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## **CERTAIN MODELS OF PROJECT MANAGEMENT IN THE FIELD OF IT**

### **Introduction**

Determining the project management methodology in the IT field is one of the most important requirements for the implementation of tasks. The final result and the timeframe for its implementation depend on which methodology is chosen.

### **Purpose, subject and method of research**

The purpose of the study is a detailed analysis of software development models at all stages from the beginning to their complete completion.

The subject of the article is the theoretical and practical foundations of project management at different stages of the project life cycle.

The research methods used are methods of system analysis and synthesis, methods of abstraction, grouping and generalization.

### **Recent research and publications analysis**

The following scientists have studied project management models in the field of IT: I. Neskordieva [1]; Datsko M., Semeniv G. [2] and others. However, they do not consider the peculiarities of implementation and application of the models in sufficient detail, since this is a relatively new and dynamic concept that requires a thorough study, given the lack of its development in Ukraine. It is the peculiarities and specifics of the company's activities, its industry, form of organization, management and decision-making structure that determine the most appropriate model of project management in the IT sector.

### **Results of the research**

The main qualities of processes that can be used to determine the effectiveness of a particular method in a particular situation are: project

implementation speed; project creation costs; risk management; time to project start.

Waterfall model is a software development model in which the development process looks like a flow that sequentially goes through the stages of requirements analysis, design, implementation, testing, integration, and support.

The source of this model is considered to be an article written by W. W. Royce [1].

In Royce's cascade model, the phases were in the following sequence: Requirements Definition, Design, Construction (including Implementation and Coding), Implementation, Testing and Debugging (including Verification), Installation, Support [2].

The transition from one phase to the next occurs only after the previous phase is completed in a sequential manner.

First, the Requirements Definition phase is fully completed, resulting in a list of software requirements. After the requirements are defined, the transition to Design takes place, during which documents are created that describe in detail how and how to implement these requirements for programmers. Once the design is complete, programmers begin to implement the resulting project.

The next phase of the process involves the integration of individual components developed by different teams of programmers. After the implementation and integration are completed, the product is tested and debugged. This phase eliminates all the shortcomings that occurred at the previous stages of development.

After that, the software product is implemented and supported, including the introduction of new functionality and bug fixes.

Thus, the cascade model implies that the transition from one phase of development to another occurs only after the previous phase is fully and successfully completed. There are no backward or forward transitions or overlapping phases.

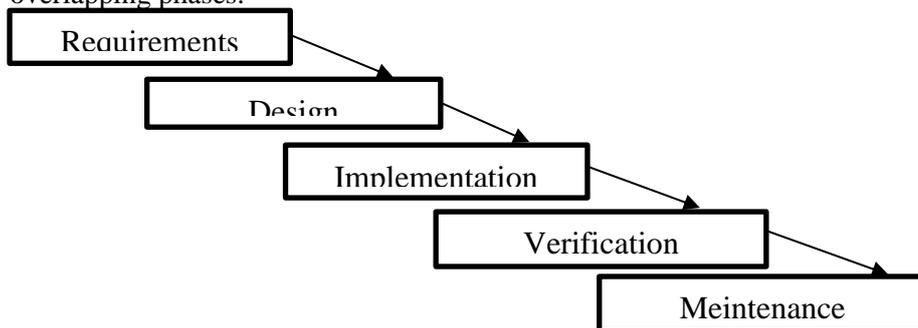


Fig. 1. Cascade model of project management [2].

The main disadvantages of the Cascade Model are insufficient flexibility and the recognition of formal project management as an end in itself to the detriment of time, cost, and quality. However, formalization is useful in managing large projects because it can reduce project risks and thus make it more transparent [1].

The PMBOK 3rd version formally enshrined only the Cascade Model methodology, and did not offer alternative options known as iterative project management [3].

Starting with the fourth version of PMBOK, a compromise was reached between supporters of formal and progressive project management and supporters of flexible iterative methods.

Thus, the Project Management Institute (PMI) has proposed a hybrid version of the project management methodology as a standard, combining the features of the Waterfall methodology and the achievements of iterative methodologists.

The PRINCE2 Projects IN Controlled Environments 2 (PRINCE2) project management model is a structured project management method approved by the UK Government as a standard for project management in the social sector [1].

PRINCE2 technology contains approaches to project management, control and organization. This standard of project management in the field of information technology is widely used in the UK.

PRINCE2 is a structured approach to project management within a clearly defined framework. PRINCE2 describes the procedures for coordinating the activities of the project team during the development and control of the project, as well as the procedures used when the project changes or if there are deviations from the original plan.

In PRINCE2, each process is defined with its main inputs and outputs, with specific goals and activities to be carried out, which gives automatic control of any deviations from the plan. The division of processes into manageable stages enables efficient resource management.

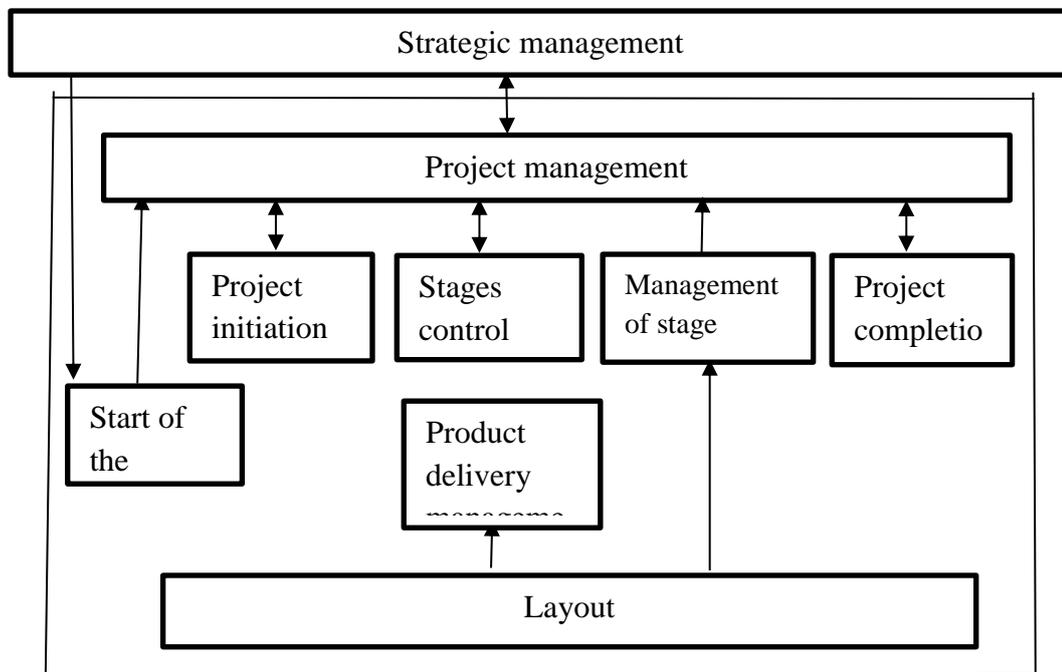


Fig. 2. Process diagram according to the PRINCE2 method [1].

The main disadvantages of the PRINCE2 method are the lack of any regulation regarding the methodology of approaches to managing supply contracts, project participants and other processes that have been taken out of scope by specialists. Each project manager chooses their own methods and approaches to this work.

The diagram shows the processes according to the PRINCE2 method. Arrows show the direction of information flows.

The beginning of the project. To move from the initial project idea to the direct implementation of your ideas. An organization is created - a project manager and a project committee chairman are appointed.

Create a brief description of the project (Project brief) and an approach to its implementation. The project launch stage is planned in detail.

Project initiation. Project planning is carried out, including a quality plan. A Business Case is created, a Risk Log is opened, and a project risk assessment is performed. Project control points and deviations are planned.

Project management. The deadlines for decision-making by the project committee are specified, tasks are issued and accepted, difficulties and risks are recorded, escalation decisions are made, and reporting to the committee is generated.

Product production management. Measures implemented by working groups to determine the scope of work, progress reports, and handover of work performed. Stages are monitored, action plan implementation is analyzed, interim planning for the next stage, contingency plans, risk review, and a business plan for the transition between stages are carried out.

Project completion. Closing the project, managing the next steps, determining the benefits of the project.

Planning regardless of the planning stage.

The Project board, to which the manager regularly reports, consists of three people - the customer, the main user and the main specialist. The Project Board is responsible for making strategic decisions.

The project manager is obliged to monitor possible problems and propose alternative solutions that are chosen by the Project Board.

Project assurance service (analogous to a project office), which aims to provide an independent perception of the project by customers, users and specialists (in the subject area). The service prepares three reports:

- business report (a report on the financial status of the project and the benefits of the project as a whole);
- user report (to what extent the requirements of users are met);
- technical report (how applicable the project is in terms of technology).

Administrative support (project administrators) is responsible for holding meetings, communicating the necessary information to its recipients, and storing project information. In small projects, this is the responsibility of the project manager.

Agile project management methodologies are a separate class of models.

Agile development methodology (Agile software development, Agile methods) is a series of approaches to software development focused on the use of iterative development, dynamic requirements formation and ensuring their implementation as a result of constant interaction within self-organized working groups consisting of specialists of different profiles. There are several techniques related to the strategic management of the class of agile development methodologies, including extreme programming, DSDM, Scrum, FDD [4]. It is used as an effective practice of organizing the work of small groups (performing homogeneous creative work) in combination with their management by a combined (liberal and democratic) method.

Most agile methodologies are aimed at minimizing risks through the well-known development of a series of short cycles - iterations lasting two to three weeks.

Each iteration is a software project in miniature and contains all the tasks necessary for a mini-increment in functionality: planning, requirements analysis, design, programming, testing, and documentation.

A single iteration is not enough to release a new version of the product (an agile software project is ready for release at the end of each iteration). At the end of each iteration, the team reassesses development priorities.

Agile methods emphasize direct face-to-face communication. Most Agile teams are located in one office (bullpen). It includes a "Product-owner" (a customer or authorized representative who defines the requirements for the product). This role can be performed by a project manager, business analyst, or client. The office may include testers, interface designers, technical writers, and managers.

The main Agile metric is the work product. By favoring direct communication, Agile methods reduce the amount of written documentation compared to other methods. This characterizes these methods as undisciplined.

"The Agile Software Development Methodology Manifesto is an alternative to managed documentation, software development practices such as the Waterfall model, which was considered the gold standard of software development. This manifesto was approved and signed by representatives of such methodologies as software programming, Crystal Clear, DSDM, Feature driven development, Pragmatic Programming. The agile development methodology was used by many companies before the adoption of the Manifesto, but the entry of Agile development into the masses occurred after this event [4].

Agile is a grouping of development processes, not a single approach to software development, as defined by the Agile Manifesto. Agile defines the values and principles that guide successful teams.

The Agile Manifesto includes 4 main ideas and 12 principles, but does not contain practical advice [4].

The main ideas of the Agile Manifesto:

1. People and interaction are more important than processes and tools;
2. A working software product is more important than comprehensive documentation;
3. Cooperation with the customer is more important than agreeing on the terms of the contract;
- 4) Readiness for change is more important than following a preliminary plan.

The principles explained by the Agile Manifesto are:

- Customer satisfaction is more important than rivalry and internal hierarchy. This is achieved through continuous work and instant error correction.
- Quick response to changes in product requirements.
- Continuous pace with repeatable speed of work.
- Support for engaged employees. A motivated team performs better than specialists dissatisfied with working conditions.
- Close communication with the customer and all members of the development team throughout the project.

- Simplicity as the basis of work.
- The marketing plan should be updated as often as possible - once every two weeks or a month and a half.
- Rejection of conventions and subjective opinions in favor of a detailed study of the customer, implementation of changes and analysis of results.
- Several short-term tests are more relevant than one long-term experiment.

RAD (Rapid application development) is a concept of creating software development tools that pays attention to the speed and convenience of programming, creating a technological process that allows a programmer to create programs as quickly as possible.

A practical definition of RAD is the life cycle of the design process, created to achieve higher development speed and software quality than with the traditional design approach. The RAD concept is often associated with the concept of visual programming [1].

RAD implies that software development is carried out by a small team of developers within three to four months by using incremental prototyping with the use of visual modeling and development tools.

RAD technology involves active customer involvement at the early stages, such as surveying the organization and developing system requirements. The last of these features implies full fulfillment of the customer's requirements (functional and non-functional), taking into account their possible changes during the system development period, obtaining high-quality documentation, ease of operation and maintenance of the system. Additional costs for support immediately after delivery will be much lower.

Thus, the time from the beginning of development to obtaining an acceptable product is significantly reduced when using this method.

RAD technology should be used when the priority areas of project development are clearly defined [1].

1. It is necessary to complete the project in a short time; fast project implementation allows you to create a system that meets the requirements of today. If a system is designed for a long time, there is a high probability of changing the fundamental provisions governing the organization's activities (the system will become obsolete before its design is completed).

2. Software requirements are not clearly defined. In most cases, the customer has only a rough idea of how the future software product will work and cannot clearly formulate all the requirements for the software. The requirements may not be defined at all before the start of the project or may change during its implementation.

3. The project is carried out under a limited budget. The development is carried out by small RAD teams in a short time, which ensures a minimum of labor costs and allows you to fit into budgetary constraints.

4. The user interface (GUI) is the main factor. There is no point in forcing the user to draw pictures. RAD technology makes it possible to demonstrate the interface in a prototype, and quite soon after the start of the project.

5. It is possible to divide the project into functional components. If the proposed system is large, it must be divided into small parts, each of which has a clear functionality. They can be released sequentially or in parallel (in the latter case, several RAD groups are involved).

6. Low computational complexity of the software. RAD technology is not universal, and its use is not always advisable. In projects where the requirements for the software product are clearly defined and should not change, the customer's involvement in the development process is not required and hierarchical development (cascade method) may be more effective. This also applies to projects, software, the complexity of which is determined by the need to implement complex algorithms, the role and scope of the user interface is small.

The RAD technology principles are aimed at ensuring its three main advantages: high development speed, low cost, and high quality.

Achieving high quality of a software product is not easy. One of the main reasons for the difficulties is that the developer and the customer perceive the subject of development differently:

- The toolkit should be aimed at minimizing the development time;
- prototyping to clarify customer requirements;
- development cyclicity: each new version of the product is based on the customer's evaluation of the previous version;
  - minimizing the development time of a version by transferring ready-made modules and adding functionality to a new version;
- The development team should work closely together.

Project management should minimize the duration of the development cycle.

RAD principles apply not only to implementation but also to all stages of the life cycle, including the organization survey, requirements engineering, analysis, and design.

RAD rapid application development technology allows you to ensure:

- Speed of promotion of the software product to the market
- A user-friendly interface
- Easy adaptability of the project to changing requirements
- ease of development of a functional system.

## **Conclusions**

Today, an integrated approach to solving tasks is the most common in the IT industry. A mix of project management methodologies is used. When using specific methodologies, development companies involve specialists in a specific area of the methodology. Most agile methodologies are aimed at minimizing risks

by developing a series of short cycles - iterations lasting two to three weeks. Each iteration itself represents a software project in miniature and includes all the tasks necessary to deliver a mini-project in terms of functionality.

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#### Abstract

The article contains a description of the conditions and criteria for the effectiveness of project management methodologies with regard to the field of information technologies. The Institute of Project Management proposed as a standard a hybrid version of the project management methodology, which combines the features of the Waterfall methodology and the achievements of iterative methodologists. The article provides an analysis and features of the application of these methods in various fields.

**Keywords:** model, project management, software, methodology, project manager, iteration, technology

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