Management of process control in innovative projects

Chapter 10
Management of project time management

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Lecture content

- The content of controlling the project implementation processes
- Monitoring of project work
- Tools for monitoring project implementation
- Controlling the cost of project work
- Change management in the project implementation process

01

The content of controlling the project implementation processes

The role of control as a management function is that it is a means of providing feedback in the management system. Its meaning is to create guarantees for the implementation of planned decisions.

Definition 1. Project control is a process in which the project manager determines whether the goals are achieved, identifies reasons for destabilization of the work process and justifies management decisions that adjust the implementation of tasks before the damage to the project (failure to meet deadlines) works, excess use of resources and cost, low quality, etc.).

Regular measurement of project parameters and identification of emerging deviations is called **project implementation control**.

The progress of the project is controlled as follows:

1. *Comparison of actual indicators (volume of work performed, effort, funds) with the planned*. The control is performed constantly and continuously. In addition, the plan for the completion of the stages of the project assigns control points, after which even more complete and deeper control and analysis are performed.

2. *Adoption and implementation of the decision to change the plan*. At this stage, control over the implementation of planned changes, analysis of results and, if necessary, the introduction of further corrective action. As a result of the document, a report on the implemented decisions is provided, which states that the experience gained should be taken into account in further work.

3. *Implementation of actions correcting the plan:*

- review the current plan and make changes to it;
- performance of works on mitigation of the occurred risks;
- termination of the project and setting new goals, taking new ones obligations.

4. *Adoption of organizational policy.* The organization's policy regarding the project control process determines the organization's expectations from this process and the procedure for implementing corrective actions.

5. *Planning the project implementation control process.* The project progress control plan can be either part of a joint project plan or a separate document that refers to a joint plan.

6. *Ensuring the control process with appropriate resources.*

7. *Assignment of personal responsibility and authority*. Without proper authority, the process is doomed to failure, just as in the absence of personal responsibility.

8. *Training of staff to perform monitoring*.

9. *Development of document formats for the process*. Fixed document formats used in the process should be developed, as well as a defined procedure for working with them.

10. *Involvement of stakeholders in the process*. A list of employees relevant to the work of the control process should be defined. This is important so that all the necessary staff are present at the discussions or take the time to work on the results of the project.

11. *Execution of the process - the actual control over the project.*

12. *Monitoring the process for compliance with established policies.*

13. *Discuss the results of the process with senior management.* The key performance indicators, such as the number of reviews conducted, the number of corrective actions taken, the number of reports issued, etc., must be identified. The resulting documents of this stage will be lists of non-compliance of the process with the company's policy, actions aimed at eliminating shortcomings, and the results of these actions.

Definition 2. Regular measurement of project parameters and identification of emerging deviations is called project monitoring.

Managers constantly monitor the project implementation process. They compare the work done on the project with the plan and identify significant differences. In project management, such differences are called deviations. There are always deviations, so they are not paid attention to during the project control process. The most common question is: Are the deviations small enough to deal with or accept?

Requirements for the control system: accuracy, timeliness, completeness of information, ensuring the unity of information for all project participants.

The purpose and purpose of control. The project implementation process is influenced by many factors, which leads to changes in the calculation parameters (time and cost). Due to the changing environmental conditions of an innovation project, managers are not always able to take timely measures to adjust the process of work and motivate subordinates to achieve their goals. Under such conditions, one of the important means of achieving the goals is to monitor the implementation of the project. With the help of control, the project manager determines the correctness of the decision, project implementation in time, cost, resources, decides on the need to make changes to the project implementation plan.

The subject of control is: facts and events, checking the implementation of specific decisions, finding out the reasons for deviations, assessing the situation, forecasting the consequences. Monitoring involves constant monitoring of the project implementation.

Elements of the project that are objects of control are time, cost, quality, changes that occur during project implementation; preparation, receipt, distribution, and approval of project documents, the state of affairs with financing, operational characteristics of the project, compliance with the provisions of the contract, etc.

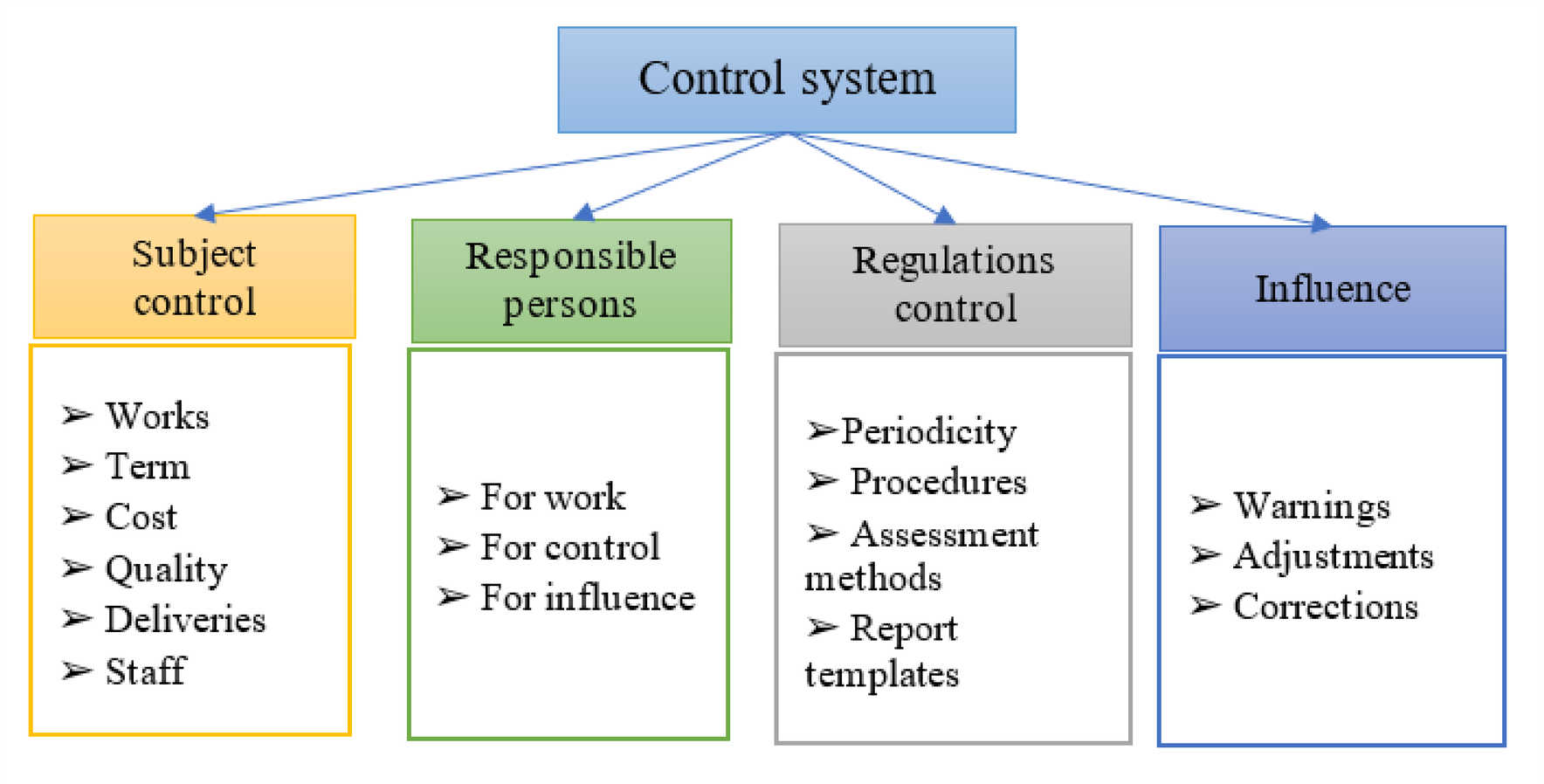
Control processes include:

- determination of results of activity on the basis of comparison of results of realization of decisions with planned;
- comparison of indicators of expected and actual implementation of plans;
- analysis of probable deviations from planned indicators;
- verification of assumptions;
- checking the methodological and substantive consistency of the planning process.

The main processes of project control: general control of changes, project reporting.

Auxiliary processes of project control: processes of control of schedule, costs, quality, risk, changes in content.

Definition 3. The control system is a set of formalized, documented methods used in the project to determine the information collected, methods of its analysis, methods of responding to deviations and responsible persons.



There are:

- control of the project by time parameters (road map of the project) - project plan by deadlines;
- control of the project by cost parameters.

There are three main types of control:

1. **Preliminary** - is carried out before the actual start of work and is aimed at compliance with certain rules and procedures, as a rule, it focuses on the resource provision of work;

2. **Current** - is carried out during project implementation and includes: time control, achievement of intermediate goals of the project, performance of the set volumes of works, control of the budget, control of resources, quality control. The main goal is the operational regulation of the project implementation. This approach is based on the comparison of the achieved results with the cost, time and resource characteristics established in the project. Depending on the required accuracy, there are the following current control technologies: control at the end of work; control at the moment of 50% of readiness of works; control in pre-established certain points of the project; regular operational control; expert assessment of the degree of work performance and project readiness.

3. **The final** one is held at the stage of project completion for the purpose of integrated evaluation of the project implementation. Its main purpose is to summarize the experience gained for further development and implementation of similar projects and to improve management procedures.

The control includes the following stages:

I. Establishment of control standards

II. Accounting for the results actually achieved

III. Determination of deviations between control and actual standards results

IV. Conducting research and analysis of deviations

V. Carrying out the necessary work to rectify the situation.

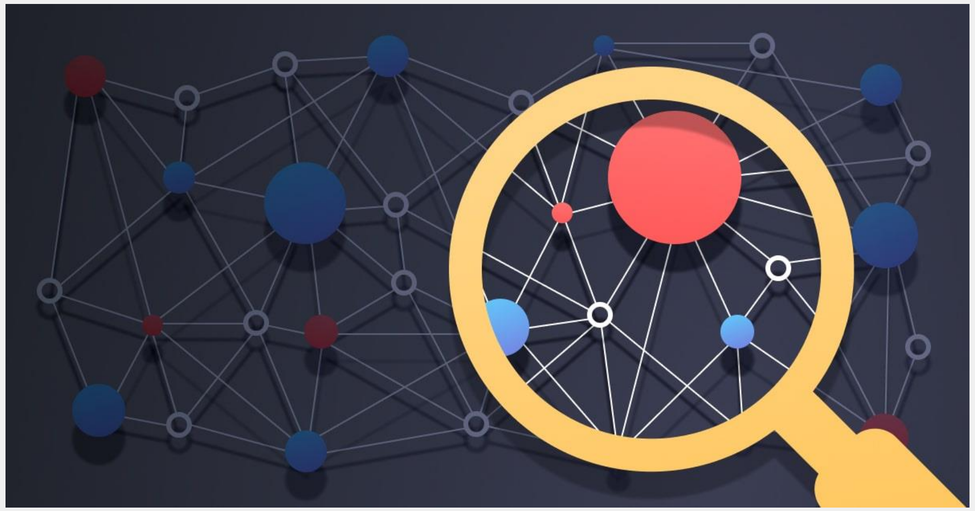
Evaluation of project activities. Like control, evaluation is an important function of feedback. However, there are many significant differences between monitoring and evaluation:

1. control involves constant monitoring of project progress, and evaluation is based on periodic summarizing of interim results;
2. control of project activities is focused on the details of what is happening in the project, and evaluation - on the big picture;
3. the project manager is responsible for control, and the assessment is carried out by a person or group of persons who do not work directly on the project (to ensure objectivity).

Given the differences, it is possible to formulate a definition **of the evaluation of project activities**: it is an objective periodic summary to determine the status of the project in relation to the implementation of its stated objectives. The evaluation is carried out during the project implementation and after its completion. Obviously, in these two cases the role of evaluation is different.

02

Monitoring of project work



Definition 4. Monitoring is the control, observation, accounting, analysis and reporting on the actual implementation of the project compared to the plan.

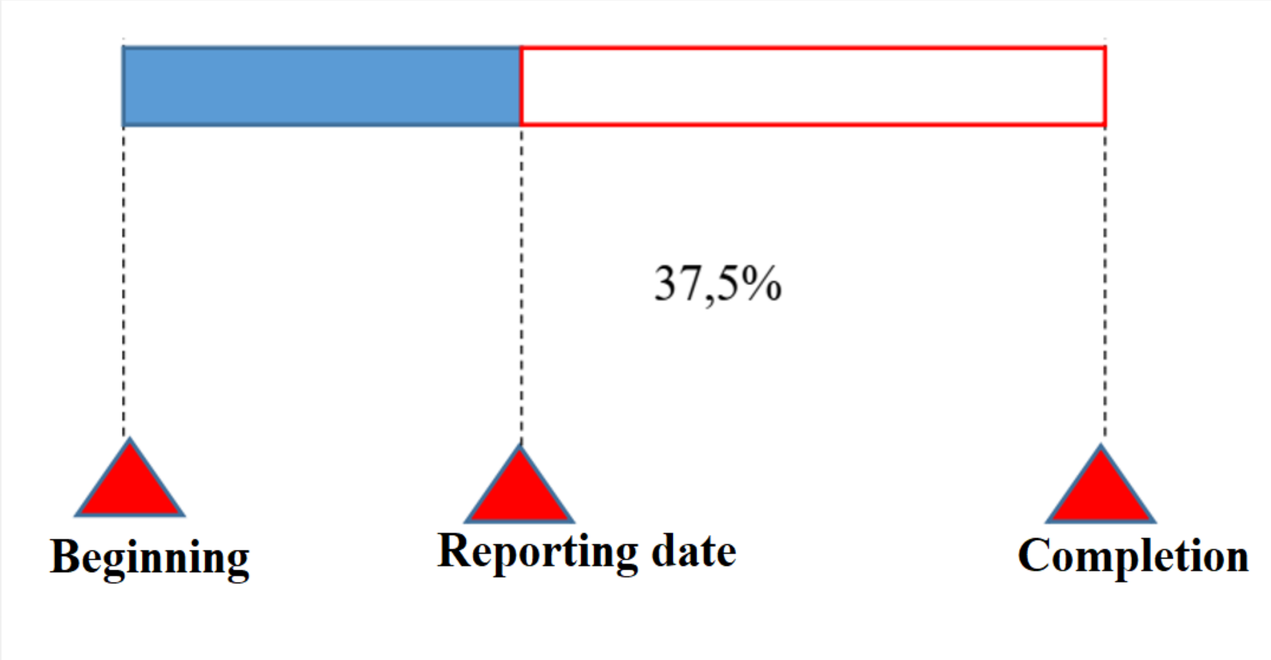
The first step in the control process is to collect and process data of the actual state of work. Management is obliged to continuously monitor the progress of the project, determine the degree of completion of work and based on the current state to assess the parameters of future work.

Effective data collection tools are filled with factual data and returned work orders or special reports to be filled out performers.

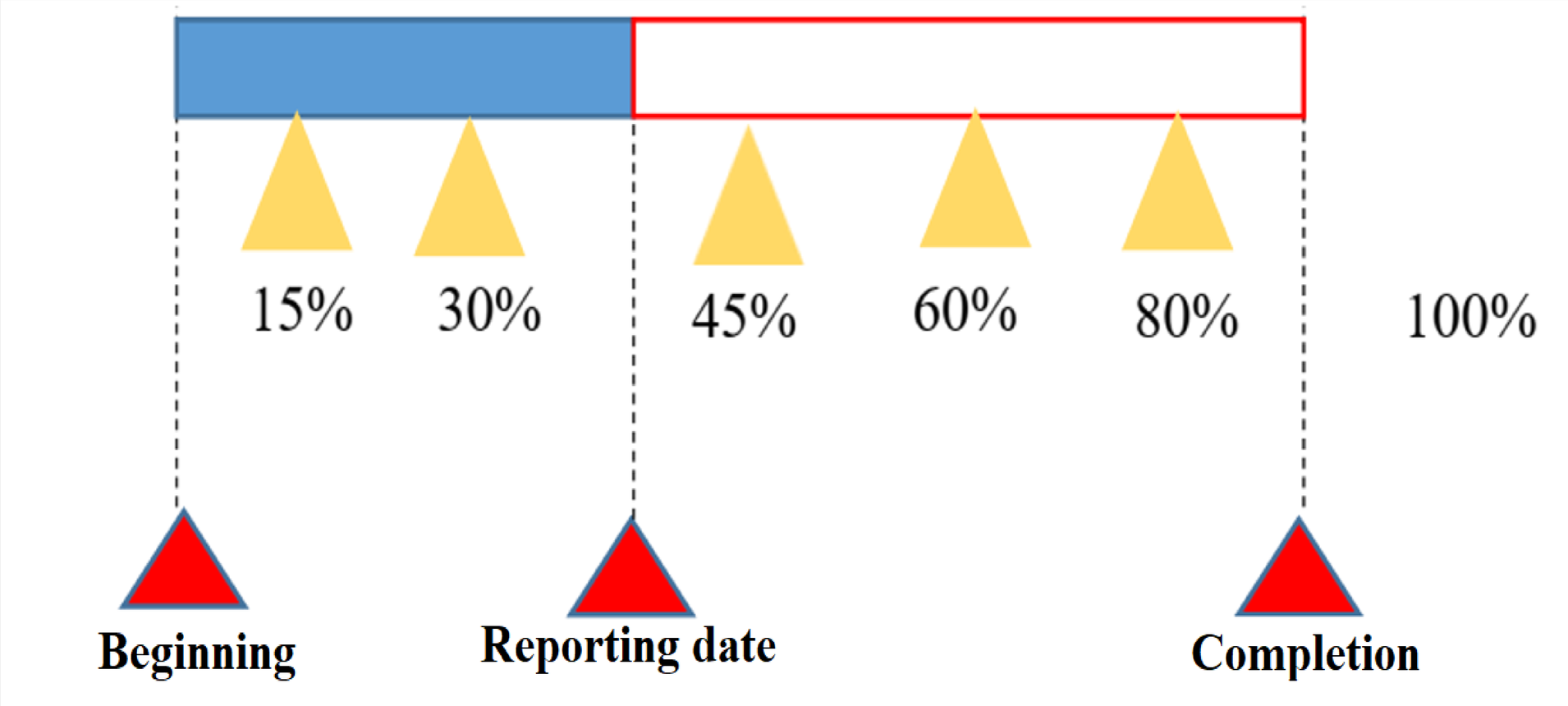
Methods of control of actual performance are divided into:

1. *The method of simple control* - a method that tracks only the moments completion of detailed work, in which there are only two measures completion: 0% and 100%. In other words, it is considered that the work is done only when its final result is achieved. It can be noted that the method of simple control is suitable for many short-term works.

2. *Method of detailed control*, which involves the implementation of assessments in intermediate stages of work (for example, the completion of detailed work by 50% means that, according to executors and management, the goals of the work are achieved by half). This method is used if the duration of work is long and this method is more complicated, as it requires the manager to estimate the percentage of completion for work in progress.



3. *Milestone method* (used for long-term work, such as contractors, other co-executors of the project).



It consists in determining a sufficient number of intermediate results of work and monitoring them by a simple, discrete method: achieved or not. However, within the work, each result may have its own "weight" - the achievement of the next result is interpreted as a certain percentage of total performance. The specificity of the method is: the work is divided into parts by milestones, each of which implies a certain degree of completion; set milestones before starting work; record the achievement of milestones on the reporting date.

The main points of the assessment of the state of works:

✓ It is necessary to collect all information about the work performed on the reporting date.

✓ Reporting date changes periodically. The period can be one week, one month, etc. This is regulated by the periodicity of control.

✓ The method of assessing the state of work must be determined before the start of work and brought to the attention of the executor of this work.

During the project monitoring, the project progress is compared with the plan.

To do this, you must perform the following types of work:

1. *Monitoring of key project indicators*. This is a snapshot of the attributes of the products being created.

2. *Monitoring of project commitments*. Identification of fulfilled obligations (both external and internal), unfulfilled obligations or those obligations that may not be fulfilled due to certain risks.

3. *Project risk monitoring*. Identification in the context of the current progress of the project list of risks with all their characteristics: probability of occurrence, degree of action, etc.

4. *Discussion of project progress*.

Definition 5. Project progress is the promotion of project work towards achieving its objectives.

Progress can be expressed in various ways, for example, the complete completion of certain stages of work, the partial implementation of work where the assessment of the state of affairs was used: the percentage of implementation; incomplete project, if planned.

The main purpose of monitoring the progress of the project is to exchange information on the progress of the project with all stakeholders.

5. *Analysis of project checkpoints*. This is a formal procedure performed after reaching a certain milestone. All aspects of the project are discussed, a thorough study of the current situation is performed. The analysis of milestone trends is carried out - a simple method for the analysis of real dates in the project in comparison with their planned data. The results of the analysis of control points are documented.

03

Tools for monitoring project implementation

In the process of managing the project schedule, the elements of the project management plan can be updated:

- base schedule - according to changes in the content of the project, resources of operations or estimates of the duration of operations;
- schedule management plan - in terms of schedule management tool;
- baseline cost plan - according to changes caused by compression methods.

Definition 6. The schedule control schedule is a tool for monitoring the time of work, which shows daily discrepancies between the planned and actual time of work on the critical path.

Today, the most popular schedule control tools are as follows:

1. Line of execution. In the traditional sense, the execution line shows how much time each project operation is ahead of or behind schedule. Thus, this line shows the completed share of each operation to the left of itself and the remaining share to the right of itself. This line is considered as one of the steps of proactive schedule management. In particular, the amount of time each project operation is ahead of or behind schedule is used to predict the project completion date and to map the corrective actions needed to eliminate any potential delays.

2. BCF-Analysis (analysis "baseline - current status - forecast for the future") - compares the base schedule of the project with two predicted schedules, the first of which is based on the current value of progress, and the second follows from the worst-case scenario. As a result, we get the trend of the schedule, or in other words, the point to which our schedule tends. Most importantly, if a trend is unfavorable, it forces us to develop actions to prevent an adverse outcome, and for many users this is the ultimate goal of using all of these proactive scheduling tools.

3. Diagram of forecasting control events. Predicts the pace of future progress of the project, focuses on the anticipated main events of the project - its control events and completion. If the trend line approaches the execution line, rises, the control event slides. If the trend line approaches the execution line horizontally, it means that the control event will occur on time. And if the control event occurs ahead of schedule, the trend line will approach the execution line, going down.

4. Slip chart - tracks the progress and shows the trend that characterizes the implementation of the project schedule. First, it is designed to perform an assessment of how long the project is ahead of the baseline schedule or lags behind it at the time of this assessment. When consecutive estimates are connected by a line - a demonstration of the trend line.

5. Buffer Diagram - measures the status of buffers set by the critical chain schedule in order to provide an early warning system in order to protect the project completion date. First, the buffer diagram takes a "snapshot" of the values of the spent share of buffers in relation to the share of work performed on the critical chain. Sequential shots at regular intervals are then linked to a chart to obtain a trend line.

6. Schedule compression is a method of reducing the overall duration of a project without changing the logic of the project, in other words, while maintaining a constant sequence of dependencies between project operations. To reduce the duration, the project usually uses more resources when performing operations. As a result, the total cost of the project increases.

04

Controlling the cost of project work

There are two methods of controlling the cost of project work:

- **Traditional method** (plan-fact analysis) - does not operate on time or schedule. The plan-factual analysis of the project shows deviations and does not allow to draw a conclusion - whether this deviation is positive for the project or negative;

- **Volume method** - based on determining the ratio of actual costs to the amount of work that must be performed by a certain date. This takes into account information on the cost, planned and actual schedule of works and gives a generalized assessment of the state of work at the moment.

Earned Value Management is very popular in project management to track project progress.

Definition 7. Earned Value Management - a system that combines the objectives, schedule and cost of project work.

The volume method combines the parameters of the content, cost and schedule of the project in order to assess and measure the effectiveness and degree of project implementation.

This technique for the objective measurement of project progress has a unique ability to combine the dimensions of achievement of goals, graphics and cost in a single integrated system, which allows us to answer the question: "What did we get for the money we spent?".

Used properly, Earned Value provides early warning of project implementation problems. In addition, this approach improves the scope of the project, prevents it from "slipping", informs stakeholders about the progress of the project and directs the project team to make progress.

The main advantage of the methodology is the possibility of "early detection" (detection in the early stages of project implementation) of inconsistency of actual project indicators with the planned, forecasting the results of project implementation (deadlines, costs, etc.) and taking timely corrective actions, even before project closure.

There are 5 possible options for action in case of deviations of the project from the plan:

1. Finding an alternative solution. First of all, it is necessary to consider opportunities related to improving the efficiency of work through new technological or organizational solutions. A new solution, for example, may be to change the sequence of a number of works.

2. Review the cost. This approach means increasing the volume of work and allocating additional resources. The solution may be to increase the load on existing resources or attract additional people, equipment, materials. This approach is usually used when it is necessary to eliminate temporary project delays.

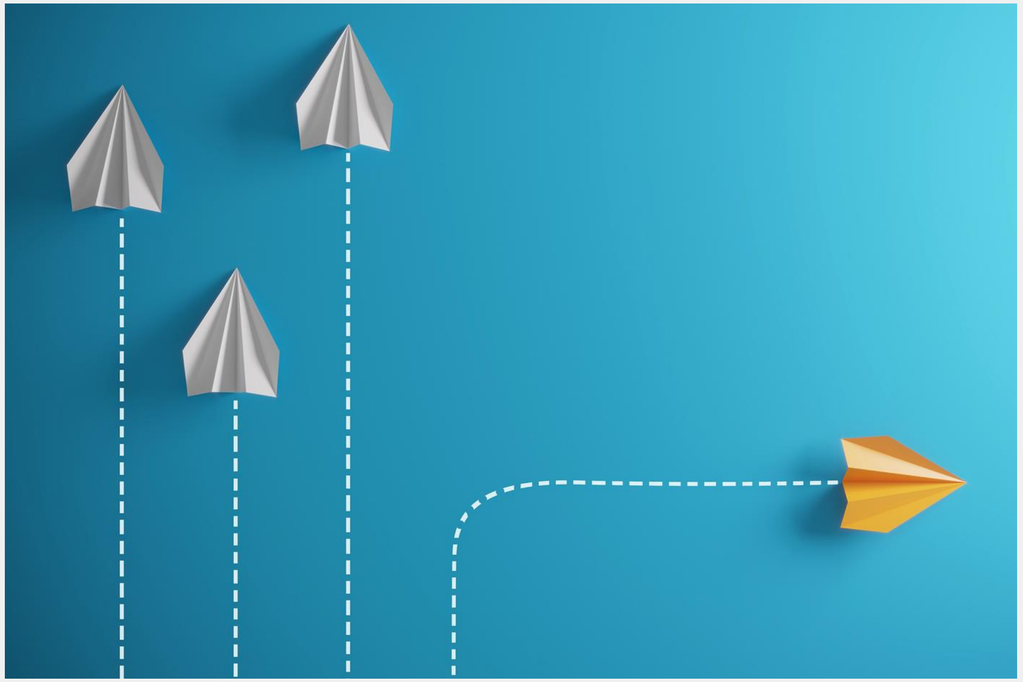
3. Revision of terms. This approach means that the deadlines will be postponed. Project management may decide to do so in the event of severe cost constraints.

4. Review the content of works. This approach assumes that the amount of work on the project can be reduced and, accordingly, only part of the planned results of the project will be achieved. Note that it is not a question of reviewing the qualitative characteristics of the results of the project.

5. Termination of the project. This is probably the most difficult decision. However, it should be accepted if the projected project costs exceed the expected benefits. The decision related to the termination of the project, in addition to purely economic aspects, is related to overcoming psychological problems related to the interests of various project participants.

05

Change management in the project implementation process



Once the analysis is done, the relevant reports need to be prepared, and here, especially for large projects, there is a widespread problem of information overload, numbers, where project managers operate on hundreds of indicators and computers publish hundreds of sheets of reports each month.

The second issue is the control over changes in the project. Changes in the scope of the project - perhaps one of the main reasons for increasing the cost of the project and increasing the time of its implementation. Very often, these changes increase costs by 50% or more. Therefore, one of the most important and, unfortunately, not very pleasant functions of the project manager is to control changes in the project.

Definition 8. Change management is the process of forecasting and planning future changes, recording all potential changes (project content, specifications, cost, plan, network schedule, etc.) for detailed study, impact assessment, approval or rejection, and organization of monitoring and coordination of executors implementing changes in the project.

Change means the replacement of one solution by another due to the influence of various external and internal factors in the development and implementation of the project. Changes can be made in different sections of the project. Changes can be initiated by the customer, the investor, the designer, and the contractor. The customer usually makes changes that improve the final technical and economic characteristics of the project. The designer can make changes to the original design and estimate documentation, specifications. The contractor in the course of the project makes changes to the schedule, methods, and technologies of work, sequence (technological, spatial) construction of facilities, etc.

These changes affect the implementation of the project as follows:

- increase costs;
- are caused by delays in project implementation;
- reduce the productivity of contractors;
- worsen relationships between team members.

The control system may be destroyed if the targets are not adjusted for changes.

The reasons for changes are usually the inability to anticipate at the design stage of new design solutions, more efficient materials, structures and technologies, etc., as well as lagging behind in the implementation of the project from the planned deadlines, volumes due to unforeseen circumstances.

The reasons for changes in the content of works may be:

1. Changes in market conditions;
2. Actions and intentions of competitors;
3. Technological changes, changes in prices and availability of resources;
4. Economic instability;
5. Errors in plans and estimates;
6. Errors in the choice of methods, tools, organizational structure or standards;
7. Changes in contracts and specifications;
8. Delays in deliveries or deliveries that do not meet quality requirements;
9. The need to accelerate work;
10. Impact of other projects.

Changes can occur at any stage of the project and have the following content and consequences:

1. Changes in the design or scope of the project under development. This is natural, but very often they are taken without proper assessment of the consequences in terms of time and cost. After approval of the design, these changes are too expensive.

2. Late design changes. These are the changes that cost the most. They arise as a result of errors in the design stage or the customer's efforts in accordance with the requirements of the time to use the latest advances in technology, which will increase the amount of work.

3. Changes required by security or legislation. Their project managers are obliged to do so.

4. Changes to increase profitability and financial return from the project (their results are quite problematic). The question of the appropriateness of these changes is decided by the company's top management in accordance with its policies. It is very difficult to accurately calculate the cost of change and future cash flows, NPV and IRR.

5. Change is a significant area of conflict, especially within the company.

Production managers seek to make changes, sometimes appropriate, sometimes excessive; designers - their own (for example, in the size of the equipment). The efforts of the project manager are aimed at eliminating inappropriate changes and establishing a clear line between "should" and "desirable", the introduction of only those changes that are necessary to meet certain volumes and safety requirements.

General control of changes is carried out: to assess the impact of factors that lead to positive or negative changes in the project; changes to the project have already taken place to determine; to manage changes in the project as they occur.

To control change and reduce conflicts within and between companies, it is necessary to ensure that:

1) senior management supported project managers in banning desired but optional changes;

2) project managers clearly defined the initial design and scope of work on the project;

3) at a certain stage of the project, any changes were stopped, this is the project was "frozen". The sooner this happens, the lower the costs and time consequences of making changes;

4) a change control system was introduced.

The change control system solves the following tasks:

- determines changes relative to the initial volume;
- forecasts the cost, time, and impact of these changes on other work;
- records information on their implementation;
- informs the top management about them;
- introduces a system of conflict resolution with minimal conflicts.

The change control system is sometimes called "trend forecasting", "deviation control", "form control". It is very important to implement it as soon as possible. This system prepares weekly or monthly reviews at the design and delivery stages. The control is carried out by means of operative reporting on changes and discussion of their necessity and consequences (concerning expenses and time) among leading experts.

To create a system of change control are the following steps:

1. Set the initial scope, specification, parameters, determine the schedule of the project.

2. Identify changes to baseline indicators, report them to those affected, and assess their implications.

3. Analyze, accept or reject these changes.

4. Implement these changes.

In a rather general form, the process of change control should regulate the passage of change through five main stages:

1. Description. At the initial stage, it is necessary to understand and describe the proposed change. The proposal is documented and discussed.

2. Evaluation. The second stage involves a full-scale analysis of the impact of the proposed change. To do this, all the information needed to assess the consequences of this change is collected and agreed upon. The results of the study are documented and discussed.

3. Approval. The results of research are considered, and the decision is made: to approve change, to refuse, to postpone. If it is decided to postpone the implementation of the change, it is necessary to conduct additional research and calculations. If a positive decision is made, the executors are approved and funds are allocated for the change. Decisions are documented.

4. Implementation. The change is made in the project plan and implemented.

5. Confirmation of execution. Control of correct and complete performance of works within the limits of this change. In case of a positive result, the change is removed from control.

A standardized document helps to implement the control system - change requirement. In this document:

- the change is determined, the costs are described and indicated, the elements of work to which it applies;
- the reasons for the changes are indicated;
- the name of the initiator of the change is given, his signature is put;
- the approximate consequences are revealed and the segments that will be affected by these changes are indicated;
- an assessment of the impact of this change on the project implementation schedule and costs;
- the classification of the reasons of changes for the purpose after the project analysis is resulted.

The last thing you need to focus on is the mandatory integration of the change control system with the control and information system.

The results of the general control of changes include: a modified basic plan of the project taking into account the approved changes, which must be communicated to project participants.

Conclusions

This lecture discusses the important concept of managing the timeliness of project implementation. For this purpose, the following were studied: the content of controlling the project implementation processes; monitoring the implementation of project work; project implementation monitoring tools; controlling the cost of project work; change management in the project implementation process. The purpose of the innovation project control process is to provide the information needed to understand the progress of the project in order to allow management to perform management actions in situations where the project is significantly different from planned. When developing an information collection system, the project manager must first determine the composition of the required data and the frequency of collection. Decisions depend on the tasks of the analysis of project parameters, the frequency of meetings and the issuance of tasks.

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Thank you!