Management of process control in innovative projects

Chapter 1
Introduction. The essence of project innovation

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Lecture content

- The concept of process control in innovation projects and innovative project activities
- Classification of innovative projects
- The main characteristics of the innovation project, program, and portfolio
- Project management as a specific branch of management
- Goals, processes and functions in the management of innovative projects
- Factors influencing the implementation of innovative projects

01

The concept of process control in innovation projects and innovative project activities

At the present stage of human development, there is an increasing desire to manage processes in the world. The amount of data is growing rapidly in all areas, with them there is a need for processing, which is reduced to obtaining knowledge, on the basis of which further decisions are made.

Today, decision support systems are increasingly using data mining tools. However, most of them are designed to make decisions in the safe mode of operation of systems. For situations where the system is rapidly changing modes, most decision support models are not able to adequately assess the situation.

Definition 1. The level of process control in the system of innovative project implementation is the assessment of the project, which indicates the possibility of achieving the project objectives under conditions of adequate (qualified) management of the decision-maker (DM).

Definition 2. If the level of process control in the system of innovative project implementation allows qualified and proactive management decisions that ensure the achievement of project objectives and the appropriate level of security of the environment, it can be said about the overall appreciation of the innovative project.

The level of process control in the system of innovative project implementation depends on many factors: management's views on the concept of security, its risk appetite, emotional state, risk-oriented factors, external and internal factors, etc. The choice of behavior is the result of the interaction of external factors, features, and opinions of DM. This choice is a prerequisite in the system of personal qualities of DM, which include his worldview, experience, knowledge, as well as features of the internal system of moral and social control, including legal awareness. Therefore, the subjective reason for the level of process control in the system of implementation of an innovative project is the decision of the DM.

Theoretical-multiple model assessment of process control in the system of innovative project implementation can be reflected as follows:

$$\{X, G, F, K, P, Mi, Mo \mid Y\} \qquad (1)$$

They are known:

X – innovative project;

G – a set of system goals;

F – set factors influencing the controllability of processes in the system of innovation project implementation;

K – set of indicators (criteria) for evaluating the properties of an innovative project;

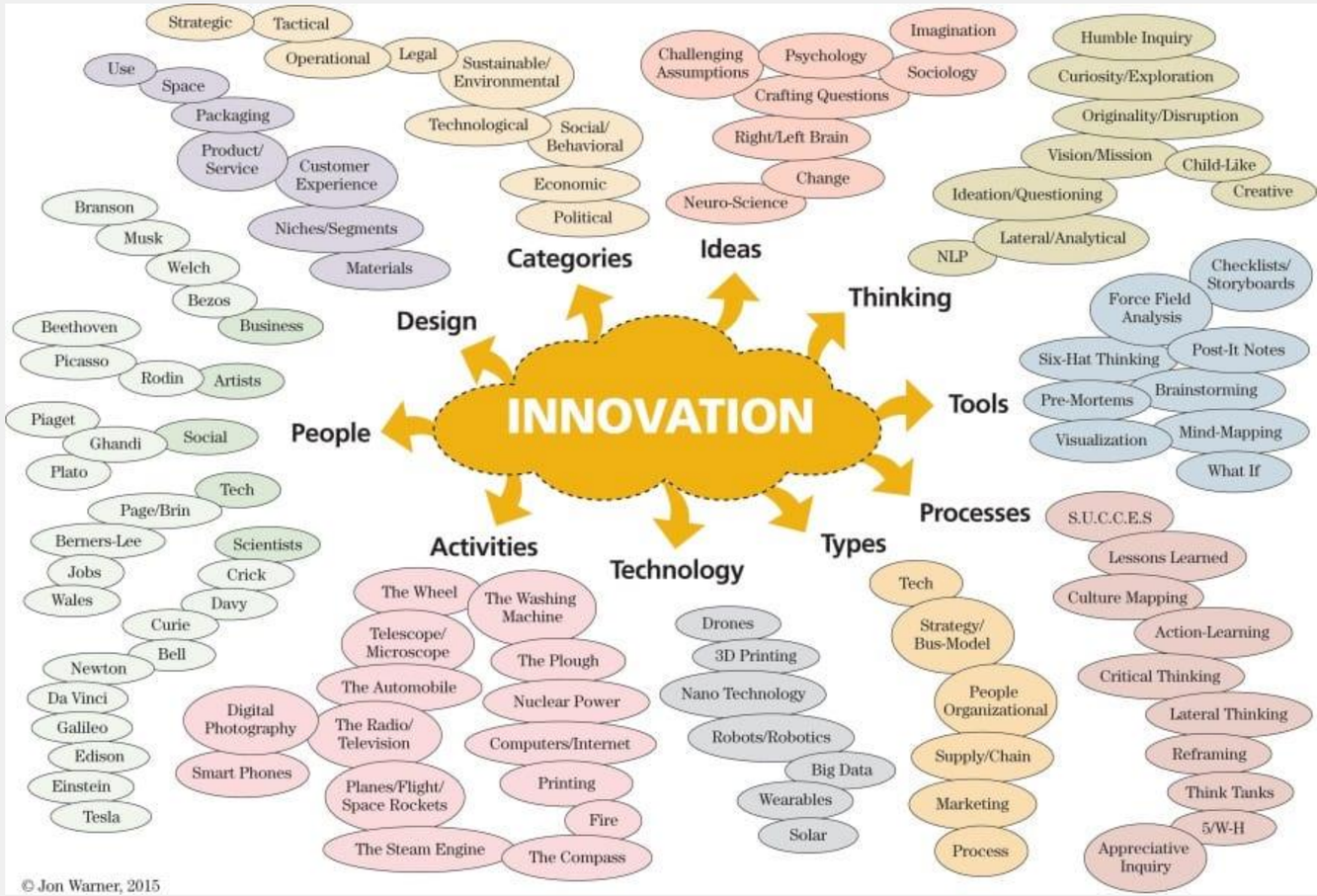
P – set parameters in the system of innovation project implementation;

Mi – input data processing model that depends on X, G, F, K;

Mo – models of initial data processing taking into account the parameters in the system of implementation of the innovative project P.

The results of the evaluation are unknown: Y – assessment of the level of process control in the system of innovation project implementation.

Innovative activity - activity aimed at using and commercializing the results of research and development to expand and restore the range and improve the quality of products, improve the technology of their manufacture with subsequent implementation and effective implementation in domestic and foreign markets.



The objects of innovation are

- innovative programs and projects;
- new knowledge and intellectual products;
- production equipment and processes;
- the infrastructure of production and entrepreneurship;
- organizational and technical solutions of production, administrative, commercial or other nature, which significantly improve the structure and quality of production and (or) social sphere;
- raw materials means of their extraction and processing;
- marketable products;
- mechanisms for the formation of the consumer market and sales of marketable products.

Definition 3. A project is a set of purposeful, consistent, comprehensive measures aimed at achieving the main goal in conditions of limited resources and time.

Definition 4. Innovation project - a set of interrelated measures designed to develop and market innovative (new high-tech) products, taking into account the established resource constraints.

The purpose of the innovative project is the evidential result and the set conditions for the implementation of the overall task of the project.

From the point of view of the theory of management systems, the project as an object of management should be controlled and managed, etc. with the help of some criteria, you need to constantly monitor the progress of the project (controllability).

Innovative projects, like any other project, have many common features that characterize them.

Common features innovative projects

✓ **Focus on achieving the main goal.** Projects are aimed at achieving some results, goals. Achieving the main goal is the driving force of the innovation project, and all efforts to plan and implement it are aimed at achieving it.

✓ **Focus on achieving hierarchical goals (sub-goals).** Because innovative project activity is a complex system of functioning that has a hierarchical structure. Therefore, to achieve the main goal of the project it is necessary to achieve under the goals.

For example, the implementation of an innovative web platform for risk assessment of startup projects requires a number of works, the implementation of which is a hierarchical goal: designing a database, filling it with knowledge, programming calculation algorithms and designing a web application.

Common features innovative projects

✓ **Coordinated implementation of related actions**. The very essence of innovative projects determines the complexity of their implementation. Innovative projects, after a clear understanding of the idea, require clear interrelated tasks: intermediate tasks cannot be implemented until other tasks are completed; some tasks have to be implemented in parallel, etc. If the synchronization of different tasks is broken, the whole project may be in danger of failure.

Common features innovative projects

✓ **Terms of implementation of the innovative project**. Projects are implemented over a period of time, with the allocation of the beginning and end of the project. An innovative project is considered complete when its main goals have been achieved. During the implementation of the project, it is important that it is completed on time. This is helped by clearly defined stages of project implementation.

Common features innovative projects

✓ **Budget for the implementation of an innovative project.** Project activities aimed at obtaining the final or intermediate result in a timely manner, and can not take place without the use of resources: material, human, financial. Therefore, it is necessary to have a budget allocated to meet the resource needs of project financing, corresponding to its scale, content, and timing.

✓ **Uniqueness.** Innovative projects are unique and one-time activities aimed at innovative development.

The most famous international associations and organizations involved in the standardization of project activities

The Project Management Institute (PMI) is a non-profit organization whose main activity is the certification of a project management professional, based on the A Guide to the Project Management Body of Knowledge (PMBOK Guide). This manual is recognized as a national standard in the United States. The seventh version of the PMBOK standard is currently available.

The International Project Management Association (IPMA) is a professional association that has now brought together more than 70 member associations. The activity is focused on the development of project management competence, respectively, in the geographical areas of their influence. In addition, they work to develop relationships with various entities, such as government agencies, universities, consulting companies and others.

The most famous international associations and organizations involved in the standardization of project activities

Association for Project Management (APM) is an independent British national organization in the field of project management, established in 1972. The Association is engaged in the development of standards for assessing the competence of managers to manage programs and portfolios.

The most famous international associations and organizations involved in the standardization of project activities

The Japanese Project Management Association (PMAJ) is a non-governmental organization focused on developing its own unique project management methodology. To this end, a committee on innovation development was established, which developed a standard of project activities, entitled "Guidelines for project management and innovation implementation programs in enterprises" (P2M).

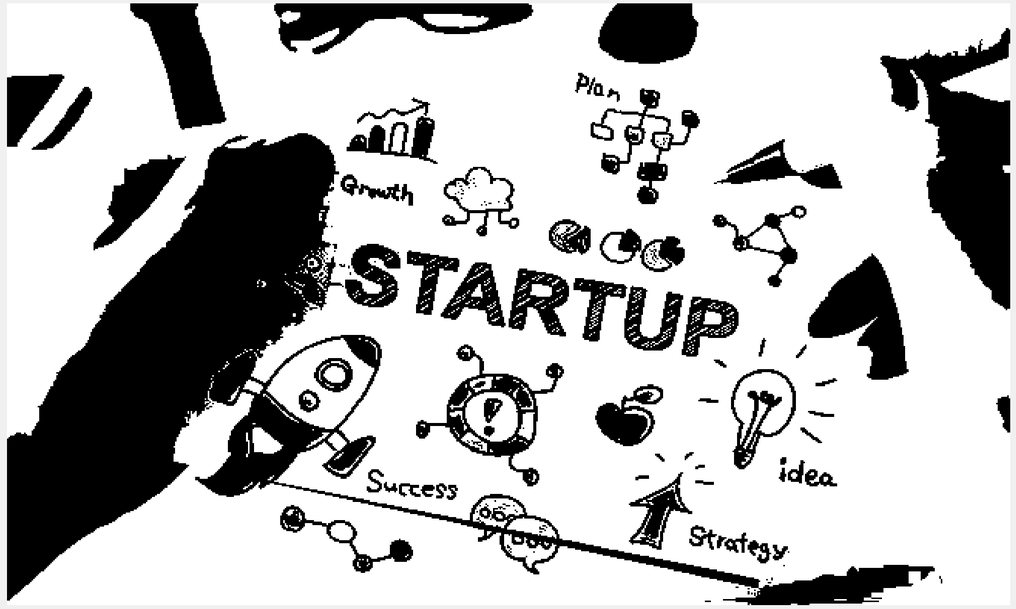
The most famous international associations and organizations involved in the standardization of project activities

The Global Alliance for Project Performance Standards (GAPPS) is a non-profit organization that brings together volunteers to develop qualification standards for project managers. Through public discussion, this organization has created and improved a number of standards. The most famous is the "Framework for Performance Based Competency Standards for Program Managers".

International Standartization Organization (ISO) is the best known and most reputable international standard's development organization, established in 1947. The latest ISO 21500 standard: 2021 Project, program, and portfolio management

02

Classification of innovative projects



The following main classifications of projects are distinguished in project management:

- classes of projects - by composition, structure and its subject area;
- types of projects - by main areas of activity in which the project is implemented;
- types of projects - by the nature of the subject area of the project, the duration of projects.

There are several classification features, on the basis of which the systematization of the whole set of projects is carried out:

1. Depending on the field of application: research; scientific and technical; organizational.
2. By level of decision: state; regional; enterprises accepted at the level of the organization.
3. By type of innovation: new product; new service; new method of production; new management method; new market; new source of raw materials.

There are several classification features, on the basis of which the systematization of the whole set of projects is carried out:

4. For existing systems:
- subversive innovation projects that offer a new system, abandon existing models, and aim to capture existing or completely new markets;
- supporting innovative projects, the aim is to improve existing systems to improve their quality.
5. By degree of completion: completed; intermediate.
6. By scale: small projects; medium projects; megaprojects.

There are several classification features, on the basis of which the systematization of the whole set of projects is carried out:

8. By quality: ordinary projects; defect-free projects - provide the highest achievable quality levels as the dominant factor (for example, the nuclear power industry).
9. On the significance of the boundaries and objectives of the project: multiprojects (execution of several orders under the investment program of the customer); mono-projects (clearly allocated resources and deadlines related to a particular project).
10. By number of partner countries: national; international.

03

The main characteristics of the innovation project, program, and portfolio

In the management of innovation projects, it is necessary to distinguish between the concepts of "innovation project", "portfolio of innovation projects", "program of innovation projects", which are sometimes identified.

	Innovation project	Program of innovation projects	Portfolio of innovation projects
Goal	The project must produce ready to supply innovative product	The program must achieve strategic changes	The portfolio should coordinate, optimize and adjust strategy
Vision and strategy	Interconnected through the working project shell	Implemented program	Regulated strategy and are under her monitoring
Commercial profit	Almost absolutely excluded from the project	Almost completely included in the program	Almost absolutely excluded from portfolio
Organizational changes	Often excluded from the project	Usually included in the program	Excluded from the portfolio
Time, expenses	Defined in the business plan and implemented in the project	Approximately outlined in strategy; divided into separate projects	Based on the priorities and strategic goals of the portfolio

Definition 5. The program of innovative projects is a set of interconnected projects (which have been implemented in the past, today and will be implemented in the future), as well as a set of organizational changes, united by common goals and aimed at achieving some commercial benefit.

The implementation of a single innovation project in the program may not give a tangible result (income), while the implementation of the entire program provides the expected profit.

Definition 6. Portfolio of innovative projects - a set of innovative projects, programs and other works that are in the process of implementation and combined together for effective management, in order to achieve strategic goals; complex with simultaneously executed projects and programs united by the owner of the portfolio, in accordance with its strategic objectives.

There are three levels of maturity of business entities that have implemented project management (OPM3 standard):

1) Project Management Maturity Model (PM3);

2) Program and project management (P2M3 = Program and Project Management Maturity Model);

3) Portfolio management, programs and projects, (P3M3= Portfolio, Program and Project Management Maturity Model).

The company can move to a new level of maturity only after mastering the previous level.

04

Project management as a specific branch of management

The essence of project management is to manage the goals of the organization, which will allow the company to be successful in the market, responding to external and internal changes, minimizing time and resources. Under the constant attention of the head of the innovation project are three variables: time, budget and quality.

Project triad - (term, budget, and content of works, distinguish some sources of quality) are the main limitations imposed on the project.

For example, the most well-known formulations of the definition of "Project Management (PM)" are as follows.

1. US Project Management Institute, The United States gives the following definition: "PM - the art of managing and coordinating human and material resources throughout the project life cycle by applying a system of modern management methods and techniques to achieve the project results on the composition and scope of work, cost, quality, and satisfaction of the needs of project participants ".

2. English Association of Project Managers: "PM is a management task to complete the project on time, within the established budget, in accordance with technical specifications and requirements. The project manager is responsible for achieving these results".

Definition 7. Innovation project management is the process of managing the team and resources of an innovation project using certain actions and methods, the project is successfully completed and achieves its goal.

Any smallest project requires the application of the PM methodology and the definition of the person responsible for the project.

Methods of managing innovative projects involve the creation of a special organizational structure for such purposes - Project-Driven Organization.

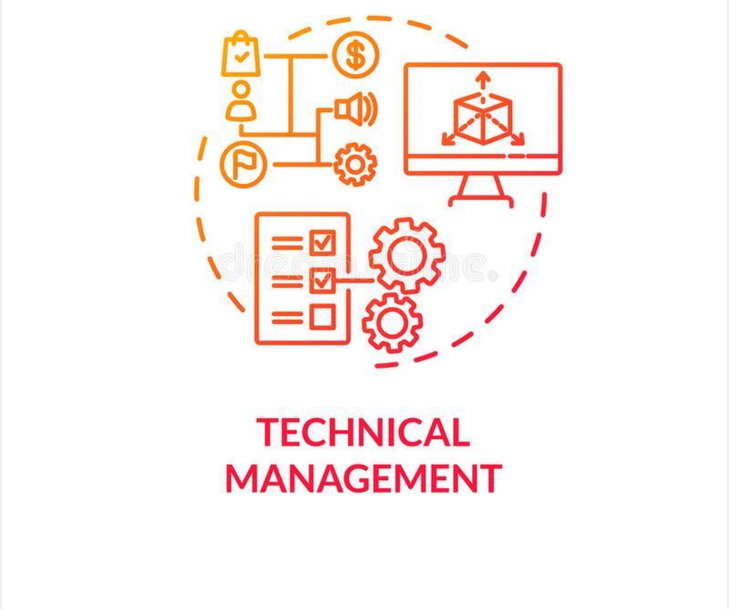
A single group with a project manager is created to manage the innovation project. The group includes authorized representatives of all participants for the implementation of functions, in accordance with the accepted division of competencies and responsibilities.

Innovation project management involves the systematic application of management methods and tools in order to obtain the declared results of the project. The project management system may include the following levels of project management: strategic management (Project Direction), operational management (Project Management), technical management (Project Realization).

The following project management bodies can be deployed as part of the system: Project Board; Project Management Team; project office; Project Management Office; technical team; project audit bodies (Project Audit team, Project Assurance Team).

Strategic management is organized and implemented by the Board of Directors of the project, consisting of, for example, the sponsor, the customer, the user of the project product, the project manager and others. Operational management organized and implemented by the project management team and the project office.

Technical management is organized and carried out by contractors according to their work. Audit bodies carry out internal and external audit of the project in the interests of the main participants and the project management team.



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Goals, processes and functions in the management of innovative projects

The need for innovative project management is declared as follows

1. The pace of industry change is increasing, so project management is one way to achieve rapid success in highly competitive markets.

2. Market conditions are becoming more demanding, projects are more specific and require more professional management.

3. Management of innovative projects differs from other management activities that require special knowledge, skills, tools, organizational structure, etc.

4. Projects need to bring together different professionals from different fields, sometimes a global international team.

The task of project management is to achieve the set goals in terms of time, cost (budget), quality.

Tasks of innovation project management:

- definition of the main objectives of the project, sub-objectives and justification;
- identification of the structure of the innovation project;
- determination of the necessary amounts and sources of funding;
- selection of a team of project executors;
- preparation and conclusion of contracts;
- determination of deadlines, stages, and calculation of relevant resources;
- preparation of estimates and budget of the project;
- control over the stages of project implementation;
- project monitoring.

The main goals of the project are achieved through certain management processes. One such approach is the classic.

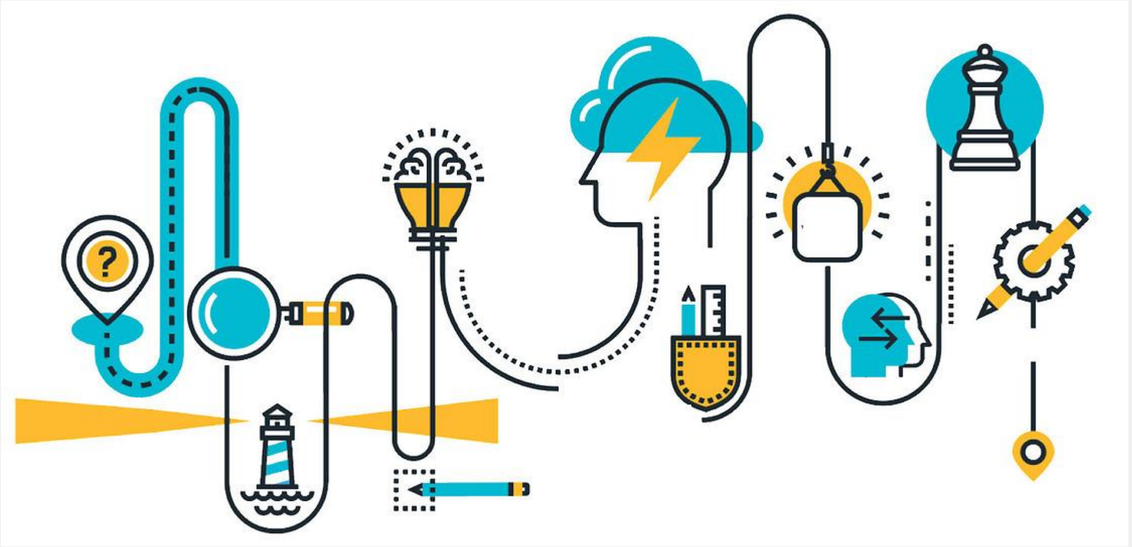
The classic approach proposed by Henry Fayol in 1949, represents five main functions of management:

- planning the amount of work required to implement the project and achieving all its goals;
- organization of resources for all work, strictly adhering to deadlines and budget;
- implementation of the created action program;
- control over the implementation of the plan, or adjust it if necessary;
- management of the team of executors of the innovative project.

Innovation project management is performed through processes, using special knowledge, skills and abilities, tools and methods for project management, receiving inputs and creating process outputs, id est project management is carried out according to the process approach.

Definition 8. Process - a set of certain actions aimed at achieving the end result.

According to the ideas of the process approach, an innovation project is a unique process that is a set of interconnected coordinated subprocesses.



The Project Management Institute has developed a certification program that defines professional knowledge, known as the Project Management Body of Knowledge (PMBOK). PMBOK consists of ten functions (areas of knowledge) [11]:

- **Project Integration Management** is a combination, consolidation, integration actions aimed at successfully managing the expectations of stakeholders and meeting certain requirements.
- **Project Scope Management** is the process of sampling, filtering, and grouping by project those and only those jobs that a project manager needs to complete successfully.
- **Project Time Management** - processes that ensure timely completion of the project.

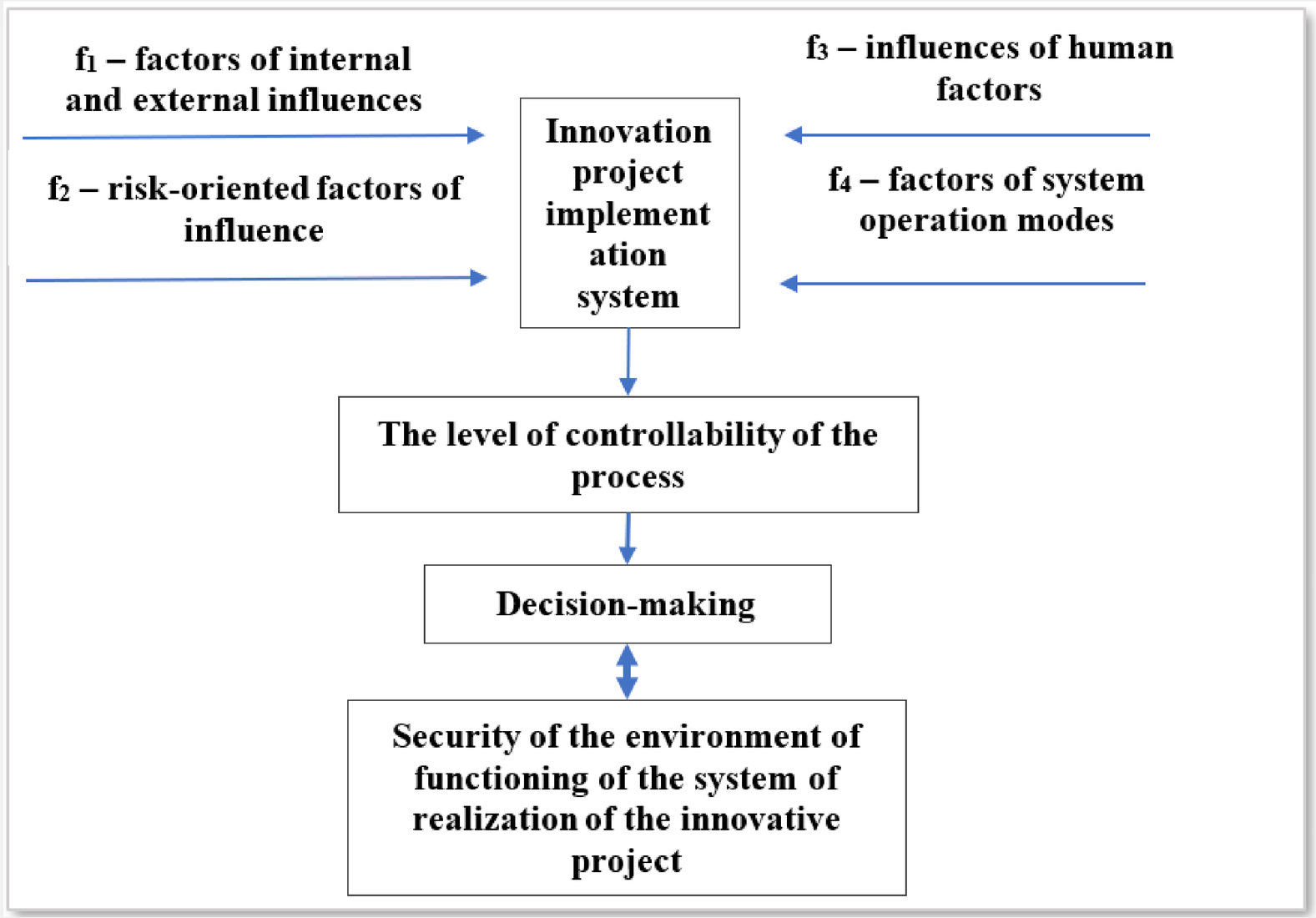
- **Project Cost Management** - processes in terms of budget planning and development, as well as cost management, ensuring the completion of an innovative project within the declared budget.
- **Project Quality Management** - processes and actions, approaches and policies aimed at meeting the needs for which the project was initiated.
- **Project Human Resource Management** - processes that include approaches to management and leadership of the team implementing an innovative project.
- **Project Communications Management** - processes used to ensure the timely formation, preparation, dissemination, transmission, receipt, use of information in project implementation.

- **Project Risk Management** - risk management planning processes, risk identification and analysis, development of risk response methods, risk management during project implementation.
- **Project Procurement Management** - processes that include the purchase or acquisition of certain necessary entities (products, services, results, documents) produced by external (contracting) organizations in relation to the one in which the project is implemented.
- **Project Stakeholder Management** - processes aimed at communication between the project team and stakeholders, as well as work aimed at meeting their needs.

06

Factors influencing the implementation of innovative projects

Factors influencing the implementation of innovative projects: f1 - factors of internal and external influences; f2 - risk-oriented factors of influence; f3 - influences of human factors; f4 - factors of system operation modes.



Factors of internal influences of controllability of processes of realization of innovative projects are a set of components interconnected by means of certain structures within its limits.

The main variables of the internal process control environment are goals, objectives, structures, technologies, and people. Internal variables are usually called socio-technical subsystems because they have a social component (people) and a technical component (other internal variables).

Factors of external influences of controllability of processes of realization of innovative projects are a set of elements which are not a part of system, but carry out a certain influence on it.

The main characteristics of external influences are the relationship of its factors, complexity, mobility, and uncertainty. The influence of external factors on the controllability of innovation projects is divided into two types: external management environment of direct influence, which includes elements that directly affect the operations of the system and feel the direct impact of its operations; external management environment of indirect influence, which may not have an immediate impact on system operations, but will be reflected in them over time.

Depending on the innovation project of a complex as a complex system of functioning, it is necessary to: adequately select risk factors for the resource of innovative projects, which may suffer losses in the event of risk; determine risk assessment scales; build evaluation methods; to analyze, select and make decisions on proactive risk reduction management to increase the manageability of processes in the implementation of innovative projects.

Depending on the specific assessment of the impact of the management entity on the level of control over the implementation of innovative projects, the construction of information models should include various aspects of professional and non-professional influences of the project team.

The implementation of innovative projects depends on the factors of implementation modes and achievement of goals by the system. It is necessary to forecast the level of project implementation in different modes, to take measures aimed at improving the implementation of the project, in order to be able to implement it, even in catastrophic situations.

Conclusions

Theoretical and methodological principles of innovation project management are considered.

Namely, the concept of process control in innovative projects and innovative project activities, the classification of innovative projects, the main characteristics of the innovative project, program, and portfolio. The issue of project management as a specific branch of management is raised. The goals, processes, and functions in the management of innovative projects are analyzed, as well as the factors influencing the implementation of innovative projects are classified.

Conclusions

We will remind once again that the level of controllability of processes in the system of realization of the innovative project is called such estimation of the project which testifies to possibility of achievement of the set project purposes under conditions of adequate (qualified) management of the decision-maker.

I would like to draw your attention to the fact that for successful project management it is necessary to know the application of the project management methodology, to select an adequate team that successfully implements the project, as well as the team leader.

Conclusions

Among the prerequisites that will contribute to the growth of resource-efficient economy, an important role is played by the formation of a new generation of managers of knowledge and skills to use a modern project approach to solving innovative problems of management processes at different levels. The orientation of these processes ensures the achievement of the project goal with minimal time and money.

I want to remind you that this course systematizes knowledge in the subject area of innovation project management, principles, methods, and tools of design, as well as issues of planning, control, organization, motivation, and coordination in the framework of process control in innovation projects.

References

[1]. Evaluation of start-up projects in conditions of risk and uncertainty, Polishchuk V., Publishing house "FOP Sabov AM", 2021.
The scientific monograph is devoted to the development of a methodology for evaluating start-up projects in conditions of risk and uncertainty, based on a combination of expert experience and various factors for evaluating start-up projects using fuzzy logic, fuzzy sets, and neural fuzzy networks. The scientific monograph develops and tested fuzzy and expert mathematical models that allow: quantify start-up projects and teams of their developers, assess the risks of start-up projects, assess the security risks of start-up projects, evaluate and select start-up projects for investor purposes, evaluate commercial projects of various origin and evaluate the rating of the crowdfunding platform.

References

[2]. Kelemen M. Information Model of Evaluation and Output Rating of Start-up Projects Development Teams / M. Kelemen, V. Polishchuk [Electronic resource] // Proceedings of the Second International Workshop on Computer Modeling and Intelligent Systems (CMIS-2019), Zaporizhzhia, Ukraine, April 15-19, 2019. – CEUR Workshop Proceedings, Vol. 2353. – P. 674-688. http://ceur-ws.org/Vol-2353/paper54.pdf

The problem of constructing an informational model of evaluation and output of the start-up team rating is considered. This model is based on neuro-fuzzy network when there are expert fuzzy data on the teams of developers. As the success of a start-up implementation depends on the quality of the team of developers, then the development of such a model will increase the degree of validity of the decision to finance the start-up projects.

References

[3]. Polishchuk V. Technology Improving Safety of Crowdfunding Platforms Functioning in the Context of the Protection of the Start-up Investors in the Financial and Transport Sectors/ V. Polishchuk, M. Kelemen, J. Kozuba // The Journal of Air Force Institute of Technology (Journal of KONBiN), 2019. – Volume 49: Issue 1. – P. 313-330. doi.org/10.2478/jok-2019-0016
The information technology models improving security functioning of crowdfunding platforms and advice on a new type of business were developed. The article solves the problem of safety of crowdfunding platform functioning based on developed models: rating assignment system of unified assessment crowdfunding platforms; startup projects assessment; startup projects risk assessment concerning their financing safety level and criminal law protection of investors against the financial fraud.
[4]. Polishchuk, V.; Kelemen, M.; Gavurová, B.; Varotsos, C.; Andoga, R.; Gera, M.; Christodoulakis, J.; Soušek, R.; Kozuba, J.; Blišťan, P.; Szabo Jr., S. A Fuzzy Model of Risk Assessment for Environmental Start-up Projects in the Air Transport Sector. Int. J. Environ. Res. Public Health 2019, 16, 3573. https://doi.org/10.3390/ijerph16193573

References

[5]. Kelemen, M.; Polishchuk, V.; Gavurová, B.; Szabo, S.; Rozenberg, R.; Gera, M.; Kozuba, J.; Andoga, R.; Divoková, A.; Bliš'an, P. Fuzzy Model for Quantitative Assessment of Environmental Start-up Projects in Air Transport. Int. J. Environ. Res. Public Health 2019, 16, 3585. https://doi.org/10.3390/ijerph16193585
[6]. Gavurova B.; Kelemen M.; Polishchuk V. Expert model of risk assessment for the selected components of smart city concept: From safe time to pandemics as COVID-19. Socio-Economic Planning Sciences, 2022, 101253. https://doi.org/10.1016/j.seps.2022.101253
[7]. Upravlinnya proektamy. Dovhan L. YE., Mokhonko H. A., Malyk I. P. K.: KPI im. Ihorya Sikors'koho, 2017.
[8]. Upravlinnya proektamy. Babayev V.M. Kharkiv: KHNAMH, 2006.
[9]. Upravlinnya proektamy: pidruchnyk. Nozdrina L.V., Yashchuk V.I., Polotay O.I. K.: Tsentr uchbovoyi literatury, 2010.
[10]. R2M. Kerivnytstvo z upravlinnya innovatsiynymy proektamy ta prohramamy: per.z anh.; za red..S.D.Bushuyeva. K.: Nauk.svit, 2009.
[11]. https://www.pmi.org/pmbok-guide-standards/foundational/PMBOK

Thank you!