

# **Management of process control in innovative projects**

## **Chapter 9**

# **Management of communications and information support of innovative projects**

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# Lecture content

- **Communications management processes in the implementation of an innovative project**
- **Project management information system**
- **Software and hardware tools for project management**
- **Automation of project management**



To manage the communications of any project, including innovation, includes the processes necessary for the timely creation, collection, dissemination, storage, retrieval, and use of project information. According to project management, it includes the actions required to ensure the receipt, collection, dissemination, storage and final placement of project information. Management function aimed at ensuring timely collection, generation, distribution, and storage of the required project information.

Project communication management processes:

1. communications management planning is the process of developing an appropriate approach and plan for project communications, based on the needs and requirements of stakeholders in information, as well as available assets of the organization;
2. communications management is the process of creating, collecting, disseminating, storing, obtaining information of an innovative project strictly to the communications management plan;
3. communications control is the process of monitoring and controlling communications throughout the life cycle of an innovation project, to meet the information needs of all project stakeholders.

Communication actions related to these processes have many aspects that need to be considered for process control:

1. internal (within the project) and external (with the customer, suppliers, other projects, organizations, the public);
2. formal (reports, minutes, briefings) and informal (e-mails, notes, current discussions);
3. vertical (with higher and lower employees of the organization) and horizontal (with equal status);
4. official (reports, estimates) and informal (corporate correspondence);
5. written and verbal.

**Information** means collected, processed and distributed data.

To be useful for management decisions, information must be provided in a timely manner, on purpose and in a convenient form. This is solved by using modern information and communication technologies within the project management system. Communication, various accompanying information, is the foundation for the creation and maintenance of coordination of actions of project participants.

**Definitions 1.** Communication management planning is the process of identifying the information needs of project stakeholders and defining an approach to communications.

Interaction planning includes determining the information and communication needs of project participants:

- regulations on access to information;
- terms of access to information;
- tools for access to information.

The planning of such interactions is closely related to the planning of the organization. This is due to the fact that the organizational structure of the project significantly affects the requirements for the flow of information interaction.

When planning the communications of any project, it is necessary to analyze the requirements for communications. According to the Project Management Knowledge Code of Practice (PMBOK), the analysis of communication requirements is a summary of the information needs of project participants. In determining such requirements, the type and format of the required information, as well as the analysis of its value, are taken into account.

Some restrictions may be imposed on planning, such as the transfer of information between project participants. This follows from the resulting specific laws or regulations, technology and organizational policies.

Resources in the project are spent on the transfer of information, which contributes to its success. Also, the project manager should consider the number of potential channels or ways of communication, as an indicator of the complexity of project communications.

Openness of information is the ability to access the information of all consumers.

The following information is required to determine the design requirements for communications:

- the subject of the project and the responsibilities of the project stakeholders;
- direction of innovative project development;
- quantitative and qualitative staff of project executors;
- external information links.

**Definition 2.** Communications management is the process of creating, collecting, disseminating, storing, receiving, archiving project information according to the communications management plan.

The main advantage of this process is to ensure efficient and effective exchange of information between project stakeholders.

This process ensures that the information provided to project stakeholders is properly formed, received and understood. It also provides stakeholders with favorable opportunities to interpret it, or to obtain additional or further information.

Methods and aspects of effective communications management include:

- Sender-recipient models. Introduction of feedback cycles in order to provide opportunities for interaction and participation in communications in the project.
- Choice of communication tools. Depends on the situation. Sometimes it is appropriate to use different chats, e-mails, or create a small online meeting to inform and quickly inform project team members.
- Writing style. Application of real or passive state, sentence structure, formal, encouraging approaches, word selection and more.

- Meeting management methods. Preparation of order and work with conflicts.
- Methods of presentations. Awareness of the impact of body language and the development of visual aids.
- Methods of organizing group work. Achieving consensus and overcoming obstacles.
- Hearing methods. Active listening (confirmation, clarification, and verification of understanding) and removal of barriers that may distort understanding.

The project manager should create a kind of intellectual space for the project stakeholders to discuss common tasks, goals, and areas of interest, which adds value to the project. Such a space for project stakeholders must meet certain criteria, in particular, creativity, openness, synergy.

The information platform provides for the organization of communications on the Internet for the formation of integrated reports, information processing in corporate software products, providing free access to unified information, technological, regulatory databases. The information platform has the potential to create additional value of the project through effective tools for receiving and processing current information, its accumulation in electronic form and use in future decisions. In addition, it allows you to involve a wide range of specialists from around the world in the project development team.

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# Project management information system



**Definition 3.** Project Management Information System (PMIS) is an organizational and technological complex of methodological, technical, software, and information tools aimed at supporting and improving the efficiency of project management processes.

The basis of the PMIS is a single information space, which provides:

- a single database of plans of all corporate projects;
- the only directory of resources used in projects;
- uniform forms of documents, templates of projects and reports;
- a single database of documents of all corporate projects.

The PMIS is designed to increase the efficiency of work related to the collection, processing, and analysis of data on the progress of the project, conducting analytical and forecast calculations, evaluating alternative design solutions and choosing the best among them.

The PMIS in the general case consists of two parts: support and functional.

The supply part includes the following main components:

1. organizational support - a set of documents that define the organizational structure, rights, and responsibilities of staff;
2. legal support - a set of legal norms governing legal relations in the creation and operation of the system;
3. technical support - a set of technical means designed for the operation of the system, computer, communication and organizational equipment;
4. information support - a set of forms of documents, classifiers, regulatory framework and implemented decisions on the volume, placement, and organization of information used in the system;
5. software - a set of programs and relevant documentation for operation, designed to manage hardware and solve functional problems.

The main working tool needed when working with any project is a database, the structure of which forms a kind of platform on which all components of the project are developed. The database reproduces hierarchical links between project elements. A typical database structure contains:

- initial data, basic processes and boundary conditions of the project;
- links between data, constraints, filters, etc., which allow you to structure and share data to describe the processes in the project.

The functional part includes those elements (subsystems) that determine its purpose, management functions and information processing functions. The functional part of the PMIS is considered a project management model, it is built on the basis of three components: the structure of project work, the structure of resources, the matrix of resource allocation for project work.

PMIS can be structured by:

- stages of the project cycle;
- project management functions;
- levels of government.

The following levels are distinguished in the organizational structure of the project:

### **1. Strategic level of project portfolio management (senior management).**

He is responsible for making decisions related to the approval of goals, priorities and funding of projects, monitoring the achievement of milestones, intermediate and final results of the project. The information system at this level of management should provide data collection from various sources, generalization and presentation of data in a form convenient for intuitive perception.

## **2. Level of project management (project management).**

At this level of project management, detailed planning of the complex of works, operational management of resources and control of the project over time and cost is performed. This level of management is primarily interested in powerful tools to create an adequate information model of work complexes and resources that support the calculation of the model with different input parameters, which provide data exchange with other levels of management and reporting for analysis and management.

## **3. Level of project implementation (project team).**

At the level of project tasks, detailed information is needed, which regulates and ensures the implementation of tasks. This information comes from the project management level and from the functional units. At the same time, at this level, the DM of the project collects and transmits actual data on the implementation of works and use of resources.

## **The main functions of the PMIS are as follows:**

- 1) automation of processes of collection, transformation, storage, search, and exchange of information;
- 2) statistical and analytical processing of information to justify and make project decisions;
- 3) implementation of calendar and network planning procedures, budget development, risk analysis, evaluation of project decisions;
- 4) performance of accounting functions;
- 5) data mining, machine learning for modeling and forecasting situations;
- 6) prompt and high-quality design of reporting documentation;
- 7) information protection.

The main differences between PMIS and corporate information systems are as follows.

- If corporate information systems are mainly developed to support individual functional units, the PMIS combines data from different departments and organizations involved in the project being developed;
- If the cycle of collecting, analyzing information and reporting in corporate information systems is usually tied to calendar periods (month, quarter, year), then in the PMIS management information is collected, stored and analyzed for the degree of achievement of project objectives (tasks, stages, milestones).

**Definition 4.** The decision support system is a combination of software, simulation, statistical and analytical models of processes and work on the project to prepare decisions for its implementation.

The purpose of the decision support information system is the organization and management of decision-making, in the development and implementation of projects based on modern technologies and cloud computing.

**The main functions of such systems are:**

1. Collection, transmission and storage of data;
2. Meaningful data processing in the process of solving functional tasks of project management;
3. Submission of information in a form convenient for decision-making;
4. Bringing the decisions to the performers.

## **Integrated project management information system:**

1. Combines data from different departments and organizations related to the relevant innovation project;
2. Provides storage, collection, and analysis of management information on the degree of achievement of project objectives;
3. It is created for each project and is temporary, because the project is a one-time activity;
4. Must provide algorithms for resolving conflicting requirements that arise in the course of project support;
5. Must provide support for business relationships between performers, temporarily united in a team;
6. It is a dynamic system that varies depending on the stage of the project;
7. Is an open system, because the project is not completely independent of the business environment and current activities of the enterprise.

The structure of the integrated information system for decision support is largely determined by the structure of the management processes adopted within the project and organization.

The project management information system provides support and improves the efficiency of project planning and management processes.

Thus, the structure and content of the management processes adopted within the project and organization largely determine the structure of the information system.

The main functional elements of the integrated information support system for decision support at the stage of project implementation are:

- Module of calendar-network planning and control of project works;
- Project accounting module;
- Financial control and forecasting module.

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# Software and hardware tools for project management



Implementation of PMIS functions is carried out with the help of information technologies.

**Definition 5.** Information technology (IT) is a process that uses a set of tools and methods for collecting, processing, and transmitting data (primary information) to obtain new quality information about the state of an object, process, or phenomenon (information product).

Modern, IT is based on the following principles:

- interactive (dialog) mode of work with the computer;
- flexibility of the process of changes in both data and task setting;
- integration (consistency) with other software products.

The task of IT management of innovative projects is to provide the user with a wide range of functionalities for project activities in the following ways:

1. description of project parameters and establishment of logical connections between works;
2. multilevel project presentation;
3. formation of the list of available resources, nomenclature of materials and items of expenses, volumes of works, etc.;
4. calendar and network planning;
5. resource and cost planning;
6. graphical representation of the project structure (e.g. Gantt charts, PERT charts);
7. control over the progress of the project;
8. creating reports, documenting the progress of project work;
9. organization of communications (work in a network environment).

The implementation of the above tools involves the use of software products that are IT tools.

Software used in the practice of project activities are divided into the following groups: spreadsheets, artificial intelligence systems, integrated enterprise management systems, specialized software products to automate project management.

The following tools are available using a spreadsheet (spreadsheet, such as Excel), a project manager, or an analyst:

- methods of mathematical and statistical data processing;
- graphic representation to illustrate data;
- means of modeling different variants of systems and situations based on a set of input data;
- means of performing financial calculations;
- implementation and work with external databases and other specialized software applications.

Today, artificial intelligence systems are very relevant, which allow project managers and analysts to work with incomplete and unclear information, to provide new knowledge. If we have a linear relationship in the data, then the means of mathematical statistics can make predictive conclusions. For nonlinear connections, a neural network tool is used, fuzzy neural networks that allow predictive conclusions to be drawn.

Many project management functions are contained in the software products that form the basis of integrated enterprise management systems.

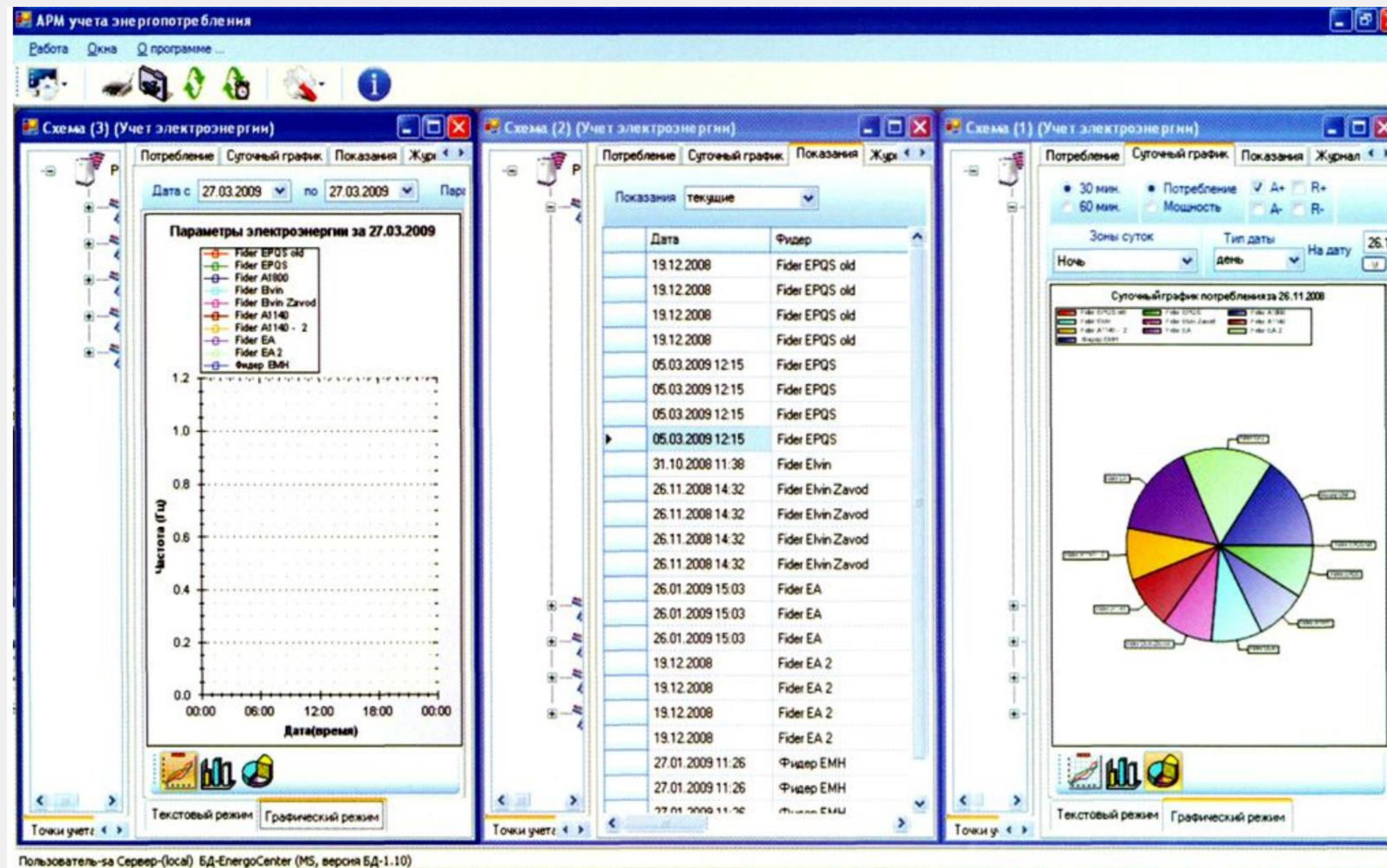
Application systems that support the work of the project manager at all stages of the project life cycle are divided into: automated systems, focused on the initial stages (stages of definition, project planning, system design) and implementation-oriented (project implementation management or so-called Project Management).

In the practice of project management, both universal and specialized software packages are used.

**Universal software packages**, which include a text editor (word processor) and programs for working with spreadsheets and databases, are used to prepare documents and calculations. The same group includes programs for preparing and conducting presentations and communication programs: programs for working with e-mail, sending faxes, accessing and publishing WEB. The level of automation in the use of these programs is determined primarily by the inherent capabilities of these programs, which include the ability to use templates and the presence of a built-in programming language.

**Specialized programs** can be divided into special and "custom". Special programs are designed specifically to solve project management problems. This group of programs includes business planning programs. These two types of programs are most widely used in practice. The group of "custom" includes software packages that have been developed as a means of solving other problems, such as modeling, but which are effective for solving project management problems, such as structural analysis.

# Example of project accounting information management software:



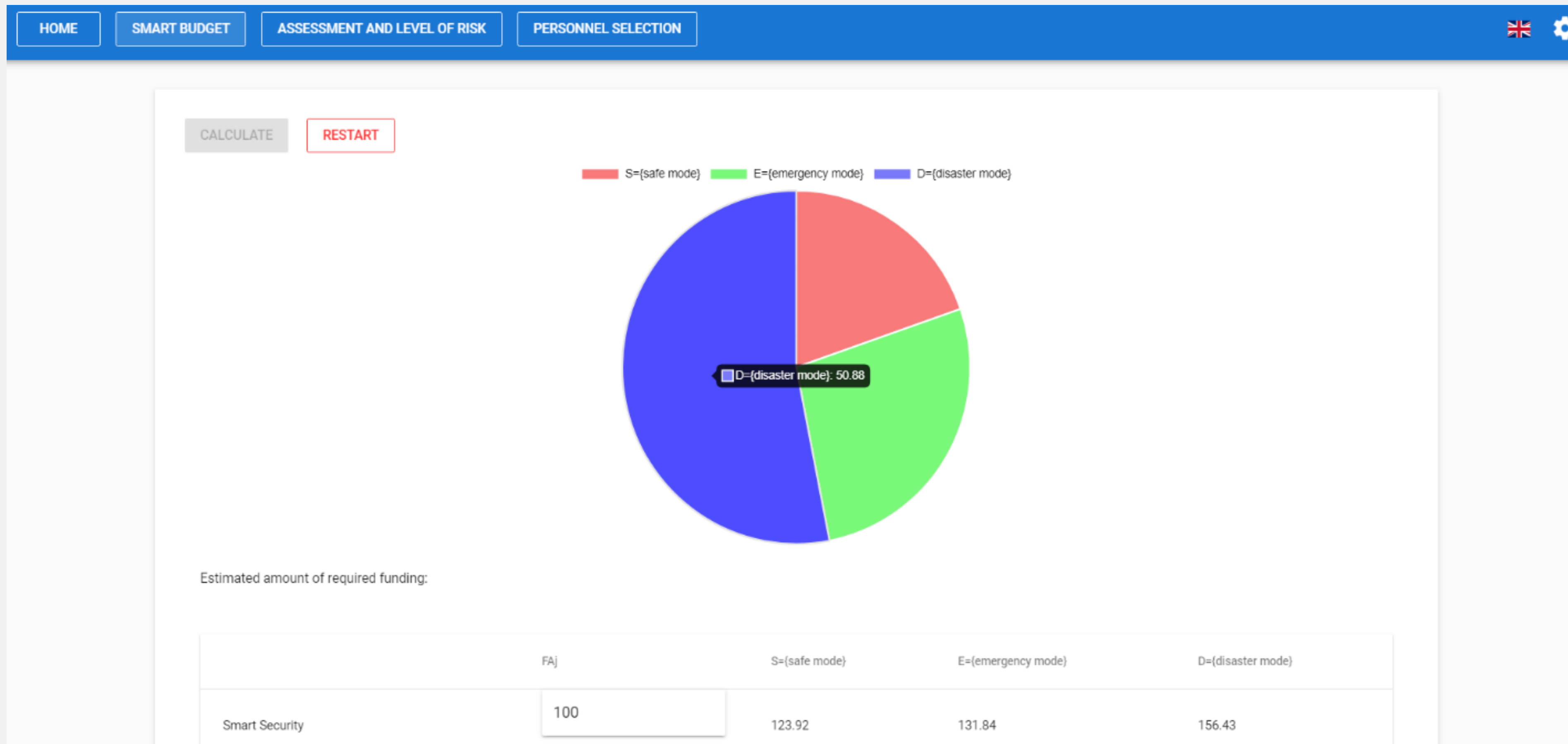
Velykodnyy, S. S. (2021). Modeli ta metody proaktyvnoho upravlinnya proyektamy z rozvytku prohramnykh system i produktiv: monohrafiya.

In the practice of project management, the most widely used software packages aimed at automating the following areas of management:

- business planning;
- work planning;
- operational control over the performance of works;
- analysis of the progress of the plan;
- making adjustments to the work plan.

Historically, most complexes are focused on solving typical, replicated tasks and are aimed mainly at automating the implementation phase. They allow you to get a schedule of project implementation and allocate resources.

For example, software for estimating the Smart City budget in different modes of operation and financing of innovations:



<https://pandemiariskmodel.herokuapp.com/budget>

Decomposition of the project, linking tasks, allocation of resources is done manually, so the quality of the project implementation schedule is determined by the experience of the project manager. As a project model, most packages use a network schedule, and the criterion of efficiency is the length of the critical path.

**Specialized software packages.** Specialized software packages include software packages designed specifically for project management, or that can be adapted to solve these individual problems. There are packages focused on managing large projects implemented by large companies, providing ample opportunities for work planning and one that focuses on solving a narrow class of tasks, such as building project implementation.

The development of cloud services and reducing the cost of access to them has led to a significant promotion of opportunities for the use of cloud applications by teams of developers of innovative projects.



The classification of specialized software packages is based on the scale of the project and the qualifications of the user, project manager. According to the proposed classification criteria, systems (packages) for project management can be divided into professional and entry-level.

Examples of specialized software packages that provide automation of project management in the concept phase (Project Expert), system design (BPWin, IThink, GPSS), project preparation and implementation (Microsoft Project, Primavera Project Planner, etc.).


Project portfolio management tools - Microsoft Office Project Portfolio Server, Microsoft Project Server, Primavera P6 Enterprise Project Portfolio Management.

From a practical point of view, the differences between these software products in terms of their capacity (the size of the project in terms of work and resources, the speed of recalculation of the project, etc.) can be considered insignificant. Even relatively inexpensive software products today are able to support project planning, covering thousands of resources and tasks, and solve the following tasks: designing the structure of project work; critical path planning; resource planning, cost analysis of projects, control over the progress of projects, risk analysis and planning of work schedules taking into account risks, formation, and publication of project reporting, analysis of trends and forecasting project parameters.



# Comparison of some modern project management software solutions

Project management program	Platform	Team size	Features and benefits
<p><b><u>Freshservice</u></b></p> 	<p>Windows, Mac, Linux, Android and iOS.</p>	<p>From small to large businesses and freelancers.</p>	<p>Freshservice is a complete set of project management tools that provides more collaboration and you can tailor your IT to your business goals. It provides various functions for managing IT projects from scratch to completion. You can plan projects with integrated modules and manage their dependencies and relationships from a single platform. It provides task management features that allow you to organize projects by tasks and subtasks.</p>
<p><b>monday.com</b></p> 	<p>Windows Mac iPhone / iPad Android</p>	<p>Small, medium and large.</p>	<p>Project development can be tracked with Kanban, Timeline or Charts. It has features for planning sprints, creating user stories and appointing team members. It provides good opportunities for cooperation. Integration with third-party applications.</p>

# Comparison of some modern project management software solutions

Project management program	Platform	Team size	Features and benefits
<p>The backlog</p> 	<p>Web capabilities and self-hosting options, Windows, Mac, Android, iOS, Linux (self-hosting).</p>	<p>From small to large businesses.</p>	<p>The application allows you to manage projects and update them from a mobile device anywhere. Easy to set up and get started quickly.</p> <p>Easy to download and log in from your mobile device and fully integrated with the desktop version.</p> <p>Simple interface that new users quickly know and use. As a result, this tool is useful for non-development teams for task or project management purposes. Both Wiki and Git / SVN are built-in; users do not need to purchase them separately, unlike Confluence and Bitbucket.</p> <p>The lag comes with an unlimited user plan that is cost-effective for larger (or smaller) teams.</p>

# Comparison of some modern project management software solutions

Project management program	Platform	Team size	Features and benefits
Hive 	Windows, Mac, Android, iOS	From small to large businesses.	<p>The hive provides a productivity tool that allows teams to manage projects as best they can. It supports multiple project layouts, such as Gantt chart, Kanban board, table, or calendar. You can easily switch between views. You will be able to actively analyze and identify risks with the help of analytics. The hive can be integrated with thousands of applications.</p>
Team week 	Web, iOS	Small, medium and large.	<p>Teamweek can be used for project planning and task management. It can also be integrated with Slack, Calendar and any other Internet tool. With the Chrome Teamweek extension, you can integrate with the online tool.</p> <p>The annual review is like a year-round helicopter view.</p> <p>You can create project roadmaps and share them with your teams.</p> <p>This allows you to do planning based on power.</p>

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# Automation of project management



Effective project management is impossible without the use of automation tools. To support the implementation of projects at different stages, there are many software packages aimed at improving the efficiency of project implementation (meaning the implementation of the project as a whole, such as its individual stages, in a timely manner within the approved allocations).

It is almost impossible to ensure effective project management without the use of modern information and computer technologies, without automation.

The main goals achieved through automation at each of the main stages of the project life cycle:

1. At the concept stage:

- reduction of time of development and coordination of the basic documents;
- ensuring effective interaction with the customer;

2. At the stage of development of the commercial offer:

- reduction of time of development and coordination of the basic documents;
- increase the efficiency of the choice of contractors, components, suppliers;
- ensuring effective interaction with the customer, potential contractors and suppliers;

- 3. At the design stage (preparation):
  - reduction of project development schedule development time;
- 4. At the stage of implementation:
  - increasing the reliability and efficiency of information on the status of the project to solve operational management problems;
  - reduction of time for preparation of reports on the progress of the project, and on this basis strict compliance with the established calendar deadlines for the issuance of documentation;
  - ensuring effective interaction between project participants;
- 5. At the stage of delivery and completion of the project:
  - reduction of time for preparation of working documentation.

All goals are divided into general and specific.

The overall goal for all stages of the project life cycle is to reduce the time required to prepare documents and ensure effective interaction between project participants. It is possible to reduce time of preparation of documents at the expense of fuller use of possibilities of modern means of work with documents (templates, macros) and automation of document circulation. Ensuring effective interaction between project participants is possible through fuller use of communication technology.

Specific goals are achieved through the use of appropriate software. For example, the reduction of project development schedule time can be achieved through the use of software designed to solve the problem.

**Definition 6.** The purpose of automation is to ensure effective project management, through software tools for project management throughout the life cycle, from idea to completion.

Personal computer systems equipped with project management software must perform the following functions:

1. Work in a multi-project environment;
2. Development of a calendar-network schedule of works;
3. Optimization of allocation and accounting of limited resources;
4. Conducting scenario analysis;
5. Collection and accounting of factual information on deadlines, resources and costs, automated report generation;
6. Planning and control of contractual obligations;
7. Centralized storage of information on implemented and completed projects, etc.

Automated project management systems contain the following structural elements:

1. tools for calendar and network planning;
2. tools for solving certain tasks (budgeting, risk analysis, contract management, time, etc.);
3. means to simplify and restrict access to project data;
4. means for the organization of communications;
5. tools for integration with other applications.

As a rule, the universal project management systems presented in the modern market provide the basic set of functionalities which include:

1) means of designing the structure of project work and planning by the method of critical path:

- description of the main parameters of the project;
- establishing logical connections between works;
- multilevel presentation of the project;
- support for the project calendar;

2) means of planning resources and costs:

- organizational structure of performers and cost structure;
- maintaining a list of available resources, nomenclature of materials and articles costs;
- allocation of resources and costs for works;
- support for resource calendars;
- calendar planning for limited resources;

3) means of control over the progress of the project:

- fixing the planned parameters of the project in the database;
- introduction of actual performance indicators;
- introduction of actual volumes of work and use of resources;
- comparison of planned and actual indicators, forecasting the performance of works;

4) means of graphical representation of the project structure and creation of various reports on the project:

- Gantt chart (with a spreadsheet that allows you to display various additional information);
- grid diagram (PERT-diagram);
- creation of reports required for project planning and control (reports on the implementation of the project schedule, various reports on resources and costs, etc.);

5) means of organizing group work.

# Conclusions

This lecture discusses the important concept of communication management and information support of innovative projects. For this purpose, the following were studied: communication management processes in the implementation of an innovative project, project management information system, software, and hardware tools for project management and automation of project management. The use of automated project management systems has long been used only in traditional fields (large construction, engineering, defense projects) and required professional knowledge. But over the last decade, the situation with the use of scheduling and project management software has changed dramatically. In the period of globalization and development of innovations, there are wide possibilities of means for information support of innovative projects. Today, the market has many universal software packages that automate the functions of project planning and control.

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**Thank  
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