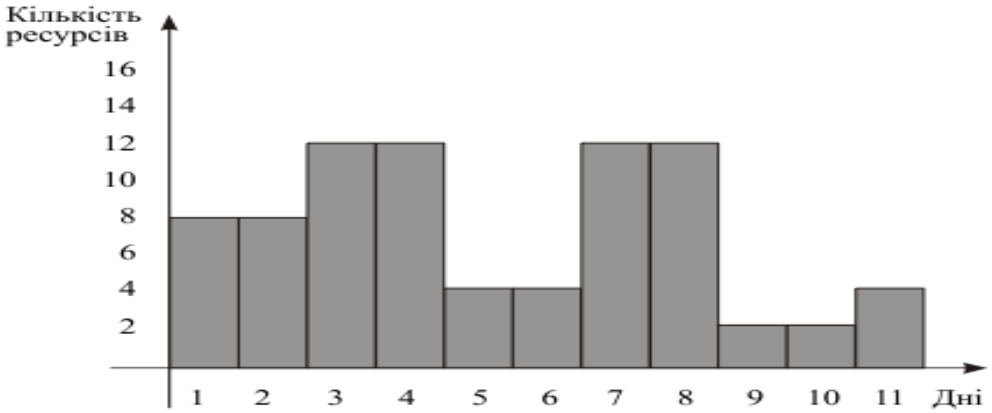


Fig. 5.5. Histogram of the need for the resource after smoothing

Resource analysis requires a lot of mathematical calculations, so it is usually done using computer programs.

There are three steps to be taken:

- Step 1: Determine where information can be obtained (ie where information on resources is contained);

- Step 2: Set priorities for resource allocation. While it is difficult to speak unequivocally about the "correct" or "optimal" allocation of resources, in the case of large projects, when it is not possible to manually resolve these issues, they also use a priority scale:

1st priority - early start (who has the earliest start);

2nd priority is the smallest amount of work time;

3rd priority is the highest duration of work;

Priority # 4 is the ordinal number.

When setting priorities, the following should be remembered:

1. When performing large projects, it is unrealistic to formulate a detailed plan for many months in advance, since changes will inevitably occur. Because of this, early work should be prioritized.

2. Time reserve involves the possibility of postponing work completion, so priority is given to work with the least amount of time, that is, those that are almost critical.

3. Duration and budget characterize the volume of work, so resources are directed primarily to larger and more expensive work.

4. If the previous criteria cannot be met, prioritize the work order number;

- Step 3: Resource allocation (after prioritization).

There are two basic methods in resource allocation:

consistent and parallel.

The sequential method allocates resources between jobs according to established priorities, reviewing one job after another.

The concurrent method distributes resources across all jobs at the same time, but every once in a while, comparing the daily availability of resources, the need for them, and the duration of the work. In doing so, the manager must determine if it is possible to interrupt the execution of the work and finish it after a certain time.

These actions require the following principles:

1. From the very beginning of the project, the need for resources is compared to the availability of them, a schedule is developed for early start of work.

2. If there is no resource to get started early, it is shifted one day (or a week) within the time limit and again compared to the availability of resources. This process will continue until:

a) the need for resources will match their availability;

b) all work time reserve will be used.

In the latter case, use one of two possible approaches:

1) limited resource planning;

2) planning for a limited time.

1. Scheduled resource planning.

If the resource is limited or cannot be increased, it is necessary to extend the life of the resource until it becomes available. Sometimes this increases the duration of critical work, then the overall implementation of the project is delayed. This is possible in the following situations:

a) work is carried out in a confined space (lift cabin repair);

b) limited capacity (for example, the number of vehicles for freight);

c) limited amount of equipment, ie computers, machine tools, cranes, etc.;

d) safety requirements limit the number of employees in a certain area (painting the house outside in a tube).

Increasing the duration of work may be less if the measures considered to address resource scarcity were used.

2. Planning for a limited time.

This method is used if it is not possible to extend the completion of the project.

In this case it is necessary to satisfy the needs for resources (ie, the lack of resources to renew due to the additional purchase of them). Such situations are possible when:

- the project has severe penalties for failure in time;

- the project is part of another project with limited time (repair of the river pier to the summer recreation center).

Because the timing of such projects is not transferable, they increase resources.

After the analysis and allocation of resources are completed, the initial grid schedule needs to be revised, as some work during the resource planning has to be carried over. You should also check the other related documents: Gantt charts; budget; cost curves; cash flows; workforce plan; supply plan. After each reporting period, the work schedule may change, requiring the creation and analysis of new resource histograms. New plans and bar charts are the basis for planning for the next reporting period.

It should also be remembered that when a company executes several projects at the same time and needs to plan for the need for specific resources for all projects, then the coding system must provide different work codes so that different projects are not the same, otherwise the computer will add resources, which will lead to significant problems.

5.3. PROJECT COST PLANNING

Cost planning of project works in Ukraine is carried out in accordance with the Methodological recommendations for the formation of cost of project work, taking into account the requirements of the Accounting Regulations (Standards), approved by the Order of the State Committee for Construction, Architecture and Housing of Ukraine No. 64 dated March 29, 2002.

Project costs are classified according to the following features:

Ø All project costs are divided into investment and current costs.

Investment includes fixed capital investment (land acquisition, construction of premises and facilities, purchase or lease of technology and equipment), pre-production costs for working capital needs.

Current costs - production costs that include the cost of purchasing raw materials, basic and auxiliary materials, wages, factory and overhead costs that are attributable to the reporting period;

Ø Costs at the place of performance of work are divided into: expenses of department, sector, laboratory, temporary creative team, expedition, party, station, service or other administratively separated structural unit, etc.

Ø classification of costs by economic elements and costing items. Cost elements include a set of costs that are homogeneous in terms of their economic content, and cost items have one or more elements;

Ø depending on the selected object of cost accounting: costs for development, topics, objects of design, stages, tasks, etc., approved in the established order, concluded contracts for the development and execution of project works;

Ø by ways of inclusion in the cost of project work (this is the production costs of the project organization, directly related to the commissioning of organizations, enterprises, citizens at their own risk and their own forces of project work, the income from which was recognized in the reporting period) and the nature of participation in the production process, the costs are divided into direct and indirect costs.

Direct costs are costs that are directly related to the execution of project work and are included in the production cost of the project works of the relevant accounting objects on a direct basis, in particular: direct material costs, direct labor costs; deductions for social events, other direct costs.

Indirect (hereinafter referred to as production costs) are costs associated with the management and maintenance of production, the organization of project work, and other costs that cannot be directly attributed to a cost object directly.

Ø Depending on changes in the volume of project work performed, production costs are divided into fixed and variable.

Variable costs are costs that increase as the volume of project work performed increases and decreases as they decrease. These costs include: costs of materials, labor remuneration, deductions for social events, etc.

Fixed costs are costs that remain unchanged when the volume of project work is changed. These costs include:

costs associated with the management, organization and maintenance of production;

Ø on the basis of the relation to the cost of the work costs are divided into production costs and costs of the period.

Production costs are the costs of a project organization related to the execution of design and survey work. Production costs form the production cost of the project work and are its component.

Period costs are costs that are not included in the cost of production and are treated as costs in the period in which they were incurred. These are administrative, sales and other operating expenses.

Ø by calendar periods during which costs are included in the cost of project work: month, quarter, year, operating cycle.

Cost scheduling To coordinate the timetable for the execution of work with available resources, for the purpose of further control and decision making, a scheduling of costs is also carried out, that is, the allocation of costs by early and late deadlines.

Planning involves not only defining the timeframes for work, reconciling them with available resources, but also scheduling costs or budgets to further control them and make appropriate decisions.

The process of budgeting a project is the allocation of estimated cost over time to the calendar plan.

The components of the calendar budget:

 calendar of expenses (including payment dates)

 Terms of payment чні Critical milestones for the project and ways to reduce the risks involved.

Typical project cost items:

Direct costs: labor, materials, equipment and other costs.

Project overhead.

General and administrative overhead.

Direct costs are directly related to the work package. These costs are real cash costs and must be paid as the project works. Direct costs are usually separated from overheads.

The project overhead cannot be tied to any intermediate result, but applies to the whole project as a whole.

For example, costs for project management consultants, training, business trips are project overhead.

General and administrative overhead are organizational costs that are not project related. Although these expenses are not immediately paid out of pocket, they are real and occur throughout the project.

All costs are charged to the cost budget by item. Here is their list:

1. Salaries of project team members.

2. Expenditure on equipment and materials.

3. The cost of renting premises.

4. The cost of marketing, including marketing research and focus groups.

5. Legal expenses.

6. Travel expenses.

7. The cost of advertising.

8. The cost of the study.

9. Cost of feasibility study.

10. Cost of consulting services of external experts and project participants.

11. Payment for phone, fax, long distance calls.

12. Costs for office equipment.

13. Payment for Internet access or web site hosting.

14. Software.

15. Computer hardware.

16. Training.

When planning costs, it is not enough to know only the total amount of investment (investment) in the project. It is necessary to have data on the annual need for financing, and for the first year - its quarterly and monthly division. Payments of advances should be made with extreme caution.

Before planning the cost, perform the following work:

- on the basis of the calendar, make a list of the work that must be done in each time period (year, quarter, month);

- from the cost documentation determine the cost of these works;

- calculate the cost of work by cost items (raw materials, equipment, wages, overhead).

When drafting a project budget, expenses are planned from general to specific.

In addition to the list of major costs, the project budget should include a detailed calendar, the degree of accuracy of which depends on the characteristics of the project, the amount of investment, as well as the specific requirements proposed by the creditor organizations.

5.4. METHODS OF CALCULATION OF THE PROJECT COST

Costing is the process of developing an estimate of the cost of the resources required to carry out the project's operations; is the estimate of the likely cost of the resources required to complete the project work.

The inputs for cost estimation are:

1. Hierarchical work structure (used to streamline cost estimates and to ensure that all required work is evaluated);

2. Resource requirements (a description of what types of resources and in what quantities are required for each element of the DCI);

3. Resource norms (it is necessary to know the individual norms (hourly staff salaries, cost per cubic meter of material, etc.) for each resource in order to calculate project values; if actual norms are unknown, then norms can be estimated);

4. Estimation of the duration of the works (should affect the cost estimates in any project where the budget includes the cost of financing the works - capital investment);

5. Archive information (available from one or more of the following sources:

• project files (one or more organizations involved in the project may keep records of previous project results that are sufficiently detailed to assist in cost estimation. In some applications, such records may be maintained by individual team members);

• commercial databases with cost estimates;

• awareness of project team members (individual project team members may remember previous actual results or estimates (such information is generally not as reliable as that documented);

6. Accounting card (describes the code structure used by the executive to prepare the financial statement in the general ledger.

Project cost estimates should be assigned to the correct accounting category).

There is a tool that provides a systematic approach to project cost planning - the CPLM. CPLM formulates a sequence of steps that the team must take to make the necessary decisions, develop key definitions, terminology and types of valuations, select valuation tools and value planning processes.

If the results of these actions can be integrated seamlessly, CPLM helps build an organizational culture that is aware of the value of cost and is proactive.

When to use. Although the use of a value planning card is convenient in any project, it is most useful in organizations that carry out large projects or have a steady stream of small and medium-sized projects.

Time of use. Building CPLM takes a lot of time. In organizations involved in the implementation of projects large, complex and consuming a lot of resources, it is customary to involve specialists from different functional departments in the work on the cost planning map; Sometimes it takes hundreds of hours to compile a full CPLM.

The value of CPLM is that it gives the project team clear and clear guidance. By carefully formulating the action scenario and ensuring the smooth

execution of the planning tasks, the cost planning map clearly defines the type of valuation and the type of the underlying cost plan as well as the methods for obtaining them. It significantly reduces the risk of inadequate cost planning and misuse of company resources and makes it possible to realize the value of cost.

Advantages and disadvantages. The main advantage of CPLM is its linear structure, which clearly shows the steps needed to get a good value plan. The disadvantages are the longer duration of the map development and the need to have considerable experience in dealing with these employees.

There are many types of estimates, however, in areas such as software development, construction, and manufacturing, the three most commonly used are: order estimation, budget estimation, and determining estimation (Table 5.4). They differ in many dimensions, such as purpose, accuracy, cost of training, required information, and type of assessment tool. Each of these estimates can serve as a basis for developing the second element of a cost plan, a cost base plan, or a time-shared budget. Naturally, the characteristics of the base cost plan developed in this way must match the characteristics of the type of valuation on which the plan is based.

Table 5.4.

Types of cost estimates

Parameter	Estimation of the order of magnitude	Budget estimate	Definitive evaluation
The ultimate goal of use	Feasibility study, project selection, budgeting / forecasting	Budgeting / forecasting, authorization of full or partial funds	Full Funds Authorization, Application / Proposal, Change Order
Required information	Size, strength, bandwidth, location, completion date, similar projects	Partially prepared technical project, supplier's pricing	Specifications, drawings, execution plan
Evaluation tools	Estimation by analogy, parametric estimation	Bottom-up parametric estimation	Bottom-up, simplified parametric estimation
Other names	Global, conceptual, fast, intuitive, common sense assessment	Content Rating, Authorized, Authorized, Preliminary	Detailed, control

In addition, cost estimates include estimates of expected inflation, credit interest rates, discounts, and other additional indicators that need to be

considered in the cost analysis and project. The list of these indicators depends on the specific project.

The cost of resources is defined differently. For renewable resources - sets the cost of an hour, not renewable - the cost of one.

There are several common methods of calculating cost estimates:

1) Top-down estimate method. Top-down estimates are used to determine cost in the early stages of project development when project information is rather limited. Therefore, in fact, the cost of the whole project is estimated. The plus of this assessment is that it does not require much effort and time. The downside - and very significant - is that the accuracy of such an estimate is much lower than when looking at the bottom-up project in more detail.

2) Bottom-up estimation method. The bottom-up rating is the opposite of the top-down rating. Used to produce an agreed baseline project price or final project cost estimate.

The evaluation involves estimating the cost of each task at the level of the work group, followed by summarizing the results at the final levels. Adding estimates gives an overall estimate of the cost of the entire project. The accuracy and complexity of such an assessment is determined by the degree of detail of the project. The more detailed the project is broken down into operations, the higher the complexity and accuracy of the bottom-up assessment. The project team must find the best balance between complexity and precision.

3) Analogous evaluation. This evaluation method is a variant of the top-down evaluation method. The method of analog estimation is that the cost of the current project is estimated based on the actual cost of similar previous projects. The basic principle is that the project on which the assessment is based is fully in line with the current project. Only under this condition will the estimate be fairly accurate.

Analogous estimation is less time consuming than other methods, but it is less accurate. It can be relied upon when not only previous projects were really similar but also when the persons preparing the assessment had relevant experience.

4) Parametric estimation. Parametric estimates are also top-down estimates. Their inherent accuracy is either the same, or inferior to the accuracy of estimates by analogues. The process of determining the parametric estimate involves finding the parameter of the project being evaluated, which varies in proportion to the cost of the project. This parameter creates a mathematical model.

Models can be simple (estimating the cost of housing by the cost per square meter) or complex using a large number of factors. After entering the

parameter values into the model, the project cost is the result. The parameters used in the valuation should be easily measurable, which will improve the accuracy of the parametric cost estimate.

5) Expert evaluation. An expert survey can also give a ready estimate of cost. Any project participant, including a manager, and persons with experience in similar projects may be experts. If these or other project tasks are performed by third-party contractors, an effective method of cost assessment may be to interview suppliers, both planned for the project and others.

6) Probability estimates. Practical experience shows that the cost of planning cannot be neglected by the uncertainty of a project, which cannot be offset by an arbitrary increase in its price. When planning, we need to evaluate not only what we know about the project, but also the details that are likely to take place. According to PERT, three scenarios should be handled (pessimistic, optimistic and most likely), paying particular attention to the worst case scenario, as well as taking into account the risks and all the factors that may affect the implementation of the project.

7) Project management software used for evaluation. Project management programs are widely used for cost estimation, such as individual cost estimators, spreadsheets, and tools for modeling and processing statistical information. Using a suitable program significantly reduces the complexity of such assessments and allows you to quickly calculate different alternatives. All you have to do is choose the program you are using - different project management programs have the ability to account for the different components of project costs and project resources.

8) Analysis of reserves. Cost estimates may include provisions for possible losses to account for cost uncertainty. The provision for possible losses may be expressed as a percentage of the estimated cost, a fixed number, or may be developed using quantitative analysis methods. As more accurate project information is received, reserves for possible losses can be used, reduced or eliminated. Possible losses should be clearly stated in the cost documentation. Provisions for potential losses are part of the funding requirements.

9) Analysis of suppliers' proposals. Costing methods may include an analysis of the potential cost of the project, depending on the relevant proposals from qualified suppliers. In cases where the supplier receives the project during the tender process, the project team may need to perform an additional cost estimate and determine the cost of the individual results and calculate the final cost of the entire project as a whole.

When planning the cost of human resources, it is very important to know the cost of an hour's work. Many experts set the price for the project based on the basic hourly rate of human resources.

You can determine the hourly rate by the formula:

$$\mathbf{CH = (E + P)/QWH + M} \qquad (5.2.)$$

where: CH is the cost of the hour; E - costs for the year; P - salary for the year; QWH - number of working hours per year; M - margin.

Costs include overhead, rent, utilities, insurance, benefits, supplies, and any other expenses that support one person's work (they can reach 30-50% of one person's full income). The number of working hours per year is 40 hours per week for 50 weeks, ie 2000 hours. Another method of calculation is to calculate the number of paid working hours per week by multiplying them by the number of working weeks per year (usually 1500 to 1700 hours per year). A reasonable margin is set at 10-15%.

In large projects, there are at least 5 types of estimates with increasing degree of accuracy (Table 5.5).

Table 5.5.

Types of estimates

Kind of estimate	Assembly method	Appointment	Error
Cost order	Evaluation by analogues	Assessment of “attractiveness” of projects	50% do +100%
Conceptually	Evaluation by analogues Parametric estimation	Evaluation of Investment Opportunities	25-40%
Previous	Parametric estimation	Feasibility study	15-25%
Approximate	Bottom-up rating	Financing plan	10-15%
Ultimately	Bottom-up evaluation Analysis of performers' proposals	Pricing	5-6%

The results of the valuation are:

1. An estimate is a quantitative estimate of the probable value of the resources required to complete the project. The project cost plan is called the estimate.

Project Estimate Costs - a complete calculation of the cost of all project work This is a set of documentary calculations necessary to determine the amount of project costs. The estimate has a double meaning: it is a document that determines the cost of the project; is a tool for controlling and analyzing the costs and resources of a project. Estimates can be presented in full or in detail. On the basis of the budget and the plan, they form the budget of the project and keep records of costs, prepare reports and evaluate the activities of the customer and contractor.

2. Additional information - should include: a description (List of additional information depends on the area of use. Documentation) of the evaluated work, for which a reference to the DCI is often sufficient; a description of the assessment methods used; a description of all assumptions and assumptions used; Accuracy of estimates - Indication of the range of possible outcomes (for example: $ 10,000 ± $ 1,000 to show that the estimated cost of an item is between $ 9,000 and $ 11,000).

3. Cost management plan. The cost management plan includes methods and procedures for reviewing cost estimates when deviations from actual values are expected. That is, it describes how best to manage cost differences (for example, different reactions to major and minor issues). The cost management plan can be formal and informal, very detailed and broad-based, based on the needs of project stakeholders. It is an ancillary element of the overall project plan.

5.5. DETERMINING THE PROJECT BUDGET

Costs need to be planned so that they can meet the financial resource requirements throughout the project implementation period. For this purpose, they make up the project budget - a plan that reflects the results of the adjusted calendar and the project implementation strategies estimated in quantitative terms.

Project Budget (Budget) is an itemized list of estimated expenditures required to complete work to achieve project goals.

The budget presents the estimated results of the revised calendar and project implementation strategy.

Budgeting is the process of combining the estimated values of individual operations or work packages to develop a mandated cost base plan. This base plan includes all authorized budgets, except for management reserves.

Budgeting - defining a project cost baseline that shows the distribution over time and the incremental cost of the project and serves to compare current results with the planned results; component of project budgeting, which means

the definition of cost indicators in the framework of the project work and the project as a whole, the process of forming a project budget containing established (approved) allocation of costs by type of work, cost items, time of work, cost centers or other structure.

Project budgeting (budgeting and budgeting) is the process of assigning cost estimates to all project operations. As a result, all project costs and resources are allocated to individual operations.

Different types of budgets correspond to different stages of the project life cycle:

1. Preliminary (estimated) budget.
2. Approved (official) budget (cost baseline).
3. Current (adjusted) budget.
4. The actual budget.

The budget can be in the form of:

• A calendar of expenses.
• Cost allocation matrices.
• Bar chart of costs.
• Cumulative cost diagrams.
• Line charts distributed over time cumulative costs.
• Pie charts of cost structure.

Highlights of budgeting

- The budget should be based on cost estimates and calendar schedules, as well as a clearly defined procedure for its adoption. The budget should be based on project requirements, and any assumptions should be identified and documented.

- Cost items should be designed so that it is convenient not only to plan, but also to "gather fact."

The structure of the project budget is shown in Figure 5.6.

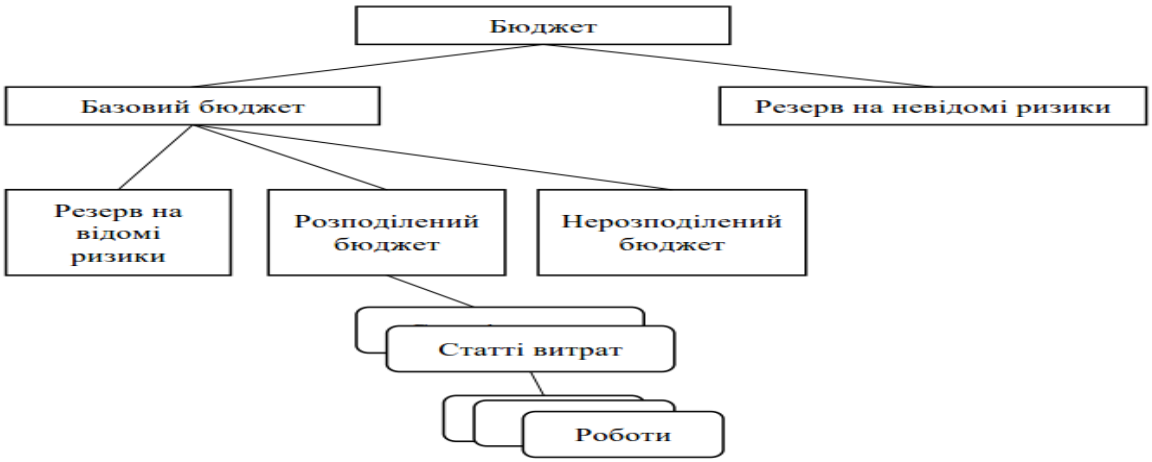


Fig. 5.6. Project budget structure (example)

The known risks reserve (project manager reserve) is defined at the management level as a separately planned amount that is used to make adjustments for future situations that depend on known risks.

Unknown Risk Reserves (Management Reserve) - Time and cost reserves for unknown risks. The baseline plan does not include reserves for unknown risks, these reserves are included in the project budget. Using an unknown risk reserve requires a change in the project framework and the cost of the project.

Project budget calculation

To calculate the project budget, you must have:

1. Project estimate
2. Approved cost items
3. Project calendar

The budget of the project is calculated by summing by itemscosts and by time periods. If the budget is graphically displayed then a typical project cost curve is obtained. This curve is also called the S-curve of the project.

5 problems of project budgeting:

1. Projects that take a long time to complete increase the inaccuracy of the calculations.

2. A predetermined implementation time can greatly affect time and cost calculations.

3. The human factor can also be a source of error in calculations. The extent to which employees have the qualifications necessary to complete the task will affect the productivity and time of their experience.

4. Estimates of how people work - at a rate or half-time - show that those who work full time work more productively.

5. Sometimes the factor of turnover (it is clearly not reflected in the budget) can significantly affect the calculations.

Methods of project budget formation:

Top-down budgeting involves defining top-level project costs. Usually, such determination of costs is performed by the management responsible for tangible assets or by a cost planning group that performs similar functions. The purpose of budgeting from the top down is long-term planning. As a rule, top-down budgets do not take into account project details and therefore cannot accurately determine costs.

Bottom-up budgeting begins with the planning of the budgets of the individual lower-level project components and the subsequent consolidation of those budgets at a higher level. Such processes are usually performed by project managers or those responsible for project timetables, who typically spend a lot

of time collecting and processing detailed information, but the results they produce have a higher accuracy.

A budget combination of top-down and bottom-up budgeting is used to plan costs more efficiently.

Test tasks:

1. Renewable, ie reusable resources are:

a) fuel;

b) financial resources;

c) objects of work;

d) manpower

2. The methods of resource conflict settlement include:

a) division and differentiation

b) stretching and compression

c) transfer of investments and optimization of production

d) optimization and redistribution

3 The method of equalization of a resource conflict, which consists in planning of work for a later period at the expense of reserve of time before emergence of the necessary quantity of a resource, is called:

a) normal;

b) breakdowns;

c) stretching;

d) compression.

4. Which of the following steps is not used in resource planning:

a) assessment of resource requirements;

b) comparison of need and availability of resources;

c) determining the resource requirements of the project;

d) obtaining the necessary resources under the signed contracts;

e) formation of schedules of supply of resources.

5. The cost estimate of the project is:

a) a document that defines the cost of the project and is a tool for controlling and analyzing the cost of the project;

b) a list of items of all types of income and expenses in the summary table;

c) directions of spending of the funds approved at the signing of the project;

d) a document defining the list of all types of resources that will be used in the project.

6.Direct costs:

a) the magnitude of which increases as the volume of completed project work and decreases with their decrease

b) directly related to the execution of the project work and included in the production cost of the project work of the relevant accounting objects on a direct basis

c) cannot be attributed to the cost object directly by a cost-effective way.

d) All answers are correct

7. The stretching method for equalizing a resource conflict involves:

a) a breakdown of work into several parts, each of which requires a certain amount of resources;

b) reduction of resource intensity by increasing the duration of work;

c) planning of work for a later period by reserve of time before emergence of necessary quantity of a resource;

d) reducing the duration of work by increasing the resource utilization rate.

8. Identify the main problem of resource planning:

a) is to find quality resources;

b) is to bring the idea to life;

c) is consistent with the available and necessary workforce;

d) depends on the budget.

9. The following methods do not apply to project cost estimation methods:

a) parametric estimation method;

b) valuation with the help of the investor;

c) evaluation by analogues (cost estimation by analogy with similar works performed in this or other projects);

d) bottom-up and top-down ratings.

10. Depending on the stage of the project life cycle, budgets may be:

a) preliminary (evaluative);

b) approved (official);

c) current (adjusted);

d) all of the above options are correct.

11. One of the mechanisms used to achieve such goals, therefore, despite the practical absence of examples of its application in practice (especially in Ukraine) as a management method, its interest is enormous - it is…

a) Business Process Reengineering

b) Continuous improvements

c) PFS

d) Reengineering of business processes

12. Total Quality System methods include:

a) method of process analysis, in-house evaluation of activities, analysis of process perception, process quality management

b) method of process analysis, in-house evaluation of activities, analysis of process perception, method of comparison

c) process analysis method, synthesis method, process perception analysis, comparison method

d) process analysis method, intercompany performance evaluation, administrative methods, process quality management method

13. Total quality programs should:

a) only the beginning and the middle

b) just the beginning

c) beginning and end.

d) beginning, middle and end.

14. Most organizations are built today… .and there is a strong conviction that it is not only the most natural and effective but generally the only means of organization.

A) by hierarchy levels

B) by functions and levels of the hierarchy

C) on the mechanism of subjectivity

D) based on differentiation

15. The difference between innovation and creativity

a) Realization is finding new directions for development, and creativity is the realization (commercialization) of the most viable and competitive ideas.

b) Creativity is finding new directions for development, and innovation is the realization (commercialization) of the most viable and competitive ideas.

C) there is no right answer

THEME 6. PROJECT MANAGEMENT MODELS

Issues to discuss

1. What is programming technology?
2. How did programming styles evolve?
3. What is the software life cycle?
4. What models of the software life cycle are you aware of?
5. What is done during the phases of the software development phase?
6. What life-cycle models allow you to respond promptly to changing software requirements?
7. What are the advantages of a spiral life cycle model? Explain.
8. What are some of the key points of your software development project?
9. What parameters characterize the quality of the software product?
10. What model of the software life cycle has a fixed set of stages? How was this model modified?

LECTURE

1. WATERFLOW MODEL

The cascade model of LCD software was created to meet the need for systematization of work at the early stages of program development. According to this model, software systems go through two phases in their development:

development; accompaniment.

The phases are divided into a number of stages (Fig. 6.1.).

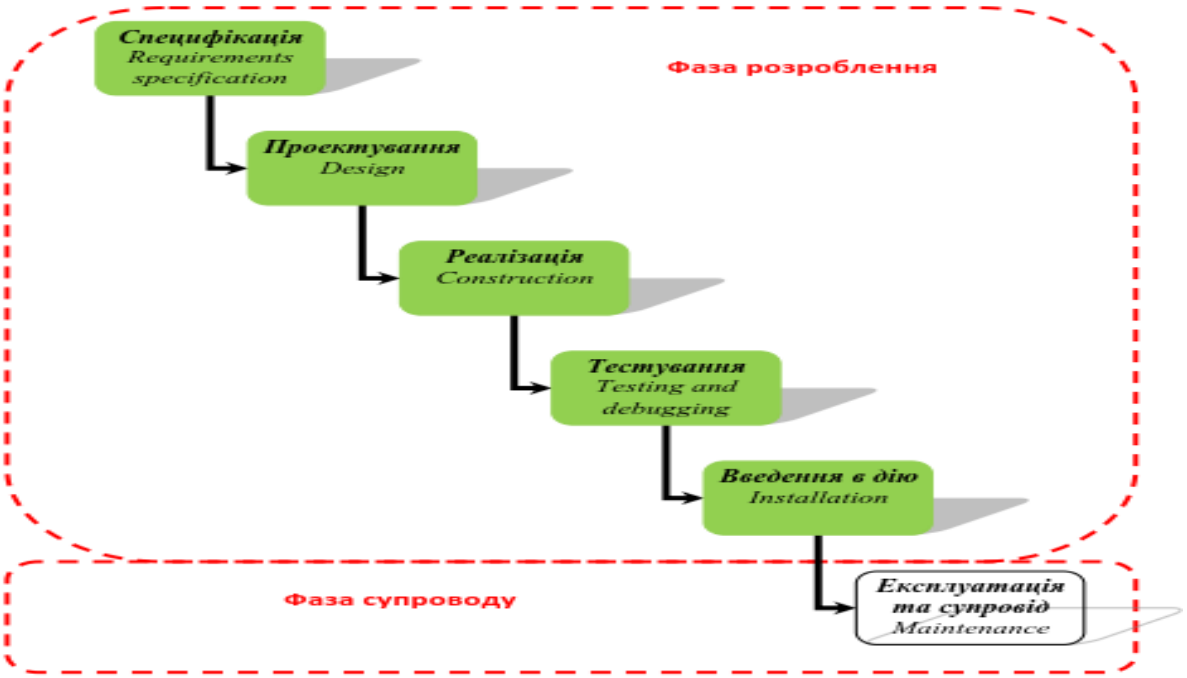


Fig. 6.1. The cascade model of ZhC

The cascade model assumes consistent execution of all project steps in strictly fixed order. Going to the next step means complete completion of the previous step.

Development begins with the identification of the need for a new application, and ends with the transfer of the product to development. All stages of software development are regulated by enterprise standards and state standard GOST 34.601-90 [7].

The first stage of the development phase is the specification (Requirements Speification) - setting the task and defining the requirements. At the stage of setting the task, the customer together with the developers make the decision to create the system.

The definition of requirements includes a description of the general context of the task, the expected functions of the system and its limitations. This stage is especially important for non-traditional applications. In case of a positive decision, the system analysis according to the requirements begins.

Software developers are trying to make sense of the customer requirements and fix them in the form of system specifications. The purpose of the specifications is to describe the external behavior of the system, not its internal organization.

Requirements must be carefully checked for compliance with the original objectives, completeness, compatibility (consistency) and uniqueness before starting to create the project to specifications. The task of the analysis phase is to construct the program description in the form of a logical system that is understandable to both the customer, future users and project executors. At the specification stage, a specification for the software development is mandatory [8].

The development of design solutions that answer the question of how the system should be implemented so that it can meet certain requirements is performed at the design stage (Design). Since the complexity of the system as a whole can be very large, the main task of this step is to consistently decompose the system to the level of obviously implemented modules or procedures. The results of the implementation of this stage are formulated as a technical project, the requirements for which documents are set by the standard GOST 34.201-89 [9].

In the next implementation phase, or coding, each of these modules is programmed in the most appropriate language for the application. From the point of view of automation, this stage is traditionally the most advanced.

In the cascade model, the development phase ends with the testing phase (Testing and debugging), standalone and integrated, and the system commissioning (Installation).

The maintenance and maintenance phase includes all activities to ensure the proper functioning of software systems, including fixing bugs discovered during the execution of programs, finding their causes and corrections, improving system performance, adapting the system to the environment, as well as more essential system improvement work. In fact, there is an evolution of the system. In some cases, this phase accounts for most of the money spent in the software life cycle.

It is clear that the attention of programmers to different stages of development depends on the specific project. Often, the developer does not have to go through all the steps, for example, when creating a small, well-understood program for a clearly stated purpose.

Short description:
fixed set of stages;
each stage ends with a documented result;
the next stage begins only after the previous one.
Disadvantages:
inflexibility;
the phase must be completed before the next phase;
the set of phases is fixed;
it is difficult to respond to changing requirements.
Usage: where the requirements are well understood and stable.

2. ITERATIVE AND INCREMENTAL DEVELOPMENT

The cascade lifecycle model is ideal because only very simple tasks complete all stages without any iterations (returning to the previous steps of the process). For example, when programming, it may be that the implementation of some function is inefficient and conflicts with the performance requirements of the system. In this case, changes to the project are required, and possibly a revision of the specifications. Alternatives to the cascade model were created to account for the repetitive stages of the development process.

From such alternatives an iterative model was formed. This model assumes a breakdown of the project life cycle into a series of iterations, each resembling a "mini project" with all phases of the life cycle.

The classic iterative model eliminates the possibility of returning to previous stages (Fig. 6.2). This fact reflects a significant aspect of software

development: the desire to anticipate in advance all situations of use of the system and the inability in most cases to achieve it. All traditional

programming technologies are only designed to minimize returns. But the essence of this does not change: when returning always have to repeat the construction of what was already considered ready.

The purpose of every iteration in software development is to get a working version of the software system that includes functionality defined by the integrated content of all previous and current iterations. The result of the final iteration contains all the required functionality of the product. Thus, with the completion of each iteration, the product develops incrementally (increases functionality).

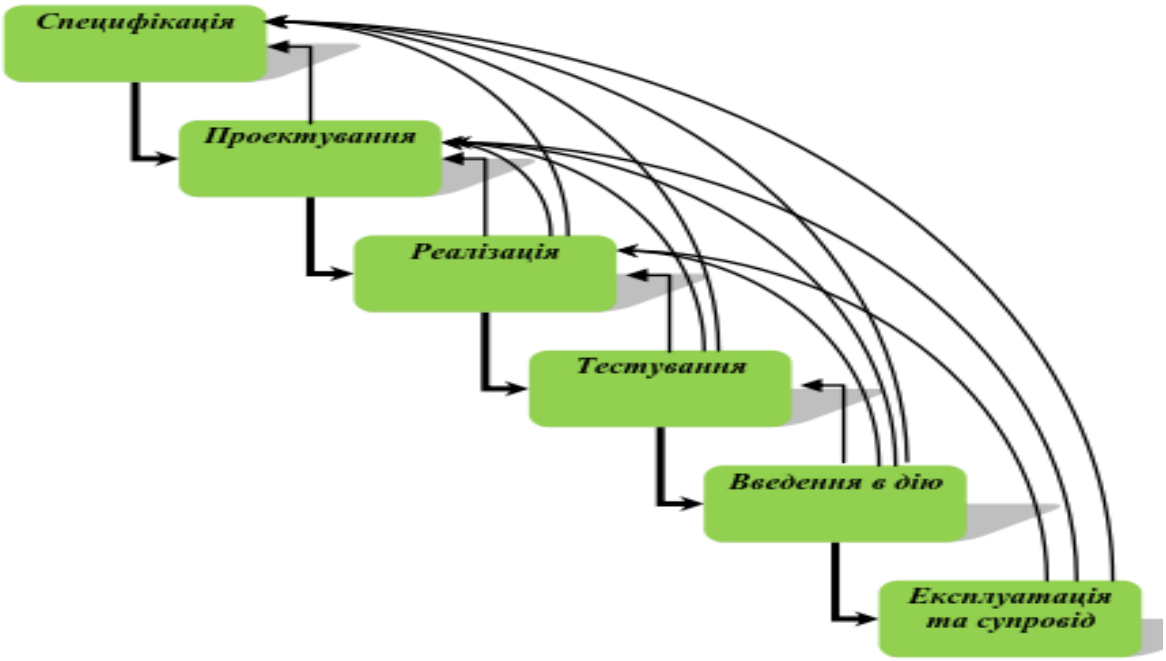


Fig. 6.2. Classic iterative model

In terms of life cycle structure and development process, such a model is iterative (Fig. 6.3). In terms of product development, it is incremental.

The experience of the software development industry shows that it is impossible to consider each of these views in isolation [10]. Therefore, this model is often referred to as the Iterative and incremental development (IID) model [11].

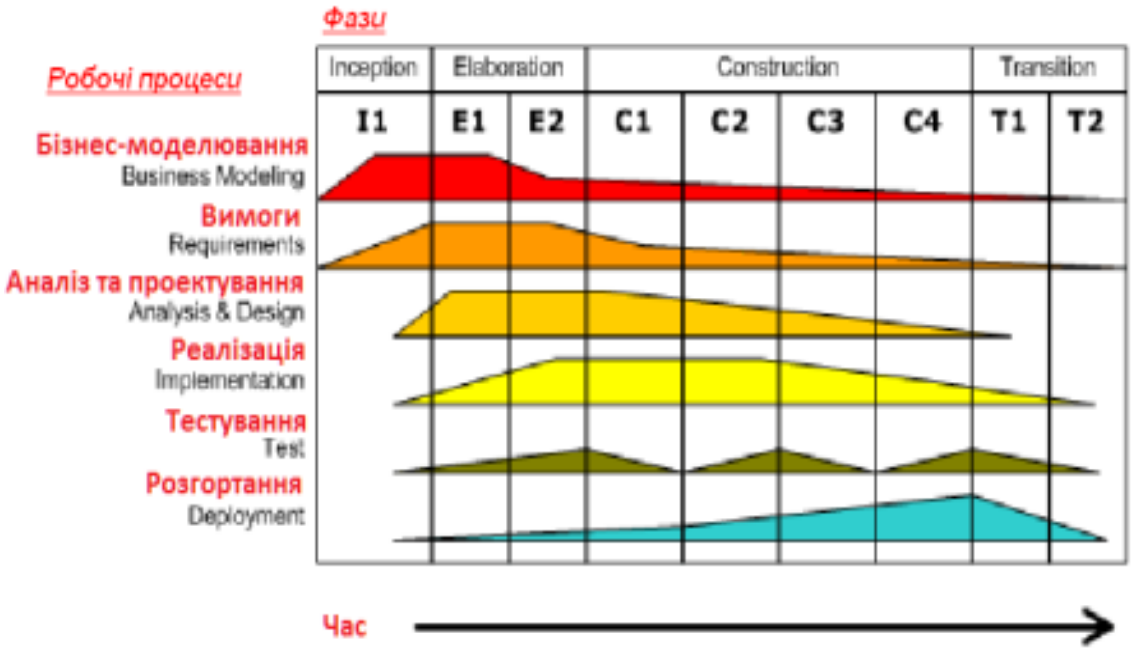


Fig. 6.3. Iterative and incremental development

Programs Various variants of the iterative approach are implemented in most current development methodologies (RUP, MSF, XP).

Short description:

the stages are repeated repeatedly.

Disadvantages:

the system is often poorly structured, the project is not transparent;

after clarification of requirements, part of work previously completed is discarded;

needed tools for rapid development.

Usage: Suitable for small to medium sized projects.

3. SPIRAL MODEL

The most well-known and common variant of the iterative model is the spiral model (Fig. 6.4.), Which was first formulated by Barry Boehm in 1988 [12]. A distinctive feature of this model is the particular focus on risks that affect the life cycle organization.

Boehm formulates the "top-10" most common (by priority) risks (used with the permission of the author):

1. Shortage of specialists.
2. Unrealistic terms and budget.
3. Implementation of inappropriate functionality.
4. Development of the wrong user interface.
5. "Golden Serving", perfectionism, unnecessary optimization and sharpening of details.

6. Continuous flow of change.

7. Lack of information about external components that determine the environment of the system involved in integration.

8. Shortcomings in the work performed by external (in relation to the project) resources.

9. Insufficient productivity of the resulting system.

10. "Gap" in the qualification of specialists in different fields of knowledge.

Fig. 6.4. Bohem's spiral model integrates a cascading approach and an iterative design process based on prototyping.

Barry Bohemus himself characterizes the spiral model of development (used with the permission of the author):

"The main achievement of the spiral model is that it offers a range of opportunities to adapt the best aspects of existing life cycle models. At the same time, the risk-based approach avoids many of the difficulties inherent in these models. In some situations, the spiral model becomes equivalent. In other cases, it provides the best possible connection of existing approaches in the context of this project.

The spiral model has several advantages:

The model pays special attention to early analysis of reuse opportunities. This is ensured, first and foremost, in the process of identifying and evaluating alternatives.

The model assumes the possibility of life cycle evolution, development and change of software. The main sources of change are the goals for which the product is created. The approach of hiding details about a detail at a certain level of design allows us to consider different architectural alternatives as if we were talking about a single design solution, which reduces the risk of inability to reconcile product functionality and changing goals (requirements).

The model provides mechanisms to achieve the required quality parameters as an integral part of the software development process. These mechanisms are based on the identification of all types of purpose (requirements) constraints on all "cycles" of the development spiral. For example, security restrictions may be considered as risks at the requirements specification stage.

The model pays special attention to preventing errors and rejecting unnecessary, unjustified or unsatisfactory alternatives in the early stages of the project. This is clearly achieved through specific risk analysis work, verification of the various characteristics of the product being created (including architecture, compliance, etc.) and confirmation of the ability to move further in each "cycle" of the development process.

The model allows you to control the sources of project work and related costs. In essence, it is about answering the question - how much effort is required to spend on requirements analysis, planning, configuration management, quality assurance, testing, formal verification, etc.

The risk-oriented model allows to address, in the context of a particular project, the objectives of the program with an adequate level of effort, which is determined by the level of risks associated with the under-execution of certain works.

The model does not distinguish between the development of a new product and the expansion (or maintenance) of an existing one. This aspect avoids the common attitude of support and support as a "second-class" activity. This approach prevents a large number of problems arising from the same focus on both routine support and critical issues related to enhancing the functionality of a product, always associated with increased risks.

The model allows to solve the integrated problem of system development, which covers both software and hardware components of the created product. An approach based on risk management and the possibility of timely rejection of unattractive alternatives (in the early stages of the project) reduces costs and can equally be applied to hardware and software. "

Describing the created spiral model, Boehm points out that having clear advantages over other life cycle views, it is necessary to clarify, detail the steps,

ie cycles of the spiral model for providing a holistic context for all people involved in the project (Boeem puts it this way: "Need for further elaboration of spiral model steps. In general, the spiral model process steps need further elaboration to ensure that all software development participants are operating in a consistent context . "). Organization of roles (Responsibilities of project team members), detailing the stages of the life cycle and processes, identifying assets (artifacts) important at different stages of the project, practice analysis and risk prevention - all this is a matter of a specific process framework or, as is commonly said, development methodologies.

Indeed, the detailing of processes, roles and assets is a matter of methodology. However, considering a design model, being a conceptual view of product creation, requires, like in any project, the definition of key milestones of the project - milestones. This is largely due to the effort to answer the question "where are we?" An issue that is especially relevant to project managers and leaders who are monitoring their progress and planning for future work.

In 2000 [Boehm, 2000], introducing an analysis of the use of the spiral model and, in particular, the MBASE - Model-Based (System) Architecture and Software Engineering (MBASE) approach, Boehm formulates 6 key characteristics or practices that ensure successful application of the spiral model:

1. Parallel rather than sequential determination of project artifacts (assets)

2. The agreement is that every cycle is given attention to:

• goals and constraints important to the customer

• alternatives to the organization of the process and technological solutions embedded in the product

• identification and resolution of risks

• stakeholder evaluations (first of all by the customer)

• agreeing that you can and should move on

3. Use of risk considerations to determine the level of effort required for each work on all spiral cycles.

4. Use of risk considerations to determine the level of detail of each artifact created on all spiral cycles.

5. Life cycle management in the context of the commitments of all stakeholders based on three control points:

• Life Cycle Objectives (LCO)

• Life Cycle Architecture (LCA)

• Initial Operational Capability (IOC)

6. Paying particular attention to the design work and artifacts of the system being created (including directly the software being developed, its

environment, and operational characteristics) and the life cycle (development and use).

The evolution of the spiral model is related to the detail of the work. Particular emphasis should be placed on more important issues - requirements, design and code, that is, giving more importance to iterations, including increasing their number while reducing the duration of each iteration. As a result, you can define a common set of control points in today's spiral model:

• Concept of Operations (COO) - system concept;

• Life Cycle Objectives (LCO) - life cycle goals and content;

• Life Cycle Architecture (LCA) - life cycle architecture; here it is possible to talk about the readiness of the conceptual architecture of the target software system;

• Initial Operational Capability (IOC) - the first version of the product to be developed for experimental use;

• Final Operational Capability (FOC) - a finished product deployed (installed and configured) for real operation.

The most well-known and common variant of the iterative model is the spiral model (Fig.6.5), first formulated by Barry Boehm in 1986 [12].

A distinctive feature of this model is the particular focus on risks that affect the life cycle organization.

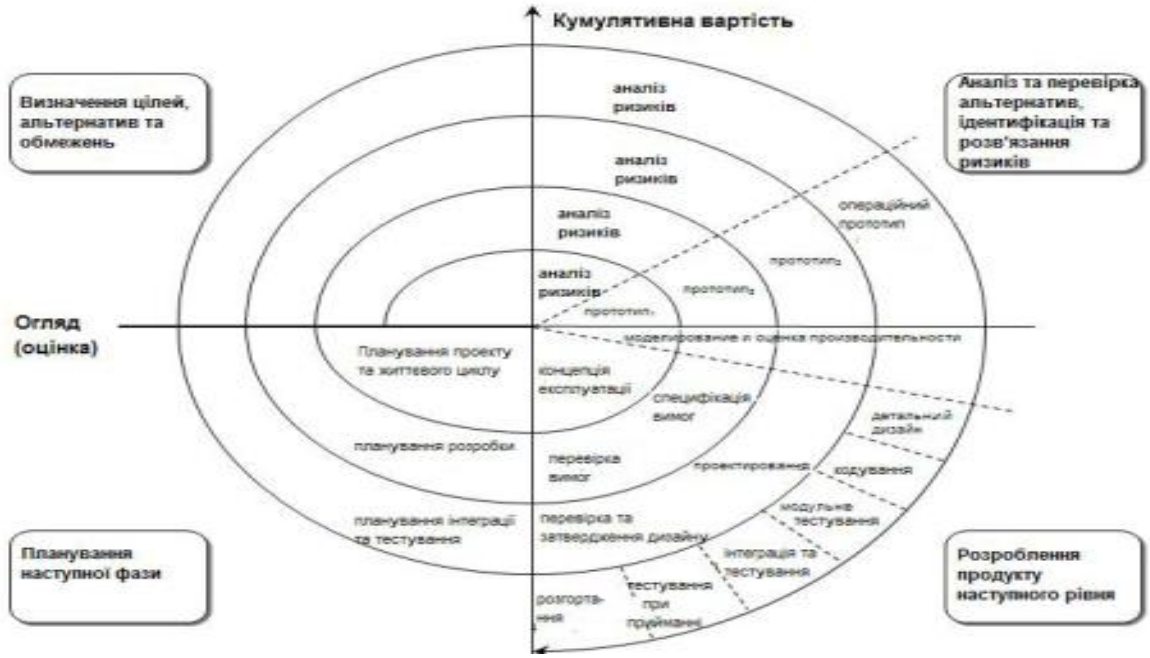


Fig. 6.5. Spiral model of ZhC

In the spiral model of program development it looks like a series of consecutive iterations. In the first stages, the specifications of the product are specified, in the following - new features and functions are added. The purpose

of this model is to re-evaluate the risks of continuing work at the end of each iteration.

At each turn of the spiral, the creation of the next version of the product is performed, the requirements of the project are specified, its quality is determined and the next round of work is planned. Particular attention is paid to the initial stages of development - analysis and design, where the feasibility of certain technical solutions is verified and justified by prototyping (layout).

Due to the iterative nature of the spiral model, it allows for adjustments in the course of operation, which contributes to product improvement.

With many iterations, the development of this model requires deep automation of all processes, otherwise it becomes inefficient. In practice, customers and users sometimes experience a sense of product instability as they do not have time to keep up with the rapid changes in the product.

The spiral model of software development requires the identification of key milestones. There are the following main control points [12]:

Concept of Operations (COO) - the concept of using the system;

Life Cycle Objectives (LCO) - life cycle goals and content;

Life Cycle Architecture (LCA) - life cycle architecture;

Initial Operational Capability (IOC) is the first version of the software, that is checked during the research operation;

Final Operational Capability (FOC) - Ready-to-use software that is real-time.

Key point analysis is especially relevant for project managers and leaders who monitor project progress and plan for future work.

Short description:

the project has milestones checkpoints;

on each turn of the spiral prototype Output - a product that meets the requirements of users.

Advantages:

early analysis of reuse opportunities;

mechanisms available to achieve quality parameters;

the model allows you to control the sources of project work and related costs;

The model allows to solve the integrated problems of system development covering the software and hardware components of the created product.

Disadvantages:

after clarification of requirements, part of work previously completed is discarded;

needed tools for rapid development.

Usage: Suitable for small to medium sized projects.

Despite the development of the theoretical base, the stage of complex automation of programming technologies became possible only at the appropriate level of development of technology. Significantly influenced the transition to integrated automation, the realization that it is impossible to develop industrial programming without the support of technological functions at all stages of program life. In the early 90's of the twentieth century. appeared

CASE technology (Computer Added Software Engineering) is a set of software engineering tools and methods for software design to ensure high quality, minimal errors and simplify design, which integrated systems for integrated automation of software development and support.

Analysis of the models of LCD software shows that programming is not the main activity of the team engaged in industrial development. Many studies add up to a programming phase of no more than 15-20% of development time (support may be endless).

Test tasks

1. Which of the following approaches does not apply when structuring a project:

a) by project life cycle;

b) by product components;

c) functional approach;

d) linear approach;

e) geographical approach;

g) for responsibility.

2. WBS is:

a) a hierarchical structure designed to logically distribute all project implementation work and presented graphically.

b) a set of several levels, each of which is formed as a result of the synthesis of the previous level of work.

3. Calendar scheduling is:

a) compilation and adjustment of terms of completion of the complexes by years and quarters and determining the need for resources for each stage of work;

b) drafting and adjusting the work with the detail of tasks per month, week or day;

c) drawing up and adjusting the schedule of work execution, according to which the works performed by different organizations are mutually agreed in time, taking into account the possibilities of providing them with logistical and labor resources.

4. Network planning is:

a) a form of graphical representation of the content of the work and the duration of plans and long-term complexes, design, planning, organizational and other activities of the enterprise, which provides optimization based on economic-mathematical methods and computer technology.

b) planning, which involves bringing to the departments and direct contractors the subjects and nomenclature of works on production preparation, carrying out the necessary calculations on the volume of works, drawing up schedules of the latter.

5. The grid model is:

a) an information-dynamic model that reflects the relationships between the technical elements of the project;

b) any production processes or other actions that lead to certain results, events;

c) the final results of previous work, which is the moment of completion of the planned action;

d) a set of interconnected elements to describe the technological dependence of individual works and stages of future projects.

6. All of the following situations are advantages of the Crimean project organizational structure:

and). The project manager has complete guidance on the project.

b). Equipment and people come together through projects.

c) Communication lines are reduced.

d). Teamwork and sense of involvement.

e) Team members are subject to one leader.

7. Which of the following are NOT benefits of a project management matrix structure?

a) Links between functional units are expanded

b) Resource duplication is minimized

in). The policies in the organization are agreed

d) There are two groups of executives - functional and administrative managers

e) Leaders - team members have functional responsibilities after the project is developed

8. Which of the following steps is not used in resource planning:

a) assessment of resource requirements;

b) comparison of needs and availability of resources;

c) determining the resource requirements of the project;

d) obtaining the necessary resources under the signed contracts;

e) formation of schedules of supply of resources.

9. At what timeframe of the project life cycle is the commercial effectiveness of the project calculated?

a) On pre-investment.

b) On the investment.

c) On the operational.

d) At all.

10. At what stage of the project implementation is determined the list of goals, requirements and objectives of the project:

a) concept development;

b) problem analysis;

c) project development.

11. What kind of control is carried out directly during the implementation of the project for the purpose of operational regulation:

a) the previous one;

b) the current one;

c) final.

12. Depending on the accuracy required, the following project performance evaluation technologies are distinguished:

a) control at the time of completion of works;

b) control at the moment of work readiness by 50%;

c) control at predefined project points;

d) regular operational control;

e) all answers are correct.

13. The basic principle of the systematic project quality management concept is:

a) each project participant is involved (within certain limits) in the overall quality of the project;

b) comprehensive project quality management;

c) responsibility for the quality of the project lies with the laboratory of the enterprise;

d) the project is a holistic system that must be managed.

14. At what stage of the project, in order to organize the quality control, the permission of the commissioning organization and the admission committee is required:

a) pre-investment;

b) project development;

c) implementation;

d) delivery of the object.

15. What organizational structures are usually used in the practice of forming a project team:

a) matrix;

b) linear-functional;

c) design;

d) correct answers a) and c).

THEME 7. PROGRAMMING PROJECT MANAGEMENT PROCESS

Issues to discuss

1. Describe the content and participants of the information exchange in the project.
2. Classify the project documents and describe their required details
3. How is information communication planning for the project?
4. Describe the methods and means of reporting on project implementation.
5. How is the project closed administratively?
6. Give a general description of the Project Expert software product.
7. What tasks allows you to solve the user interface of the Project Expert software product.
8. What tasks does Project Expert Integrator solve?
9. What includes an automated investment project management system?

LECTURE

7.1. GENERAL CHARACTERISTICS OF PROJECT EXPERT

Today, Project Expert is the most widely used software for project development and management. The developer of this product is ProInvestConsulting (Moscow).

Project Expert allows you to present the results of calculations in the form of prepared sections of the business plan. The latest version of the program is Project Expert 6 Holding.

Microsoft Project is by far the most widespread project management system in the world, combining ease of use, a friendly interface and the most essential project management tools, designed primarily for users who are not professionals in the field of project management. In many Western companies, Microsoft Project is a common addition to Microsoft Office, even for ordinary employees who use it to schedule complex workflows.

The Microsoft Project 98 work window in the form of a Gantt chart is shown in fig. 7.1. Benefits of Microsoft Project are quite flexible and convenient reporting tools. The main types of reports can be selected from (Report Gallary). In addition to the standard Microsoft Project file formats: MPP and MPX, users can save project information in ODBC, Excel, and Access formats. MPD (Microsoft Project Database) format allows you to store all project data in a structure accessible from both MS Project 98 and Access 8.0. For quick start-up,

Microsoft Project also provides the ability to step-by-step create (Create Your First Project) and smart answer (Answer Wizard) tools. Microsoft Project is not Russified, so you need English language skills, including project management terminology, to use these tools effectively.

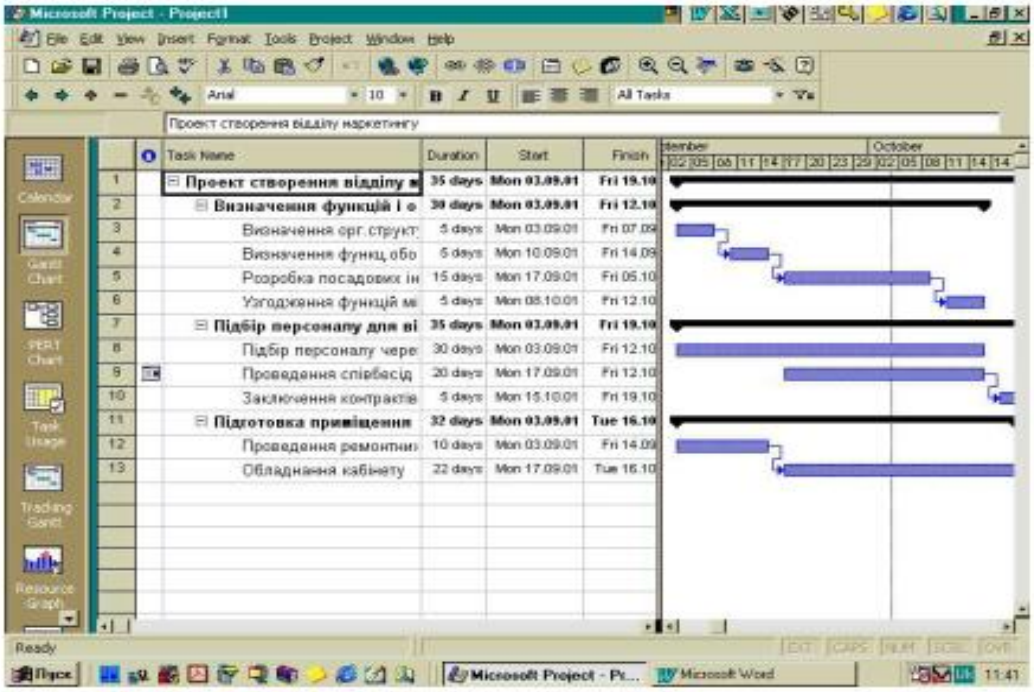


Fig. 7.1. Gantt chart in Microsoft Project 98

A major drawback of Microsoft Project 98 is that this package provides a minimal set of tools for planning and managing resources. In Microsoft Project 98, only people and equipment can be planned as resources.

The latest version of the system is Microsoft Project 2000. Of the main features related to project planning and monitoring that appeared in the new version, we can distinguish the following:

- hierarchical codes of structures for works and resources;
- non-renewable resources (materials) as a type of resources;
- month as a unit of work duration;
- individual work calendars;
- graphical indicators for visual presentation of "problem" tasks;
- fields with the ability to calculate user-defined formulas;
- two timelines (main and optional);
- ability to approximately determine the period of work (with further clarification);
- creating project templates.

Particular attention in the new version was given to the organization of information exchange in the project team. The new Microsoft Project Central

product allows for two-way communication between all project participants, as well as providing information to non-Microsoft Project 2000 users.

Project Expert has several levels:

The first level of Project Expert is designed to develop a strategic plan for enterprise development. It includes procedures for describing the enterprise, its balance sheet, sales and production plans, financial statements and more.

The second level - Project Expert Professional allows not only to carry out financial planning of an enterprise or project, but also to control the implementation of plans. In addition, this level allows for the financial planning and control of a group of projects. To do this, the Project Integrator includes an optional Project Integrator module that allows you to calculate the total flow of funds for a project group and to calculate the overall performance criteria.

Third Level - Project Expert Holding is designed for the financial planning and control of large corporations.

7.2. OPEN PLAN PROFESSIONAL

Open Plan is a professional project management system, characterized by, in particular, powerful resources for budgeting and budgeting that make it much easier to find the most efficient resource allocation and scheduling.

The product interface is quite original (Fig. 7.2). The workspace is presented as several desktops that contain shortcuts to standard objects (project files, calendars, resources, codes, templates) and file shortcuts. With the opening of the project, a "project notebook" is opened - a set of desktops with shortcuts to files directly related to the project. Using a template for a project is easy by moving the desired shortcut to the project notebook.

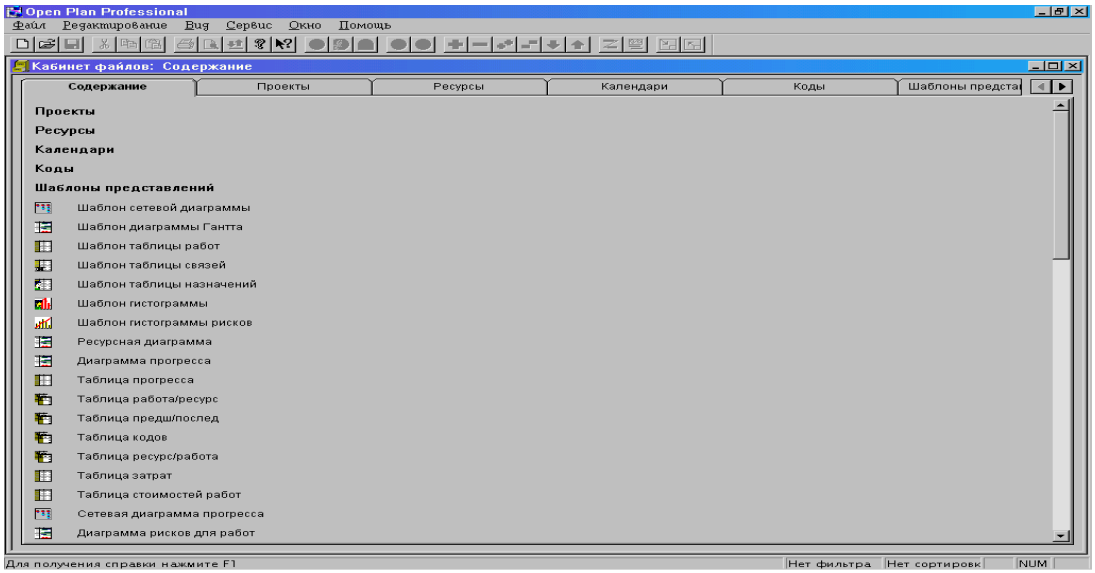


Fig. 7.2. Open Plan work window

Main features of Open Plan

1. Creating a project model.

Open Plan has the most powerful means of structuring a project model based on:

Work Work Breakdown Structure;

 network model (PERT diagram); hierarchical structure of resources;

 hierarchical system of coding works.

The Open Plan system provides flexible and convenient tools for forming a hierarchical structure of work (Fig.7.3). The manager can form an unlimited number of levels of the project hierarchy. Open Plan provides ample opportunity to create a logical project structure, including any type of linkage between tasks. Planning allows scheduling and linking work, including target start and end dates for specific jobs.

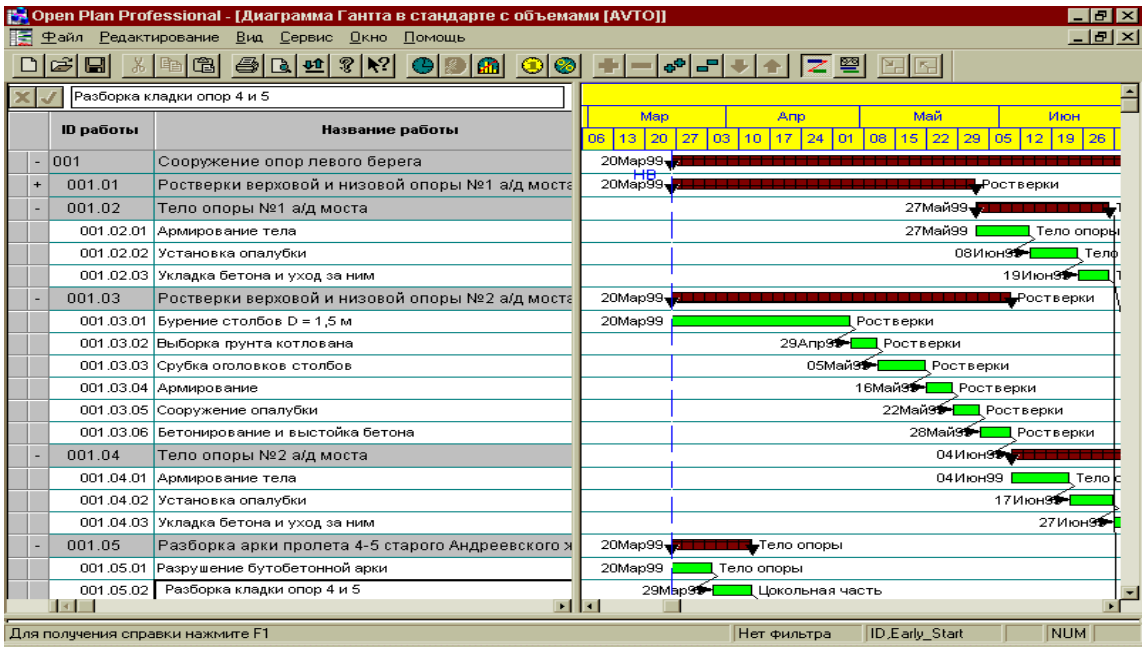


Fig. 7.3. Gantt chart in Open Plan

Provided in Open Plan the possibility of creating a hierarchical structure of resources - performers, equipment, materials, costs, which is presented in Fig. 7.4, allows you to choose the degree of detail when viewing resource downloads, to plan and allocate resources at different levels.

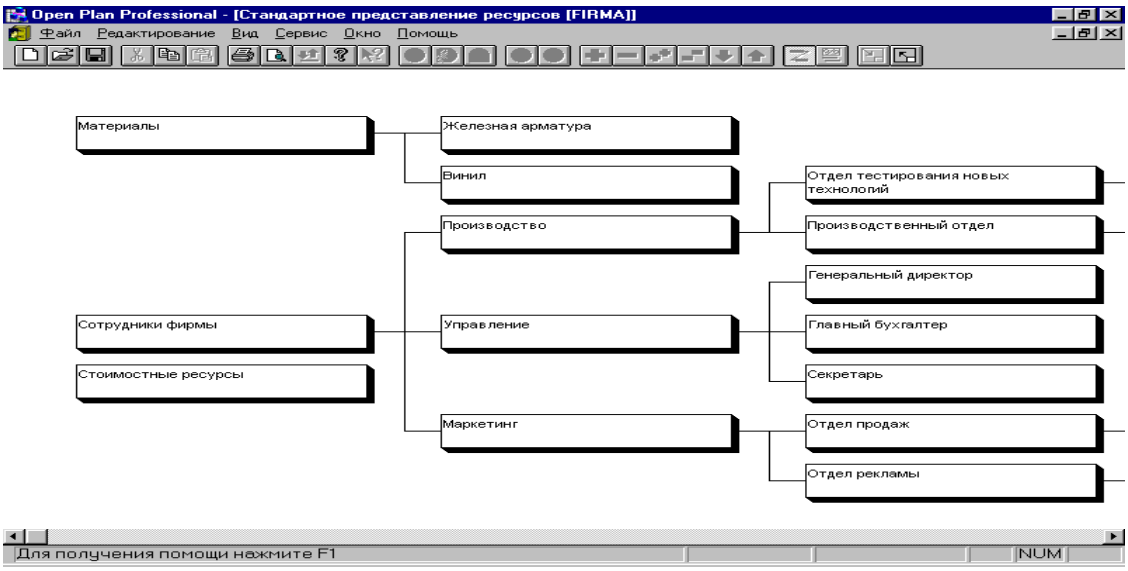


Fig. 7.4. Resource structure in Open Plan

An additional tool for structuring Open Plan is the universal code system. By assigning codes to different elements of a project, based on a predetermined hierarchical structure, it is possible to summarize data of the appropriate level to obtain reports that reflect the information in the desired section. The developed hierarchical code structure is stored in a special file and can be used for other projects.

2. Resource management

The Open Plan system allows you to manage all types of resources, namely: renewable resources (people, equipment); non-renewable resources (materials), including resources with limited shelf life; and the finances that are described in the resource file.

The amount of available resources at any time of project implementation is described by the availability parameter. For renewable resources (for example, builders), this parameter is determined by the number of resources available at certain intervals. For non-renewable resources (for example, building materials), this is the total amount and date from which the resource is made available, for finite-term resources, it is the total number and time interval for which the resource can be used.

In Open Plan it is possible to set the change in the cost of resources over time - increase or decrease prices. If after a certain period of time there is an increase or decrease in the price of the resource, then this change is reflected in the results of the cost analysis.

The system also defines the concept of resource qualification. To work you can define the need for the number of resource units and qualification of the resource. This allows the project manager to designate not a specific resource

for the job, but using Open Plan to select the least downloaded resource of the relevant qualification.

Thus, the effectiveness of creating a work schedule when assigning resources is achieved by: first, not requesting a specific performer but a specific qualification or belonging to a particular group in a hierarchical structure, and second, specifying an alternative resource to replace the original one. At the request of the manager, an automatic search for the optimal resource in terms of the availability of the resource to assign it to perform a particular task is performed.

Open Plan offers two options for describing the need for resources when you are hiring them:

1) assign the number of resource units per time unit;

2) specify the total number of resources for the entire duration of the work, defining the nature of the function of use (increase in the number of start, end, in middle, even loading).

The resource can also be assigned not for the entire duration of the work, but for a certain period of time, starting from the specified moment from the beginning of the work.

Open Plan offers powerful tools for analyzing the degree of project resource availability by comparing the project's resource needs profile and resource availability profile. This analysis can be performed for either a single resource or a resource group.

Open Plan provides two basic methods for calculating dates during resource planning:

Жен Resource planning for a limited time (to coordinate the load of resources in compliance with the project target dates);

 Resource planning for limited resources (do not allow reloading of resources even if the project completion date is delayed).

Generally, a project manager can set its own rules for resource planning, including prioritizing work.

3. Cost planning and control

Open Plan enables the following cost planning and control functions:

 calculation of project costs with and without changes in cost of resources;

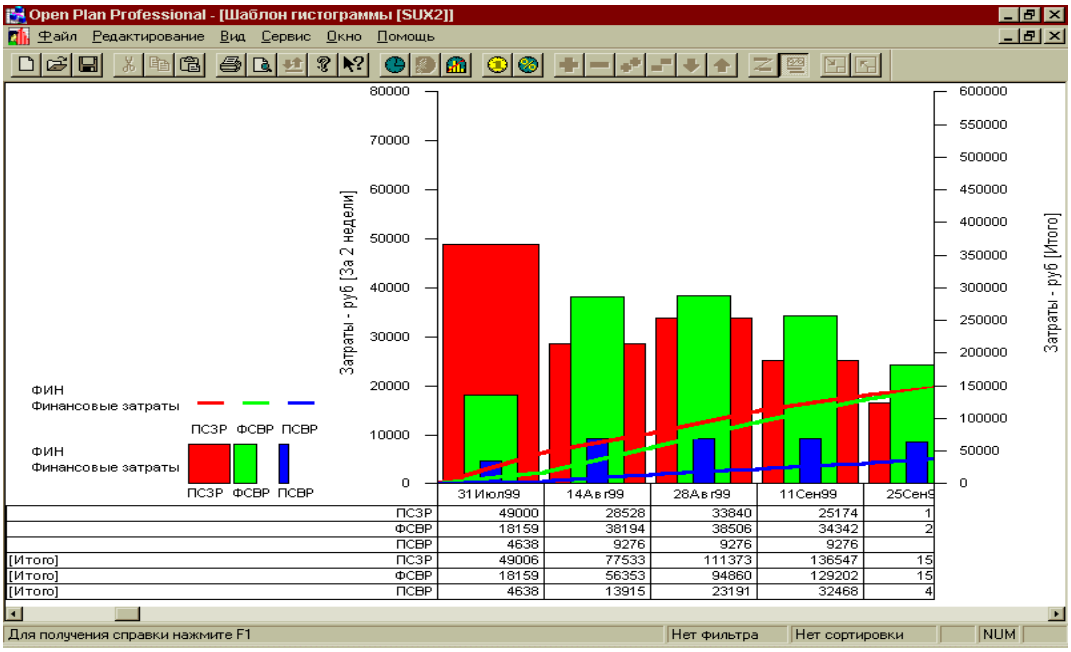
 “remembering” several project variants in different terms in order to find the “most economical” realization time;

 the ability to automatically calculate costs based on the number of spent resource units;

 Cost analysis by actual volume.

With the help of memorizing several variants of the project implementation, input of actual data on labor costs and working out of resources allow to analyze both estimated and real costs. Open Plan provides specific procedures for planning and controlling costs, among which the tools for analyzing and building actual volume reports are particularly important.

The system of budget control over the actual amount of work performed is based on three indicators - the planned cost of the planned work, the planned cost of the work performed, the actual cost of the work performed. These figures are presented by the total cost curves in Fig. 7.5 (PSZR - “planned cost of planned works”, PSVR - “planned cost of completed works”, FSVR - “actual cost of works performed”).



	ПСЗР	49000	28528	33840	25174	1
	ФСВР	18159	38194	38506	34342	2
	ПСВР	4638	9276	9276	9276	
[Итого]	ПСЗР	49006	77533	111373	136547	15
[Итого]	ФСВР	18159	56353	94860	129202	15
[Итого]	ПСВР	4638	13915	23191	32468	4

Fig. 7.5. Cost analysis of actual volume in Open Plan

4. Risk analysis

The Open Plan system has analytical tools that are based on the Monte Carlo method and allow you to identify the possible risks in estimating the timing of completion of individual works, stages and the whole project. Thus, the likelihood of deviation of the work deadline from the schedule and, hence, budget overruns, as well as other negative consequences, is estimated.

The risk analysis in Open Plan is implemented by the following means:

 procedures for introducing optimistic and pessimistic parameter estimates for some or all of the project;

 performing a Monte Carlo risk analysis to calculate the likelihood of project completion in a timely manner;

 preparation of reports used to analyze the impact of uncertainty on project implementation.

The risk histogram shows the likely distribution of specified dates for key project work. Figure 7.6 shows a histogram constructed from the dates of early work. It shows the percentage of early onset at the specified interval.

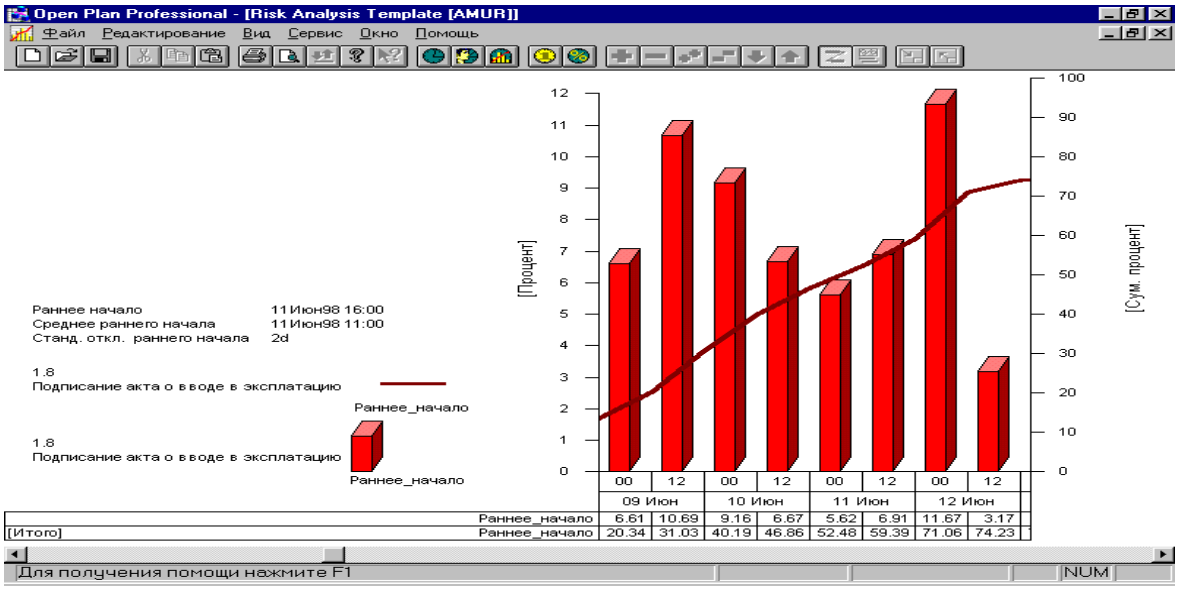


Fig. 7.6. Risk histogram in Open Plan

5. Multiproject planning

The ability to work in multi-project mode allows users to view a large project as a project consisting of smaller sub-projects and to manage it more flexibly at different levels. Multi-project mode provides the means to control and distribute an organization's single resources across all the projects it executes.

The integration of projects thus serves two purposes: first, it is possible to analyze the enterprise-wide project resource utilization, and secondly, to provide an environment for integrated programmatic management of large complex projects divided into subprojects. In the second case, each subproject may have its own resource file.

Working in multi-project mode provides the user with the means to combine the projects of the organization into one, to compile a general schedule, to coordinate the activities of different units and organizations involved in the project. With a combination of projects into one file, they are converted to external subprojects if you use the term Open Plan (or aggregate work), which should be treated in the same way as with internal subprojects. You can specify links between robots of different external subprojects, which are then reflected in individual project files. With resource planning in a combined project, the user can develop a system of prioritization of work of different projects, which will indicate the order of allocation of resources for projects in the planning process.

One of the main benefits of Open Plan is that the system can handle any profile data that is relevant to the enterprise. Welcom software can be configured to work with different databases thanks to an object-oriented and client-server architecture. The user can choose in which format to save the project data - in their own Open Plan format, in the formats Oracle, SQL Server, Sybase, xBase).

Open Plan provides the ability to restrict access to project data, allows you to grant different rights to access individual data, regulating their sharing.

The Open Plan system is implemented in two variants - Open Plan Professional and Open Plan Desktop - each of which meets the different needs of contractors, managers and other project participants. Both versions of the project work with one database, so there is no need to exchange data. Sharing a professional and lightweight version of a project management system not only takes into account the needs of all user groups, but also significantly reduces the cost of installing the program.

Open Plan Desktop users are provided with all the tools to create projects, manage them in the process of implementation, reporting, but do not have access to a number of customization procedures, so they can use all the powerful tools provided by the system, but without unnecessary complications.

7.3. SPIDER PROJECT

Spider Project's Russian development features powerful limited resource scheduling algorithms and many additional features.

The workspace of the Spider Project main window is divided into three functional zones (Fig.7.7). On the left are shortcuts for open projects, on the middle - shortcuts for templates, and on the right are shortcuts for opening documents

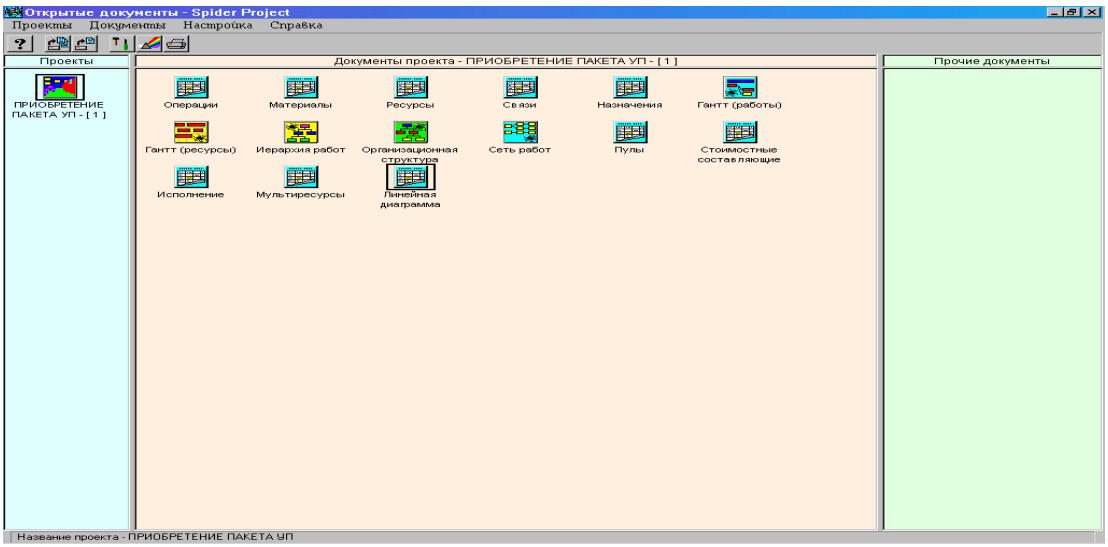


Fig. 7.7. A working window in the Spider Project

Key Features of Spider Project

1. Robots and relationships between robots

Existing project management packages are largely characterized by the duration of their implementation. In Spider Project, you can specify the physical volume of work instead of duration. Then the duration is determined by the program in the process of creating a work schedule, depending on the productivity of the required resources. Spider Project uses the same types of relationships as other packages. The differences are in the definition of delays: in addition to time delays, delays in workloads can also be used.

2. Formulation of the project schedule and calculation of the critical path

Spider Project allows you to define, in addition to the traditional critical path, the resource critical path and the performance reserves, given the limited resources available. The project implementation schedule can be calculated taking into account not only the scarcity of renewable resources, but also the project delivery and financing schedules, not only by total costs, but also by individual components and cost centers.

3. Hierarchical structures

The Spider Project can use an unlimited number of different hierarchical work structures and resources. In addition, you can create so-called incomplete structures that do not include all the work of the project. Incomplete structures are a convenient tool for preparing reports and analyzing specific aspects of a project. An example of such an incomplete structure would be a supply structure that includes only those operations that reflect the supply of materials for the project.

4. Resources

Resources - they are divided into renewable (people, equipment) and non-renewable (materials) - set separately. You can further specify which materials are used as recoverable resources, then, by identifying the latter, you can automatically predict the use of the necessary materials.

In addition to individual resources, you can specify multi-resources and pools. Multi-resources are groups of resources that work together (such as a team, a computer programmer, etc.). They can be assigned to complete the job, which means the allocation of all resources that are in the multi-resource. Pools are groups of interchangeable resources. The use of resource pools eliminates the manager's need to rigidly assign contractors to the project. It is enough to indicate the total number of resources needed to perform the work, as well as the number of resources to choose from. This helps to reduce unproductive downtime and make it easier for the project manager to work. The main

difference from the approaches used in other packages is that the pool resources may have different performance.

5. Assignment of resources

In Spider Project, as you assign resources to the execution of the project, the concept of a team, that is, a group of resources that work together, appears. The team can include both individual resources, multi-resources, and pools. Resources may be assigned to partial work, then the assigned resource load is given as a percentage along with the number. The materials can be assigned directly to an operation or a resource (you can then get a report on the use of materials by individual resources).

6. Costs

In addition to setting the cost of an hour for a renewable resource and the cost of a unit of material, costs can be allocated directly to the works. For example, if the work is performed under a fixed-price contract, then there is no point in determining the cost of an hour's work for the resource, but you should just use the total cost of assigning a resource (contractor) to work.

7. Risk analysis

The algorithm of risk analysis differs from those implemented in other systems in that, when modeling risks, the estimates of resource productivity (not optimistic, pessimistic) are used as initial information rather than estimates of work duration.

8. Group work on the project

Spider Project does not provide simultaneous access to change data. Responsible for a part of the project (phase) provides the project manager with their files, and the decision to accept or reject changes remains with the project manager. This solution, according to developers, avoids confusion when changing design data. From these positions the system of group work through the Internet is developed.

The system of interaction between project participants using the intranet or the Internet involves the following processes:

1) transfer to the server created by the main manager of the full version of the project, determine the list of users and their access level;

2) receiving system users according to project access restrictions - a read-only project plan or a separate project phase (sub-phase) for implementation management;

3) transfer by users as a result of performing the functions of management of the changed plan (phase) to the server, from where the project manager receives it.

When a user accesses the server, the system authenticates the server, thus delimiting access to the project.

Users can create various directories in a batch or import from other programs and make them project databases. Spider Project allows you to:

 Unlimited increase in the number of indicators taken into account in the project;

 create and use in the calculations any additional tabular documents and databases;

 introduce calculation formulas.

In addition to the standard graphical reports - the Gantt chart shown in Fig. 7.8, the network diagram, resource loading diagrams, material costs and project cost schedules and individual phases, Spider Project offers users a Gantt resource chart and a line diagram.

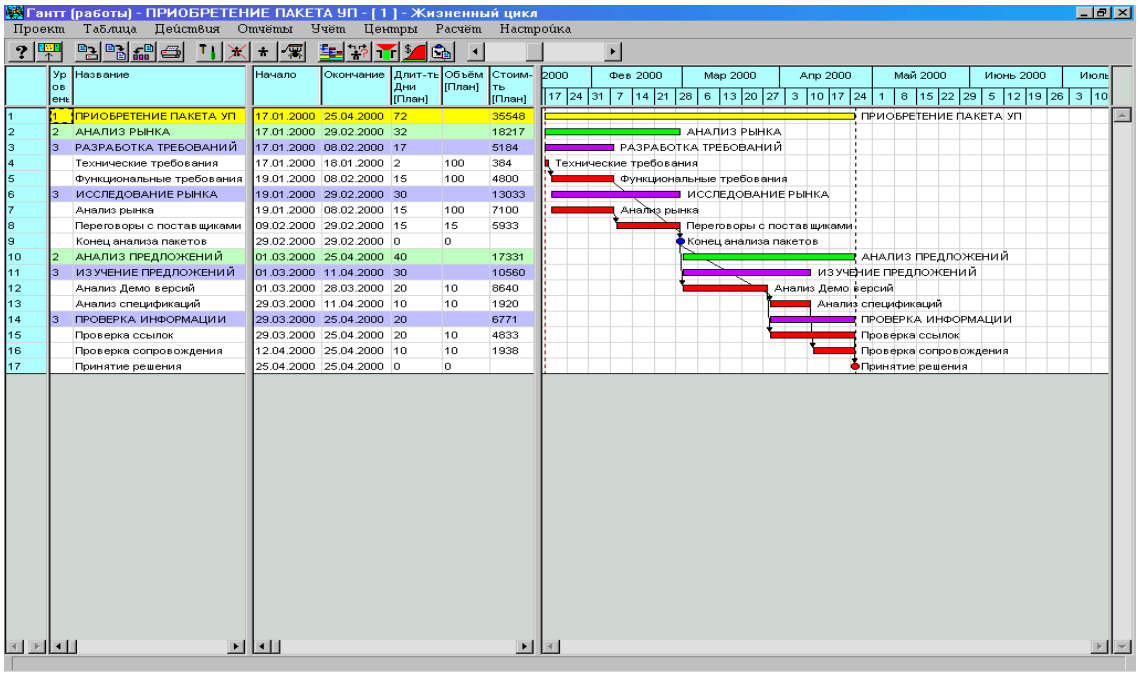


Fig. 7.8. Gantt chart in Spider Project

The Gantt resource diagram in Figure 7.9 shows the periods of resource loading. The table part shows the hierarchical structure of resources, the graph shows the periods of loading resources and units. The linear diagram shows the metric characteristics of the project (kilometers, floors, etc.) along the horizontal axis, and the time axis on the vertical axis. Users can choose which types of work to display on a line chart.

To build an integrated project management system, Primavera Systems, Inc. offers several products on the market

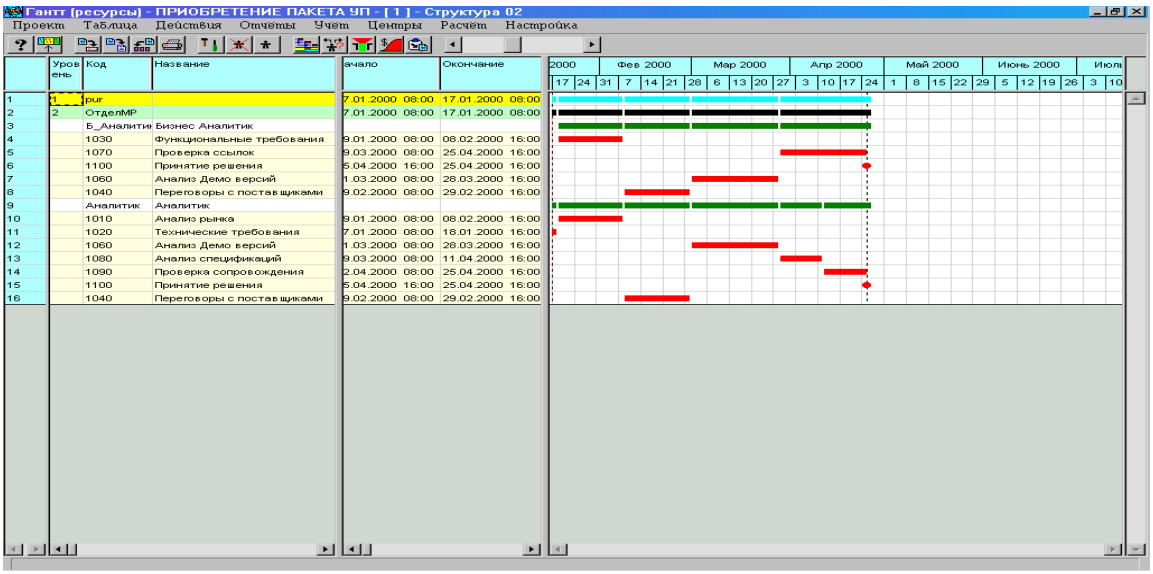


Fig. 7.9. Gantt Spider Project Resource Diagram

For use at lower levels of management - Sure Trek Project Manager package, for work with complex multi-level projects - professional project management package Primavera Project Planner (P3).

7.4. SURE TREK PROJECT MANAGER

Sure Trek Project Manager is a software product focused on the management of small projects, subprojects, as well as the work of specific contractors with project fragments. He can work both independently and in conjunction with Primavera Project Planner in a corporate project management system.

The Sure Trek Project Manager work window, which displays the Gantt chart, is shown in Figure 7.10.

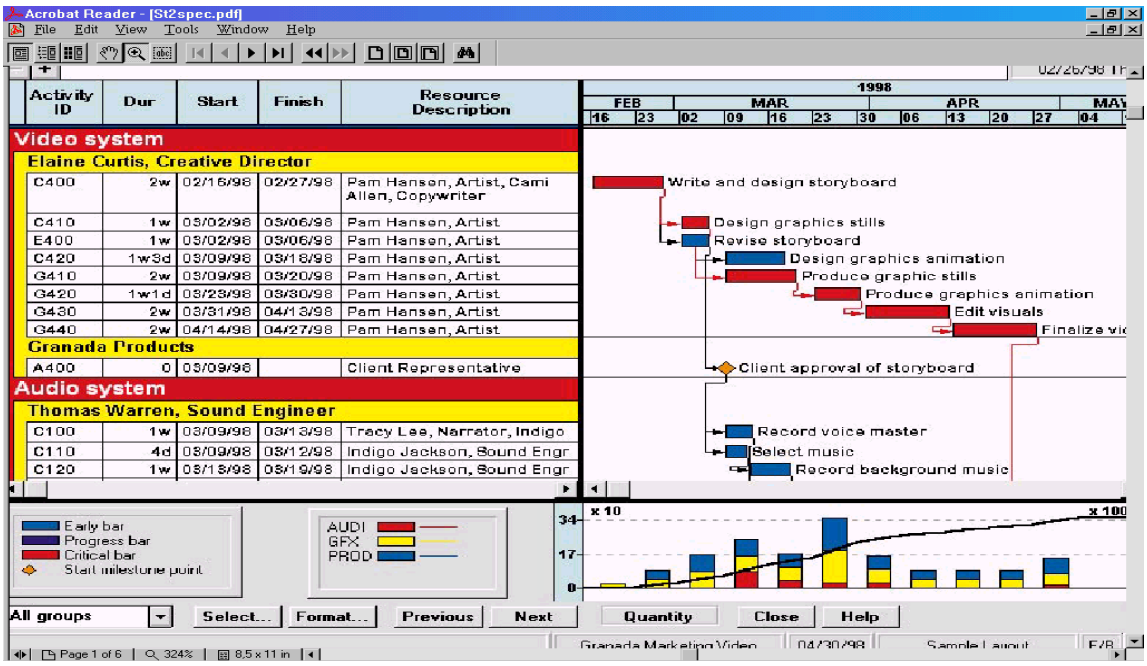


Fig. 7.10. Gantt chart in Sure Trek Project Manager

Unlike Primavera Project Planner, Sure Trek Project Manager is limited in planning tools, but includes beginner-centric tools: a multimedia tutorial and a Project Creation Wizard. It also offers greater scope for visualizing project information. You can scale the timeline, for example, to view the current month in weeks and the rest of the remaining project in months. The network diagram viewer includes a timeline that allows you to evaluate not only the logic of the work, but also their dependency on time.

7.5. PRIMAVERA PROJECT PLANNER (P3)

Primavera Project Planner (P3) is a central software product of the Primavera family, well known around the world. Today, Primavera Project Planner is used to manage medium to large projects in various fields, although this software has become most widely used in the field of construction and engineering project management.

To model the project, Primavera Project Planner offers a wide range of tools that includes around 20 WBS levels. The program provides for nine types of work (task, milestone, hammock, meeting, etc.), all types of dependencies between jobs, 10 types of restrictions. The current version of the project can be compared to an unlimited number of baseline plans.

Primavera Project Planner is a fairly standard graphical interface for all such systems. The Primavera Project Planner working window with a linear diagram is shown in Fig. 7.11. But P3 offers additional features:

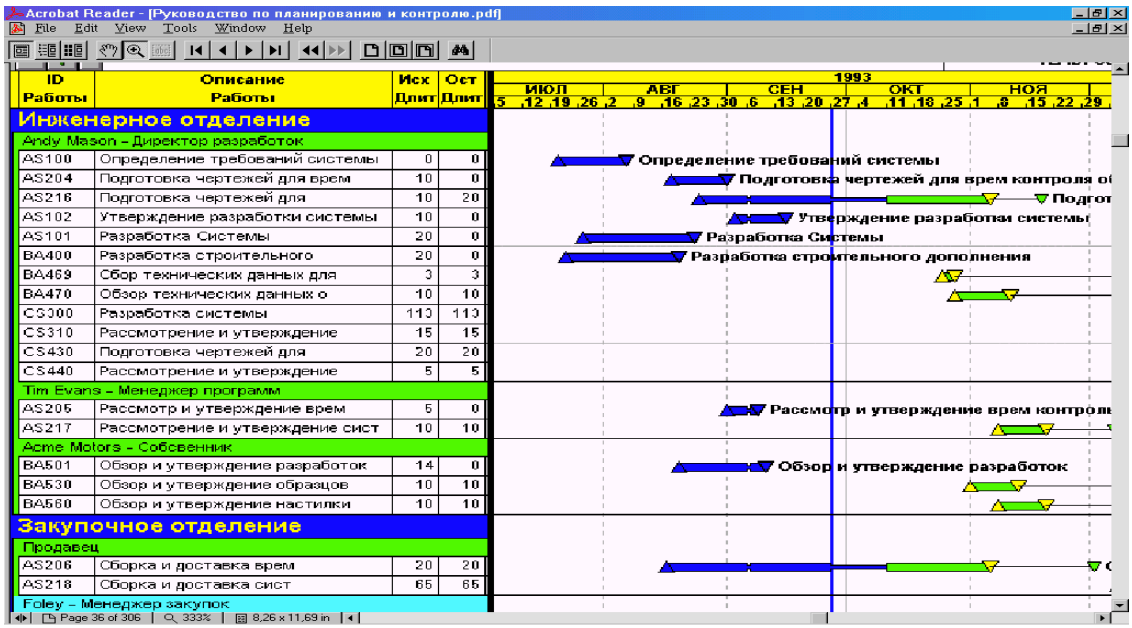


Fig. 7.11. Line diagram of Primavera Project Planner

1. Ability to group and organize work on different grounds at different levels of detail project, which allows to submit information in a more convenient form, depending on the specific management situation. For example, using these tools, all project information can be grouped by project phase at the first level of the hierarchy, by the responsible resource at the second, and sorted by the start date - at the third.

2. The ability to split the screen horizontally for independent viewing of two parts of the project or, using the Progress Spotlight feature, quickly highlight the work that needs attention in a given period of time.

Differences of Primavera Project Planner Resource Planning Tools

1. The description of the resource may indicate the normal and maximum number of availability of this resource, as well as its price at six-hour intervals.

2. A resource can be defined as manageable, then the extent to which such a resource is assigned to a task will affect its duration. For example, by identifying that workers are a manageable resource and a foreman is not, it is possible to achieve a shorter deadline for completing the Trenching task by assigning more workers. Increasing the number of foremen will not affect the duration of work.

3. When scheduling resource downloads, it may be necessary to describe the non-linear profile of resource use for individual work. Primavera Project Planner allows you to do this by offering 10 standard curves, or you can define your own usage profile by dividing the work into 10 time periods.

4. Primavera Project Planner allows you to choose the mode of recalculation of the project execution schedule, to select criteria for

redeployment of works, which is especially important for large projects, when the manager is unable to independently analyze the causes of resource scarcity and find solutions for each specific job. The recalculation modes include "forwarding" (determining the possible completion date of the project by a given start date), "equalizing backward" (determining the latest permissible start date of the project), smoothing overload within the time reserves for work or within a specified interval.

The disadvantages of the Primavera Project Planner are the number of calendars. In addition to the main project calendar, P3 allows you to describe only 30 additional calendars, while the ability to set individual work schedules for each resource has become a standard in modern project management packages. Another restriction is related to the number of resources that are controlled when leveling the limited resources download profile.

The Primavera Expedition Contract Management System is a tool for comprehensive management of project documentation (drawings, specifications, contracts, estimates, etc.).

This package allows you to:

Вати keep track of deadlines for preparation of documents (planned and current), the route of their passage;

 prepare and distribute document packs to project participants

 organize storage and retrieval of all necessary documentation;

 control the project's revenues and expenditures and evaluate the impact of the changes being made on the cost of the project and its duration.

Project management software packages today allow you to automate all major operations, such as:

 development of the project implementation schedule without taking into account the limited resources;

 determination of the critical path and reserves of project execution time;

 identifying project needs for funding, materials and equipment;

 risk assessment and project planning taking into account them;

 analysis of project implementation;

 Determination of deviations from the planned work and forecasting the main project parameters.

7.6. PROJECT MODELING SYSTEM

Functional diagram of Project Expert includes the following main blocks:

1. User interface

2. Block of generation of financial documents

3. Block analysis

4. Report Generator

The user interface includes the following modules:

1. Macroeconomic environment description module:

- allows the choice of currencies for settlements in the domestic and foreign markets, the exchange rate forecast;

- selection of the optimal scheme of receipt and repayment of the loan;

- tax regime modeling;

- modeling of inflation scenarios for different items of project receipts and payments.

2. The description module of the company implementing the project includes:

- modeling of the current state of the company, formation of assets and liabilities;

- formation of the list of products and services;

- description of the organizational and structural scheme of the company.

3. The module of formation of the investment plan of the project allows:

- to build a network schedule of the project, calendar of works;

- establish relationships between different stages of the project;

- establish a list and volume of resources required;

- determine the costs and terms of payment for resources;

- to form new assets.

4. The company operating plan simulation module includes:

- formation of a sales plan, description of conditions of sale of products and services, modeling of the sales process;

- formation of production plan, production volume planning, conditions of production inventory formation;

- modeling of direct production costs, conditions of purchase and storage of materials, raw materials, components, conditions of payment of piece-work wages;

- modeling of the personnel plan, conditions of remuneration and use of labor resources;

- formation of cost items and conditions for covering fixed costs;

- modeling of the project financing process, sources of funds and conditions for raising capital;

- modeling of the process of using free cash of the company.

The Financial Document Generation Unit provides the automatic generation of the following standard forecast financial forms:

- Cash Flow Report;

- profit and loss statement;
- Balance.

All of these documents are generated in accordance with the international GAAP standard and are the source of initial data for calculating the main project performance indicators, which are also automatically calculated using this block of the program:

- investment performance indicators (NPV, PI, IRR, PBP, DPBP);
- financial ratios.

The unit of analysis allows to analyze the income by units and individual products. In this case, it is possible to describe not only the company as a whole complex, but also to present its internal structure. As a result, you can analyze the performance of individual units.

The analysis unit contains a sensitivity analysis module that allows you to evaluate how a change in the underlying factors will affect the financial performance of the project.

Sensitivity analysis is performed with respect to the following variable parameters:

1. NPV = F (Sales) - dependence of NPV on sales;
2. NPV = F (Price) - dependence of NPV on the level of market prices for products and services;
3. NPV = F (Direct Costs) - dependence of NPV on the level of direct production costs;
4. NPV = F (Fixed Costs) - dependence of NPV on the level of fixed (overhead) costs;
5. NPV = F (Discount Rate) - NPV's dependence on the discount rate.

The option analysis module enables the expert to compare different project variants built under different scenarios, for example projects that will be implemented in different macroeconomic conditions (taxes, inflation), with different levels of demand, etc.

The report generator is a module for editing and creating a business plan that allows you to draw up a perfectly designed document, including all the necessary text blocks, tables and graphs. It allows for regular reporting and benchmarking, the results of which are the basis for decision making in the project management process.

The graphing and graphing module allows you to present project results in graphical form.

7.7. CONTROL SYSTEM OF THE PROJECT IMPLEMENTATION PROCESS

As a result of comparing the initial project data with the actual one, a report on the inconsistency of the actual project indicators with the initial data is generated.

The parameters that are controlled include the following.

In the investment phase of the project:

- compliance with the planned and actual work plan;
- conformity of the planned and actually executed volume of works;
- compliance with the planned and actual costs of the works.

In the operational phase of the project:

- compliance with the planned and actual sales volume;
- conformity of the planned and actually executed volume of works;
- compliance of planned and actual fixed costs;
- conformity of the planned and actually received profit;
- compliance with the schedule of attracting share capital;
- compliance with schedules of obtaining and repayment of loans
- compliance of planned and actually paid dividends;
- correspondence of the amount of planned and actual tax revenues.

The data control procedure should be carried out by the project supervisor at least once a month, respectively, and the planning period should not exceed one month.

The control and management of projects are carried out according to the following scheme:

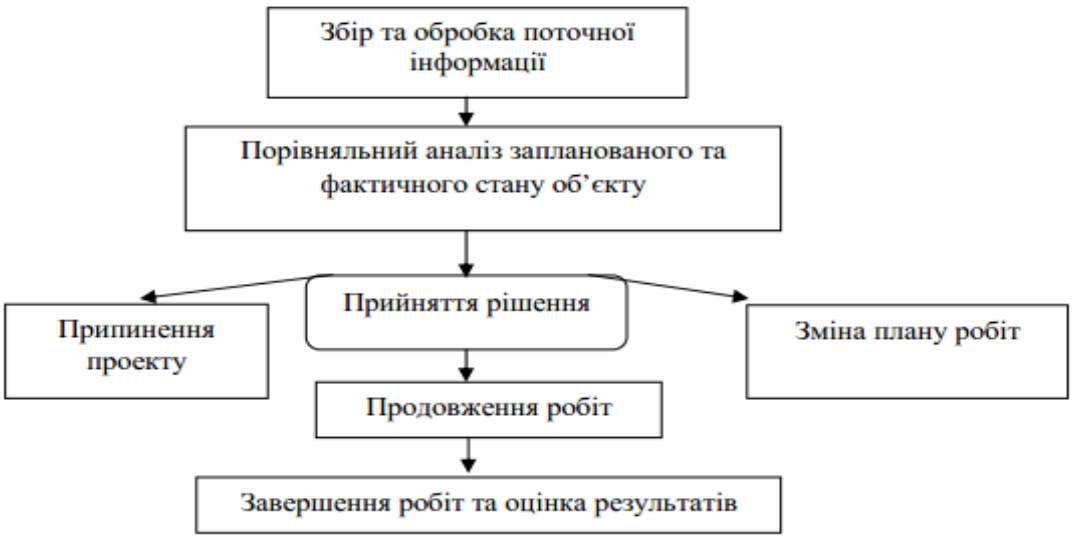


Fig. 7.12. Scheme of project control and management

Based on the report generated by the control, project management is carried out. The most important management principle is to make timely

decisions about adjusting the business plan of the project or terminating the project in the event of complex problems that cannot be overcome.

The possibility of timely operational control allows the project manager to obtain sufficient information to make a well-informed decision. The project manager prepares recommendations for making changes to the business plan of the project and provides them to the management or decision-making body to approve the changes.

The program provides for procedures for optimizing budget allocation and setting priorities. The ranking of projects is carried out both on the basis of financial and economic indicators of project effectiveness, as well as on the basis of qualitative analysis, which takes into account many factors, including social ones.

Project Expert Integrator allows you to solve the following tasks:

- to bring the feasibility study of the project to uniform international standards;
- prepare a business plan for the project in Ukrainian and English for presentation to foreign investors;
- carry out ongoing monitoring of the implementation of project implementation plans;
- provides an opportunity to prepare the most effective operational management decisions;
- allows to develop the general strategic plan of the company's investment activity;
- evaluate the financial and economic efficiency of each project;
- allows to develop a project financing strategy;
- make a risk analysis;
- to make the forecast budget of the enterprise on the basis of the following receipts and expenses;
- Report on the status of each project and the enterprise as a whole.

Automated investment project management system consists of two levels:

1. A project modeling subsystem that can be installed in different regions and at different enterprises that directly carry out project work.

The task of this subsystem is:

development of a simulation mathematical model of an investment project;

business plan development;

project development scenarios; determining the need for project financing;

risk analysis;

calculation of performance indicators;

ongoing project control and management;

Reporting;

providing information exchange with the central integrator.

2. Central Integrator of Investment Projects - system of project integration and budget consolidation, which is established in the central office of the organization that organizes or controls the implementation of the investment program. It provides information exchange with local project modeling subsystems. The central integrator ensures a rational allocation of resources between projects in accordance with the identified priorities.

7.8. GENERAL CHARACTERISTICS OF THE PRIMAVERA PROGRAM

Primavera software package was developed by the Russian company PMSOFT, it offers a complex project management solution using local (InterBase) regional network (Oracle Server) databases.

Necessary elements of corporate project management system	**Software features**
Project Portfolio Management	User-configured project portfolios and coding structure allow for a comprehensive analysis of projects by all necessary criteria. Project and portfolio level representations allow for rapid data control, project risk impact calculation, resource and cost analysis at the project portfolio level and the organization as a whole. Graphical representation of projected delays in project implementation, analysis of resource consumption for all projects. Customize views to display key milestones of projects, their current status, and compare with planned values.
Resource management	All the organization's resource data is stored in a single database, enabling analysis of their current load and forecasting needs. Each resource can be associated with several roles that determine its skills and qualifications. Consumption of resources can be analyzed as a separate project, work, or several projects and works. Evaluation of the complexity of work on roles.

Communications	Programs to notify project participants of their job assignment and provide them with additional information. Communications between distributed units of the organization. Remote project participants can view detailed project information via the Web.
Project Management	Definition of internally project dependencies and dependencies between projects. The calculation of the schedule takes into account both internal and external dependencies. The functions of remote access, return and removal of projects from the database allow updating the project schedule from the work sites and informing all parties involved in the project implementation. Resource information can be seen in graphical and tabular views Analysis of project risks for the duration and cost of the project as a whole and its individual parts Analysis of the project implementation based on several target plans Monitoring the implementation of projects on various indicators
Process Management	Execution on accurate projects can be "fixed" and used later to estimate the duration and cost of similar projects. With Primavera Software Development Kit and XML server, any level of complexity and detail can be integrated. Successfully implemented project elements or projects may well be retained and subsequently used as project plans or methodologies on the basis of which project plans are formed.

The Primavera system has several subsystems:

1. The Progect Management subsystem has the capability to support multi-level hierarchical user structures and allows you to plan resources and analyze roles and qualifications. This subsystem is capable of supporting an enterprise project structure (EPS), which may include a large number of projects, plans, work decomposition structures (WBS), organizational structures (OBS). Progect Management also allows you to manage resources centrally,

compile resource sheets, and redistribute resources. The program also allows you to monitor project costs, track the volume of work completed, and generate reports.

2. Methodology Manager subsystem - allows you to develop and store project plan methodologies and templates. Project managers can select and combine existing methodologies with Progect Architect, and then use the new methodologies created in this way in other projects.

3. Portfolio Analyst is a reporting subsystem that allows project managers to quickly make decisions, merge individual projects into portfolios for later comparison and analysis. Users can open the lowest level of the work decomposition structure, make changes to reports, tables and graphs.

4. Primavera Progect Planner for the Enterprise (P3E) is a subsystem that allows you to integrate the experience of previous projects into new projects with the help of Progect Architect and is used to create a unified project management technology for enterprises. In the P3E subsystem, projects are organized according to a structure called the organization project structure (EPS). EPS can be divided into many levels, making the work management process more manageable, while retaining the ability to summarize data at higher levels of management. In a simplified form, the system of division of responsibilities and levels of hierarchy can be represented as follows:

Test tasks

1. The essence of the collection and distribution of information:

a) determining the information needs of the project participants, namely its composition, timing, etc.;

b) regular gathering and timely delivery of the necessary information to project participants;

c) reporting on the progress of the project (processing of actual results of the project, correlation with the planned, trend analysis and forecasting);

d) there is no right answer.

2. The purpose of the information system to support project decision making is to:

a) their direct organization and management based on modern information processing technologies;

b) meaningful data processing in the process of solving functional project management tasks;

c) submission of information in a form that is convenient for decision making;

d) there is no right answer.

3. What determines the degree of complexity of the project tasks:

a) the scale of the organization;

b) management structure and degree of automation;

c) the scale and type of projects implemented;

d) level of involvement in project management of external organizations;

e) all options are correct;

e) there is no right answer.

4. What information does the destination matrix contain:

a) what resources are needed;

b) type of resources;

c) how the resources for each project work are used;

d) all options are correct;

e) there is no right answer.

5. The decision support system is:

a) human resources, equipment, materials and resources;

b) connection of a complex of software, simulation, statistical and analytical models of processes and works on the project for preparation of decisions on its implementation;

c) the list of stages and works of the project according to their subordination, interrelations between the works, the estimated duration of the works;

d) there is no right answer.

6. The structure of project work is:

a) human resources, equipment, materials and resources;

b) connection of a complex of software, simulation, statistical and analytical models of processes and works on the project for preparation of decisions on its implementation;

c) the list of stages and works of the project according to their subordination, the relationships between the works, the estimated duration of the works;

d) there is no right answer.

7. The project management information system is:

a) organizational and technological complex of methodological, technical, software and information tools aimed at supporting and improving the efficiency of project management processes;

b) the totality of the processes of collecting, transmitting, processing, storing and communicating to the users the information realized with the help of modern software;

c) connection of a complex of software, simulation, statistical and analytical models of processes and works from the project to prepare decisions for its implementation;

d) there is no right answer.

8. Information technology is:

a) the totality of the processes of collecting, transmitting, processing, storing and communicating to the users the information realized with the help of modern software;

b) organizational and technological complex of methodological, technical, software and information tools aimed at supporting and improving the efficiency of project management processes;

c) connection of a complex of software, simulation, statistical and analytical models of processes and works from the project to prepare decisions for its implementation;

d) there is no right answer.

9. Decision support system

a) organizational and technological complex of methodological, technical, software and information tools aimed at supporting and improving the efficiency of project management processes;

b) the totality of the processes of collecting, transmitting, processing, storing and communicating to the users the information realized with the help of modern software;

c) connection of a complex of software, simulation, statistical and analytical models of processes and works from the project to prepare decisions for its implementation;

d) there is no right answer.

10. The planning of the communication system is:

a) determining the information needs of the project participants, namely its composition, timing, etc.;

b) regular gathering and timely delivery of the necessary information to project participants;

c) reporting on the progress of the project (processing of actual results of the project, correlation with the planned, trend analysis and forecasting);

d) there is no right answer.

11. The main responsibilities of the project manager include:

a) overall management of the project team, organization and control of the project office, providing the project team with the necessary office equipment, materials and equipment;

b) fast and efficient organization of the start of project work, organization, coordination and control over the course of project work, appropriate distribution of work on the project among team members, interaction with external project participants for its effective and timely implementation;

c) control and coordination of the development of calendar plans for the execution of works and the use of project resources, procurement and supply of project resources, the execution of works on the project, changes in the project, completion of the project;

d) there is no right answer.

12. The main responsibilities of the project administrator include:

a) overall management of the project team, organization and control of the project office, providing the project team with the necessary office equipment, materials and equipment;

b) fast and efficient organization of the start of project work, organization, coordination and control over the course of project work, appropriate distribution of work on the project among team members, interaction with external project participants for its effective and timely implementation;

c) control and coordination of the development of calendar plans for the execution of works and the use of project resources, procurement and supply of project resources, the execution of works on the project, changes in the project, completion of the project;

d) there is no right answer.

13. The main responsibilities of the project engineer include:

a) overall management of the project team, organization and control of the project office, providing the project team with the necessary office equipment, materials and equipment;

b) fast and efficient organization of the start of project work, organization, coordination and control over the course of project work, appropriate distribution of work on the project among team members, interaction with external project participants for its effective and timely implementation;

c) control and coordination of the development of calendar plans for the execution of works and the use of project resources, procurement and supply of project resources, the execution of works on the project, changes in the project, completion of the project;

d) there is no right answer.

14. The main elements of the project team development are:

a) training and retraining of project team members;

b) general education courses, transfer of learning technologies and project management;

c) internships of managers and individual specialists, thematic seminars, "staff games";

d) there is no right answer.

15. List the main criteria for evaluating the effectiveness of a project team:

a) a clear understanding of the purpose and focus on the end result, a clear division of functions and responsibilities, team solidarity;

b) active involvement in problem solving, availability of a team development plan, mutual understanding and conflict;

c) all of the above options;

d) there is no right answer.

GLOSSARY

Project management apparatus - administrative and management personnel, ie managers, specialists, technical and auxiliary executors who perform certain functions of project management.

A quality audit is a systematic and independent study that is conducted to determine whether a quality activity meets the intended requirements, how effectively these requirements are being implemented and whether they are suitable for achieving the objectives.

The business plan of the project is a commercial document that is intended to comprehensively justify the feasibility of implementing the project and evaluating the desired results.

Project budget is a plan, expressed in quantitative (monetary) terms, which reflects the revenue and expenditure required to execute the project. Budgeting - determining the value of the work performed within the project and the project as a whole, the process of budgeting the project.

Budgeting - determining the value of the work performed within the project and the project as a whole, the process of budgeting the project.

The Production Structure (WBS) is a hierarchical structure designed to logically distribute all project implementation work and is presented graphically.

The internal organizational structure of a project is a system of liaison between individual contractors and teams that work on the project as separate organizational units within the project team.

Scheduling Control Schedule is a tool that controls the time of work that shows the daily differences between the scheduled and actual time of work on a critical path.

Gosstandart of Ukraine - State Committee of Ukraine for Standardization, Metrology and Certification of Ukraine, the national body that performs state oversight of product quality, standardization and certification of products.

Gantt chart is a graphical way of presenting the project implementation schedule.

Project lifecycle is the length of time between the idea of a project idea and the commissioning and launch of a project product.

Project Assurance is one of the integrated project management functions that enables the involvement of the logistical, human and information resources required to implement the project.

Project Management Information Systems - systems for collecting, storing, storing, retrieving and transmitting data used in a project management system.

Scheduling is the process of drawing up and adjusting a schedule in which the work performed by different organizations interconnects with each other over time and with the possibilities of providing them with different types of material and technical and labor resources. Network Project Schedule -

Leadership is a management process carried out by a leader who acts as a mediator of social control and power, based on the legal authority and norms of the broader social community to which the group belongs.

The project team is a group of experts working on the project implementation, representing the interests of different project participants and reporting to the project manager.

Quality control is the monitoring of the specific results of project activities to determine their compliance with quality standards and requirements and to identify ways to address the causes of real and potential discrepancies.

Resource conflict is a situation where at a certain point in time more units of a particular resource are required than are available.

The concept of the project is a preliminary plan of implementation of the business idea of the project, which is submitted to the manager of the enterprise or potential investor in order to evaluate the prospects of this business proposal.

The critical path is the path that delays lead to delays in the whole project; the longest full-length grid path.

Leadership is the process of psychologically influencing individuals and groups of people to encourage them to act (work) to achieve a goal; unlike leadership is not driven by an internal hierarchy in the team.

Responsibility Matrix - A matrix that defines the responsibility of a particular person or group of people for a particular block of work.

Project Manager - A manager or manager who holds a permanent position in the project team and is empowered to make decision-making powers.

The goal of the project is the desired result of the activity that they are trying to achieve in a certain period of time under the given project implementation conditions.

Network planning methods are methods whose main purpose is to minimize project duration.

Planning methodology is a set of theoretical conclusions, general laws, scientific principles for the development of plans, their justification and description in accordance with current market requirements, which are proven by best practice. Control - the process by which the project manager determines whether the goals are being achieved, identifies the causes that adversely affect the workflow and makes management decisions that adjust the tasks for

prevention of project disruption (deadline, overspending, cost, poor quality, etc.).

The project's mission is the general purpose that determines the meaning of the project.

Motivation is the process of stimulating a person or group of people to activate activities to achieve the goals of the organization.

Indirect costs - costs associated with the management and maintenance of production, organization of project work that cannot be directly attributed to a specific cost object.

The object of project management is an organized set of works aimed at solving a specific task or achievement of a specific goal, the execution of which is limited in time, as well as related to the consumption of specific financial, material and labor resources.

Operating budgets are a set of cost and income budgets required to compile a budget income statement (sales, production, direct materials costs, labor remuneration, manufacturing overhead, cost of sales, sales costs, administrative expenses).

Organizational structure of project management - a set of elements of the organization (positions and divisions) and the links between them.

The organizational form is the organization of interaction and interaction between all project participants.

Change means the replacement of one solution by another due to the influence of external and internal factors during the project implementation.

Program - a set of projects or a project, which is particularly difficult to create products and / or methods of managing its implementation.

The project is a comprehensive, non-repetitive, one-step event, limited by time, budget, resources, as well as clear implementation instructions designed to meet customer needs.

The project team is a group formed where the contractors are assigned to the project over the life of the project and are fully subordinated to the project manager (manager).

Professional development is the process of training, retraining and upgrading employees to fulfill new production functions, tasks and responsibilities in a new position in the project.

The project planning process is a process that involves defining the goals and parameters of interaction between works and project participants, allocating resources and selecting and making organizational, economic, technological decisions to achieve the project goals.

Direct costs - costs that are directly related to the production of project work and are included in the production cost of the project work of the respective accounting entities on a direct basis.

Developing a project plan is to formulate the results of the planning processes into a single structured document.

The certificate is a document certifying the high level of product quality and its compliance with the requirements of the international standards of the ISO 9000 series. ISO (International Organization for Standardization) is the World Federation of National Standards Bodies (ISO member committees).

Product certification is one of the important elements of a quality management system that involves assessing the conformity of products to certain requirements and issuing a specific document-certificate.

Network planning is one of the forms of graphical representation of the content of works and the duration of implementation of plans and long-term complexes of design, planning, organizational and other activities of the enterprise, which provides further optimization of the developed schedule.

Leadership style is a management category that allows a comprehensive assessment of the behavior of the leader in the team, the methods used to prepare and make decisions, the ways of their implementation and the forms of control over the activities of subordinates.

Cost structure is a hierarchical graph that records the cost of project elements at each level. The bidirectional structuring of the project is to combine the working and organizational structure of the project.

The structure of a project is a collection of interrelated elements and processes of a project that are presented with varying degrees of detail.

Work Breakdown Structure (CPP) is a hierarchical structure of sequential decomposition of a project into subprojects, intermediate results of different levels, sets of detailed works.

Resource Consumption Structure is a hierarchically constructed schedule that captures the resources required at each level.

Feasibility study of the project - analysis of the scope of work, timeframe, cost, cost, profit, quality, commercial risk and reliability, viability, competitiveness, social and social significance of the project.

Conflict management is a deliberate action to eliminate (minimize) the causes of conflict or to correct the behavior of participants.

Project management is the process of managing a project team and resources using specific methods that make the project successful and reach its goal.

Project quality management is an action aimed at establishing, providing and maintaining the required level of project quality in the process of its development, justification and implementation.

Change management is the registration of all changes in the project (technology, equipment, cost indicators, work schedules, etc.) in order to study in detail and evaluate the consequences of the changes, organize the coordination of executors implementing the changes in the project, as well as forecasting and planning for future ones. changes.

Project participants are individuals and legal entities whose interests are related to the project implementation.

Financial budgets - a set of budgets that reflect the planned cash flows and financial condition of the enterprise; these include the budget statement of income, the budget of funds and the budget balance.

Quality - a set of properties that determine the suitability of an object to meet the specific needs of consumers for its intended purpose

Earned Value Management is a series of methods that are collectively called and used to measure and control the performance of projects.

Expedition is a system for comprehensive management of project documentation (drawings, specifications, contracts, etc.) in complex projects and for contract management, which can be used both independently and integrated with other products.

Expedition Analyzer is an optional Project Planner (RH) module that helps you analyze project information in different sections.

Expedition Express is an add-on Project Planner module (RH) that provides access to information for remote users through a Web browser.

Microsoft Project Central - an add-on version of MS Project 2000 for shared project management using WEB tools, which allows for two-way communication between all project participants, as well as providing information to users who do not have Microsoft Project 2000.

Microsoft Project is a network project planning software developed by Microsoft in project management.

Primavera Project Planner for Enterprise (REE) is a comprehensive solution for managing all project information. The system combines advanced calendar-networking and resource planning tools, risk analysis, and project documentation management.

Project Expert is an automated system for planning and analyzing the effectiveness of investment projects based on a dynamic cash flow simulation model.

RECOMMENDED BOOKS

1. Babayev VM Project management: A tutorial for students of the specialty "Project management" / Babayev VM - Kharkiv: KNAMG, 2006. - 244 p.

2. Batenko LP Project Management: Educ. manual / Batenko LP, Zagorodnykh OA, Lischinskaya V. In Batenko LP, Zagorodnykh AA, Lischynskaya VV - K .: KNEU, 2003. - 231 p.

3. Bolshakov AS Modern management. Theory and Practice / A.C. Bolshakov, V.I. Mikhailov. - St. Petersburg: Peter, 2000. - 411 p.

4. Vasilyev Yu.V. Management theory: textbook / Yu.V. Vasilyev, VN Parachina, L.I. Ushwitsky. - 2nd ed., Suppl. - M .: Finance and statistics, 2005. - 608 p.

5. Daft R.L. Management / R.L. Daft. - St. Petersburg: Peter, 2001. - 832 p.

6. Eurasian Project Management Standard. Eurasian Project Management Standard. –M .: Eurasian Project Management Center, 2012. - 36p.

7. Zbarazska LO Project Management: Tutorial study guide. Higher Education closed / Zbarazskaya LO, Ryzhikov VS, Erfort IY, Erfort OY - K.: Center for Educational Literature, 2008. - 168 p.

8. Krynik OM Project Action Planning: A Study Guide for the Students of the Specialization Institute of Specialization 8.18010013 “Project Management” full-time study / O.M. Krainik, N.I. Takhtadzhieva - Zaporozhye, ZDIA, 2015. - 80 p.

9. L. Ligonenko Crisis management of the enterprise: theoretical and methodological foundations and practical tools: monogr. / L.O. Ligonenko. - K .: Kyiv. nat. auctioneer. Univ., 2001. - 580 p.

10. Mescon M.H. Fundamentals of Management / M.H. Mescon, M. Albert, F. Hedowrie: trans. with English. OI Bear. - 3rd ed. - M .: LLC “ID. Williams, 2007. - 672 p.

11. Nozdrina LV Project management: textbook / LV Nozdrina, VI Yashchuk, OI Polotay / Under the leadership of LVNozrina. - K .: Center for Educational Literature, 2010. - 432p.

12. Osovskaya GV Management of organizations: training. manual / GV Osovskaya, OA Osovsky. - K .: Condor, 2007. - 676c.

13. Planning and Management with Microsoft Project. - Access mode: http://compress.ru/article.aspx?id=17413

14. Project decision making: Textbook / Feshur RV, Kichor VP, Yakimov AI, Timchishin IE, Yanishevsky VS, Lebed TV, Samulak VY , Kohut IV, Shishkovsky SV - Lviv: Publisher of Lviv Polytechnic, 2013. - 220 p.

15. Software for project management. [Electronic resource]. - Access mode: http://econf.rae.ru/pdf/2014/07/3554.pdf

16. P2M. Guidelines for the management of innovative projects and programs: English translation; edited by S.S.Bushueva. - K .: Scientific World, 2009. –173p.

17. Project Management Knowledge Guide, 5th Edition / Project Management Institute (PMI). - Project Management Institute, Inc., 2012. - 614 p.

18. Starchenko GV Project management: theory and practice: teaching. tool. GV Starchenko. - Chernihiv: Publisher Braginets OV, 2018. - 306 p.

19. The theory of organization: a textbook for universities / V.G. Aliyev. - 2nd ed., Remaking. and ext. - M .: CJSC "Publishing House" Economy ", 2003. - 431 p.

20. Tukkel IL Management of innovative projects: a textbook / IL. Tukkel, A.V.Surina, N.B. Cultin / Under. ed. IL Tukkel. - St. Petersburg: BHC-Petersburg, 2011. - 416 pp.: Ill.

21. Management of innovative projects: textbook. manual / Ed. Prof. VL Popov. - M .: INFRA - M, 2009. - 336s.

22. Project management. Project Management Basics: Tutorial / Qty. ed .; ed. prof. M.L. Together. - M .: KNORUS, 2006. - 768s.

23. Innovation project management: lecture lecture / compiled by: OO Mitsura, OM Olefirenko. - Sumy: Sumy State University, 2012. - 92 p.

24. Management of innovative projects and programs. Methodology: IFI 75.1 - 00013480 - 29.12: 2010. - Standard of the Ministry of Finance of Ukraine. - K., 2010. - 44 p.

25. Project Management: Study Guide for the Study of the Masters in the Masters of Knowledge 07 "Management and Administration" specialty 073 "Management" specialization: "Management and Business Administration", "International Project Management", "Innovation Management", "Logistics" / Summary: LE Dovgan, GA Mohonko, IP Malik. - K .: KPI them. Igor Sikorsky, 2017. - 420 p.

26. Fesenko TG Project Management: Theory and Practice of Performing Project Actions: Tutorial. manual / TG Fesenko; Hark. nat. Acad. the city. master. - X .: KhNAMG, 2012. - 181 p.

27. Khomyakov VI Management of the enterprise. - 2nd edition, remaking. and ext. - Kiev: Condor, 2005. - 434 p.

28. Shegda AV Management: textbook / AV Shaggy. –3rd ed. and ext. - K .: Knowledge, 2006. - 645s.

29. Shemetov PV Management: management of organizational systems: a textbook for universities / PV. Shemetov, L.E. Cherednikova, SV Rooster. - 2nd ed. - M .: Omega-L, 2008. - 406s.

30.A Guide to the Project Management Body of Knowledge (PMBOK® Guide) Fifth Edition, PMI, 2013. – 589 p.

31.Sure trek project manager i primavera project planner (p3) [Електронний ресурс]. – Режим доступу: http://library.if.ua/book/96/6648.html

32.Open plan professional [Електронний ресурс]. – Режим доступу: http://library.if.ua/book/96/6646.html