Czech University of Life Sciences Prague

Faculty of Economics and Management

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Master's Thesis

Development of a resource management methodology in an IT company BLOOMEX INC.

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Declaration

I declare that I have worked on my master's thesis titled "Development of a resource management methodology in an IT company BLOOMEX INC." by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on date of submission _____

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Abstract

This Master's thesis develops a resource management methodology for Bloomex Inc., an IT company operating in multiple countries with various flower sales services. The methodology aims to manage the company's distributed online teams across different time zones while ensuring a clear scope of responsibility among team members. The study reviews relevant literature and conducts case studies with key stakeholders to identify areas for improvement in the company's resource management practices. The proposed methodology is designed to improve project management practices, increase productivity, and enhance customer satisfaction. The study highlights the importance of effective resource management in ensuring the success of IT projects and can be adapted and implemented by other IT companies facing similar challenges.

Keywords: Resource management, IT company, Distributed teams, Project management, Customer satisfaction, Methodology development, Case study approach

Vývoj metodiky řízení zdrojů v IT společnosti Bloomex Inc.

Abstrakt

Tato diplomová práce se zaměřuje na vývoj metodiky řízení zdrojů pro společnost Bloomex Inc., IT společnost provozující různé služby pro prodej květin v několika zemích. Cílem metodiky je efektivně řídit rozptýlené online týmy pracující v různých časových pásech a zároveň zajištění jasného rozsahu odpovědnosti mezi členy týmu. V rámci práce jsou provedeny analýzy relevantní literatury a studie případů s klíčovými zainteresovanými stranami společnosti Bloomex k identifikaci oblastí, které je potřeba v oblasti řízení zdrojů vylepšit. Navrhovaná metodika je koncipována tak, aby zlepšila projektové řízení, zvýšila produktivitu a zlepšila spokojenost zákazníků. Práce zdůrazňuje důležitost efektivního řízení zdrojů pro zajištění úspěšnosti IT projektů a může být upravena a implementována i jinými IT společnostmi čelícími podobným výzvám.

Klíčová slova: řízení zdrojů, IT společnost, rozptýlené týmy, projektové řízení, spokojenost zákazníků, vývoj metodiky, studie případů.

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Introduction

Nowadays in almost any modern organization you can see the direct interaction of information technologies and business processes of the main activity. The introduction (replacement) of the information system into business processes is a major transformation, often affecting different spheres of enterprise activity. And in many cases, it becomes a complex and costly process. However, the problems encountered in the implementation of the new information system have already been well studied, and effective methodologies have been developed to address them, combined with appropriate methodologies and standards.

1. Objectives and methodology

1.1 Objectives

The primary objective of this thesis is to propose a specific approach to resource management that can effectively address the key challenges and meet the objectives of resource management in the IT industry. To achieve this overarching goal, the following specific objectives will be pursued:

- To identify and analyze the key challenges and objectives of resource management in the IT industry: The first objective of this research is to identify the most pressing challenges and objectives associated with resource management in the IT industry. This will involve a comprehensive review of relevant literature, as well as interviews with industry experts and practitioners.

- To review and critically evaluate the effectiveness of existing resource management methodologies and frameworks in meeting the identified challenges and objectives: The second objective of this research is to critically evaluate the effectiveness of existing resource management methodologies and frameworks in addressing the identified challenges and meeting the objectives of resource management in the IT industry. This will involve a comprehensive review of relevant literature, as well as case studies and interviews with practitioners who have experience using different resource management methodologies.

- To propose a specific resource management methodology for an IT company, based on the findings of the literature review and analysis: The third and final objective of this research is to propose a specific resource management methodology for an IT company that effectively addresses the identified challenges and meets the objectives of resource management in the IT industry. This will involve synthesizing the findings of the literature review and analysis and developing a new methodology or modifying an existing one to fit the specific needs of an IT company.

1.2 Methodology

The thesis involves conducting a literature review to gather information on existing approaches to resource management in the IT industry. This includes researching and analyzing various resource management methodologies, such as agile development and project management frameworks, to identify their key features and principles.

Based on this information, the thesis proposes a specific resource management methodology for an IT company, outlining its key components and explaining how it addresses the identified challenges and meets the identified objectives. The thesis could also include a case study to illustrate how the proposed methodology has been or could be implemented in practice.

2.THEORETICAL ASPECTS OF PROJECT MANAGEMENT METHODOLOGY

2.1 Basic concepts of project management system

In order to move towards information technology (IT) project management and organisation, it is necessary to find out what the overall management system and the project management system in particular are. Term «system» is widely used in various spheres and can have a large number of values. The general characteristics of the concept of «system» can be expressed in the following terms:

- The system is a set of interrelated elements considered as a whole;
- The system is structured;
- The system is separate from other objects of the external environment [1, p.30].

The most important feature of the system is its manageability. Controllability is the ability of a system to be subject to targeted influences that ensure its sustainability, preservation, or acquisition by the system. Management, as a system-influencing process, is seen as a critical function of the system to achieve its objectives. The control system is called a control system and allocates a control and manageable part (subsystems). The operation of the management system is carried out through the interaction of the management and managed subsystems among themselves and with the external environment through communication channels. The structure of the control system is summarised in Picture 1
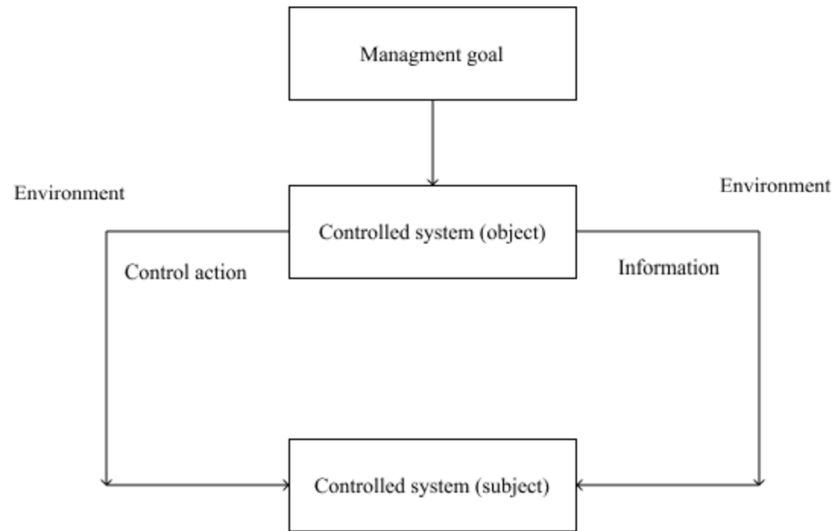
Picture 1 Overview of the management system

Project management in a project-oriented company can be seen as part of the overall management of the entire organisation. The goal of the project management system in the company is the organisation of internal processes in the company, creating the necessary conditions and resources for the successful implementation of project activities.

The effective functioning of the existing project management system in the company is essential. Project performance depends on how the project management process is organised. There are many models evaluating the effectiveness of the project management system in the company (Project Management Performance). Normally, the company's management system is organised so that the projects implemented are within the well-known project triangle - time, quality, cost [2, p. 56.]. This approach is aimed at meeting the expectations of all stakeholders of the projects, because all stakeholders want the projects to be implemented on time, be of adequate quality and do not exceed the approved budget. This approach, while universal, does not take into account company characteristics and environmental externalities [3, p. 25; 4, p.59].

Thus, models applying different approaches to the formation of the project management system in the company and analysis of its efficiency began to appear. Most models were based on the principles of continuous improvement of the company (TQM). For example, the Project Excellence Model evaluates 12 key features. «organisational areas», the quality of the organisation of which influences the success of the projects and the achievement of the company's strategy as a whole [5, p.161].

Other studies lay the foundation of the project management system with the project management maturity model, which in turn is based on the project management knowledge (PM Body of Knowledge, PMBOK Guide, PMI, 2004). The Bride (?) project management system offers the PMPA (Project Management Performance Assessment) model, which includes 5 «system factors» and one factor «effective». The diagram of the Bride model is
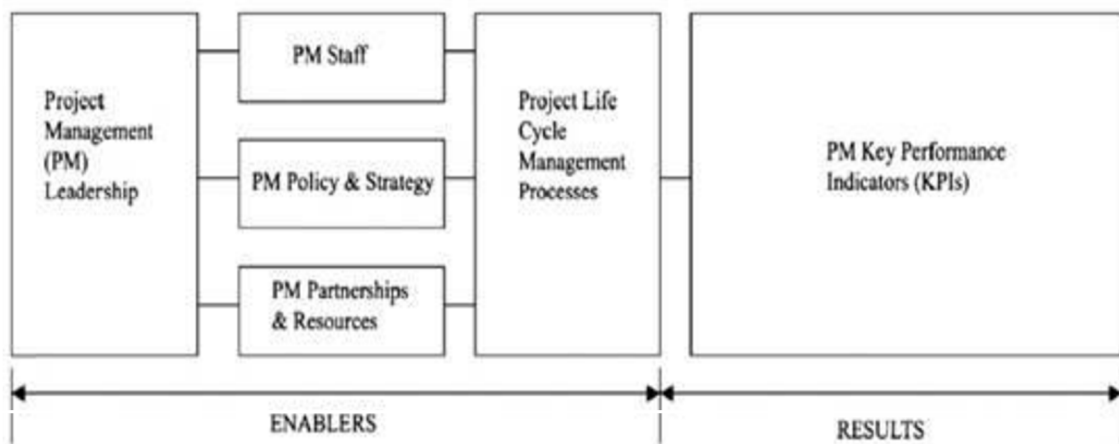
Picture 2 Bride Project Management System Model

The first system-supporting factor is «Leadership of the project approach» (PM Leadership), which shows positioning of the approach of project management in the company, the attitude of employees towards the project approach and the general awareness of the importance and importance of project management in the company. The presence of the project culture, the use of project terminology, the application of the project approach to change management, the author of the model determines the necessary conditions for the existence of the «leadership of the project approach» in the company. [7, p. 227].

The second system factor is «Human Capital in Project Management» (PM Staff), which determines the competence of the personnel of the company in the field of project management, and also reflects the company's attitude to human capital formation, to the knowledge base for continuous improvement of staff competencies.

The next factor - «Policy and Strategy» (PM Policy and Strategy). - reflects how the development of PM in the company relates to the company's strategy. Whether the

implemented projects meet the strategic goals of the company, whether the portfolio of projects in the company is a tool to achieve the strategy. Another component of the PM system according to the Bride model is «Partnership and Resources» (PM Partnerships and Resources), which reflects how relationships with suppliers and partners are developed in the implementation of projects. This factor shows the importance of applying the «win-win» (win strategy) strategy when interacting with all stakeholders. The last system supporting factor is «Project Lifecycle Management Processes». This component of the system demonstrates the importance and necessity of applying an approach to project management according to their stages of development. Bride singled out the only resulting factor in his model of the «Performance Assessment on Key Indicators» (PM KPIs) [7 p. 229].
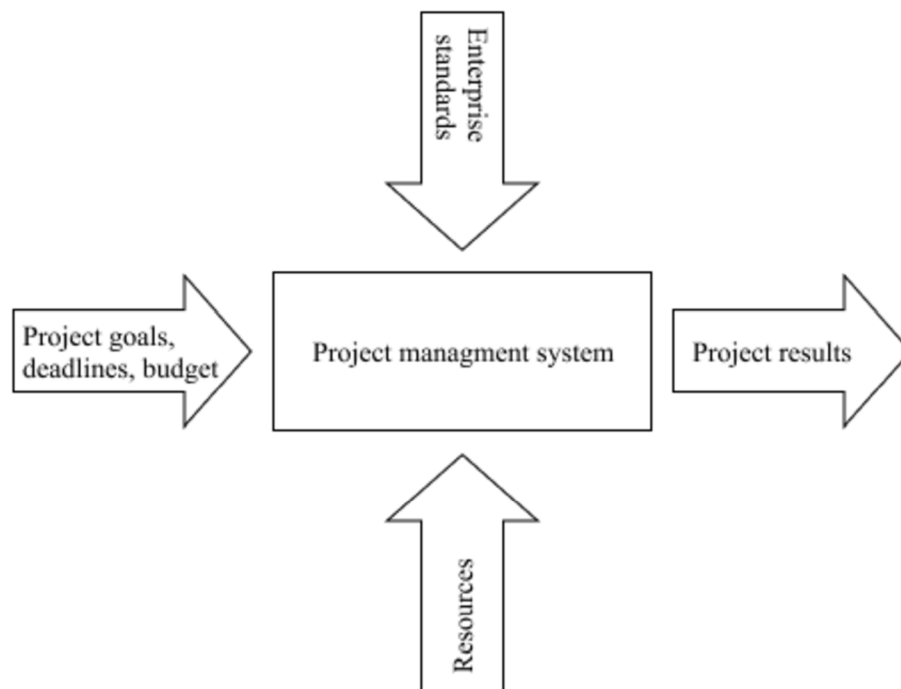
Picture 3 The management of individual projects is as follows [8, p. 13]

Such a system is a mechanism, in the correct operation of which the results of the projects meet the set goals, deadlines and budget, using certain resources of the company and within the established internal rules, regulations and standards. If you complicate this scheme by presenting it at the company level and adding to it the mechanisms of implementation of projects that correspond to the company's strategy and ensure profit, you will have a presentation of the corporate project management system (Figure 4).

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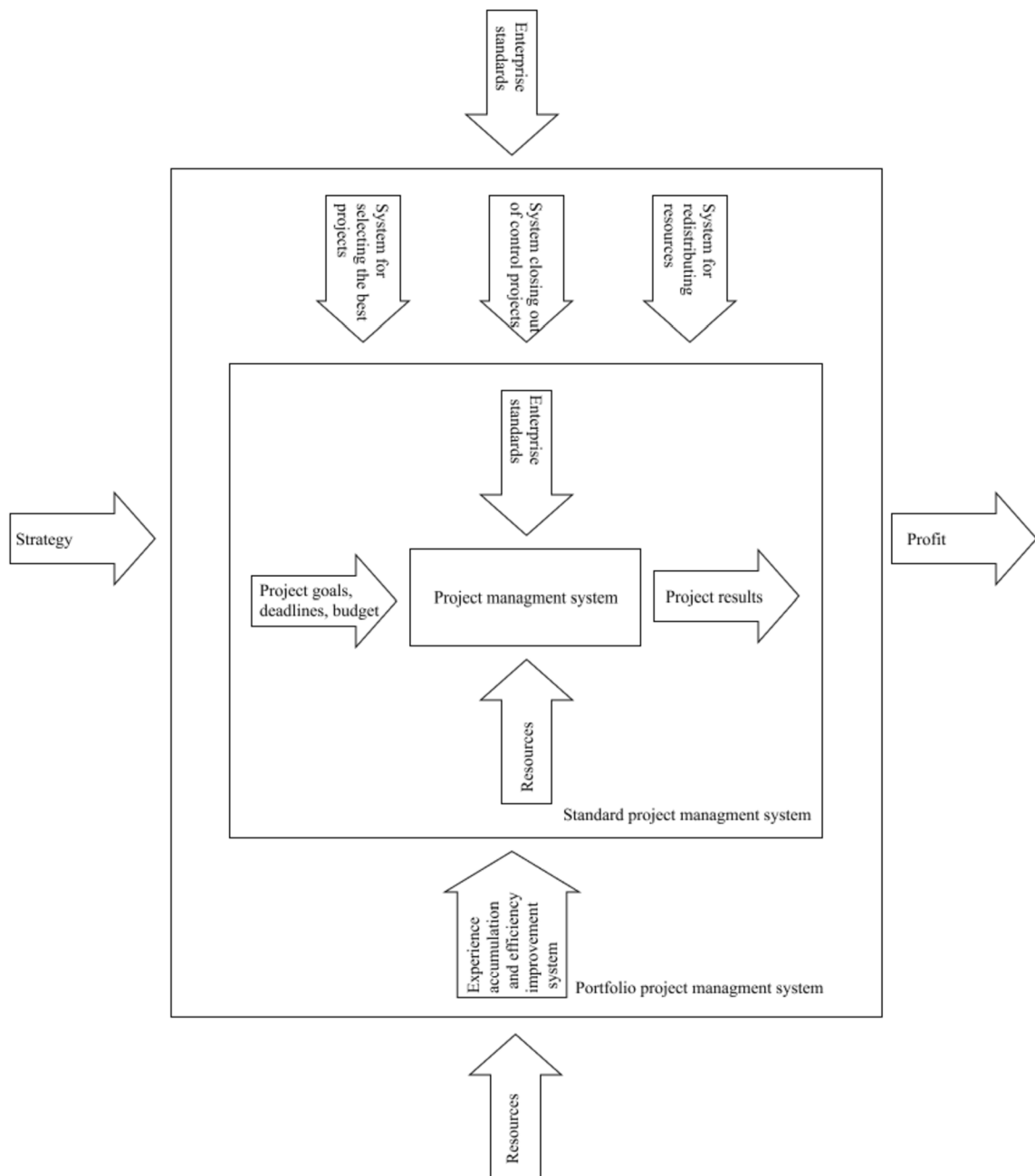
Pucture 4 Corporate Project Management System (CRMS) [8, p. 14]

The main elements of the corporate project management system are: CB methodology, hardware and software complex or information system CB (PPIS), personnel and organisational structure. The standard components of CSIP are shown in Figure 5.

Automated project managment system		Project managment office
	Project and portfolio managment methodology	
Motivation system and principles of project team formation		Concept of 'project' and 'project managment'
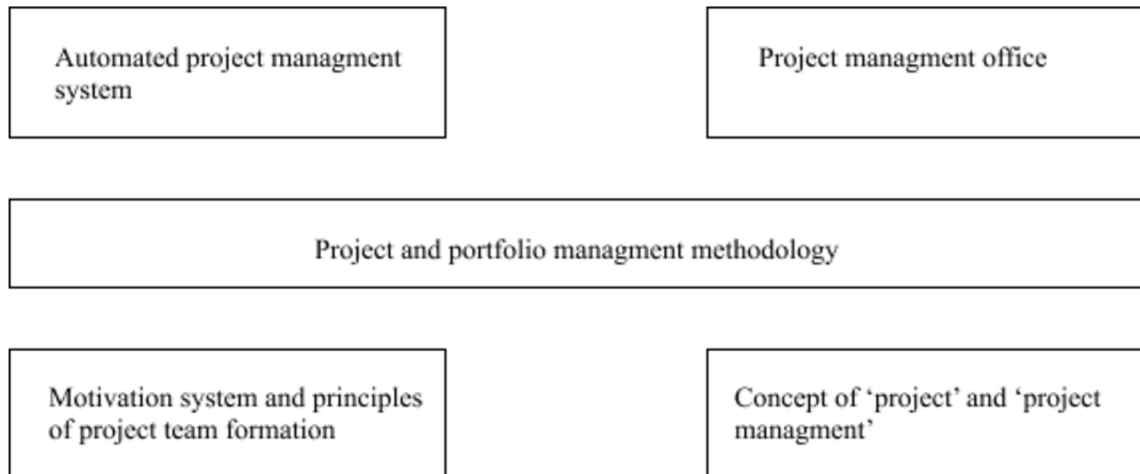
Picture 5 Components of CS [8, p. 15]

Project management, as a separate area of knowledge, began in the 60s of the last century, when such project management methods as CPM (Critical Path Method) and PERT (Program Evaluation and Review Technique) [9,p.35; 10,p.24]. Since the inception of the project approach in management, methods, tools and technologies have been constantly evolving, and now, project management is widely applied in the practice of companies from completely different fields operating worldwide. In order to increase their efficiency, companies use the project approach in management [10, p.26]. The popularity of the project approach is growing year by year at a rapid pace. From the construction area, where project management tools have been introduced, the project approach has expanded to other areas and is now being applied throughout the organisations.

There is a lot of scientific work proving that the project approach in management can be more effective than the traditional functional approach [11, p.13]. Successful implementation of projects, programs and portfolios leading to the achievement of the company's strategic goals are largely determined by the company's existing project management system, its maturity and ability to maintain the necessary processes for successful project implementation. Many researchers are studying the problem of the relationship between the effectiveness of the project management system and the successful implementation of projects. As a result, the company increased profit. For example, the international organisation PMI (Project Management Institute) conducted a study in which, for four years, using 65 cases in companies from 14 different countries, studied how project management brings added value to companies. The results of the study confirmed the significance and evaluated the contribution of project management to the

results of the company, but proved that project management in different companies has a number of features specific to each company. Factors such as the internal culture of the organisation, the existence or absence of well-functioning business processes, the way project activities are organised, influence the existing project management system in the company, and ultimately affect the results of the projects implemented.

There are studies demonstrating that a company with an effective project management system is more successful in implementing complex projects.

IT projects have spread due to the development of information technologies, the emergence of various types of software and worldwide automation of activities of various organisations. The term «IT project» in the most general sense can be defined as a project whose purpose is to use or create some information technology [12. p. 120]. Software applications development, information systems development, IT infrastructure deployment, etc. are examples of IT projects.

The IT project management system should take into account the specifics of such projects. First, when implementing IT projects, there is often a division at the level of ideology of the customer and the contractor. The customer is a business or government institution, and the contractor is an IT specialist. Communication is often difficult at the stage of identifying requirements, expectations from a project and forming a technical assignment. In the implementation of the IT project, both the contractor and the customer are responsible for the result. Most often, it is inefficient communication, unsuitable conditions for interaction between the parties are the fault of failed projects. Often the implementation of an IT project involves changes in the structure of an enterprise, the involvement of many departments, which increases the likelihood of conflicts and misunderstandings between the project manager, senior management, division managers and the staff of the organisation. When implementing IT projects, the impact of the human factor is very important, the timing and quality of the project implementation largely depend on the direct implementers and the communications between them. Work in IT projects can be attributed to creative activities, so there are difficulties in planning, standardisation of activities, setting standards, etc. [12. p. 121].

Due to the high degree of uncertainty in the work, frequent requirements to change and update the technical specification and the huge cost of executing information technology
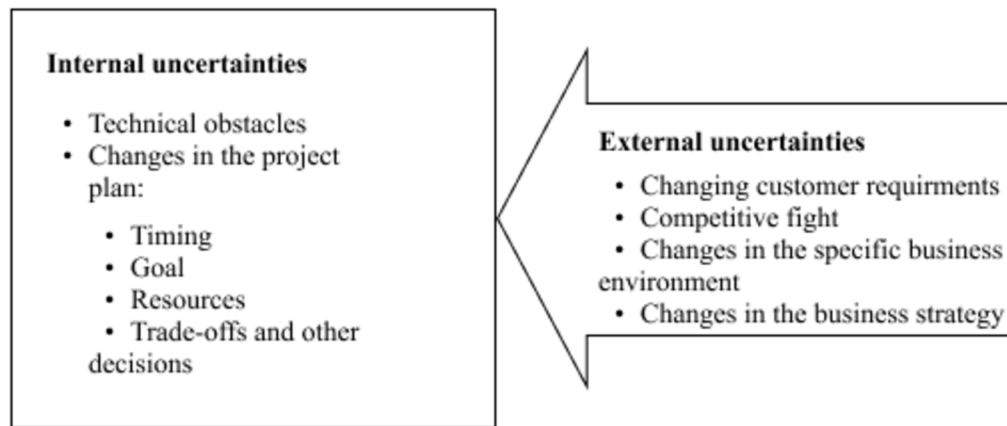
projects, IT projects are recognized as one of the most complex types of projects in terms of management and achievement of the set objectives. There are statistics on the results of IT projects' implementation and it shows that most of them are not completed on time, exceed the budget or are submitted with insufficient functionality [13, p. 88]. According to the Chaos Report by Standish Group, every fifth IT project fails, every second one fails on time, is performed with inferior quality or incomplete functionality. Currently, in the field of IT project management, the most common application in practice has a flexible approach to project management. Since IT projects are subject to a large number of changes during their implementation, it is necessary to select the approaches and tools in management that give the best results. Flexible methodologies in IT project management have proven to be the most successful. Flexible methodologies can be attributed to modern approaches to project management, the term itself «Agile», as well as the basic principles of the methodology originated in 2001 [10, p.29].

Also in 2001, two fundamental documents were created: «Manifest of flexible development methodologies» and «Principles of flexible development». The first one clearly spells out the high-level values that are given attention in the IT project management process: People and interaction are more important than processes and tools. A working product is more important than complete documentation. Cooperation with the customer is more important than agreeing on the terms of the contract. Readiness to change is more important than following the original plan».

Waterfall	Agile (Scrum)
Feasibility evaluation takes a long phase and is done in advance to avoid reworking in the next project phases.	Feasibility test takes a shorter while considerably. Clients are engaged in the early project phase to get the buy-in and refine the needs in the long run.
Project planning is done at the beginning of the project and is not open to any changes later on.	The plan is not given the foremost priority and is done during sprint planning. Modifications are welcome except during an active sprint.
Project progress gets monitored according to the project plan.	The development gets tallied in each sprint.
Only the project managers communicate and carry out progress review meetings weekly/monthly.	Communication is frequent, face-to-face, and clients also participate throughout the project.
Roles are not interchangeable once distributed among project team members.	You can switch roles quickly, and the team can work in cycles.
Documentation gets a lot of emphases and that is pretty comprehensive.	There's a need to file requirements, build designs, and write test plans to promote working software delivery.

Picture 6 Comparison of agile methodologies with waterfall model

The principles of flexible development from the « Manifesto » define the fundamental twelve values on which the flexible methodologies are implemented in IT projects. In many ways, these values coincide with the principles of iterative and spiral models. Flexible methodologies allow effective interaction between team members and between project team and customer. The methodology is based on a flexible process of IT project management for iterations, using intermediate testing and clarification of customer requirements. Flexible methodologies will work only if there is a disciplined, self-organising team that constantly communicates with the customer. Of course, not all IT projects need to use flexible methodologies. There are scientific works, the purpose of which is to identify factors and features of IT projects, indicating that it is necessary to apply flexible methodologies for their successful implementation. [12, p. 140]

Internal uncertainties

- Technical obstacles
- Changes in the project plan:
  - Timing
  - Goal
  - Resources
  - Trade-offs and other decisions

External uncertainties

- Changing customer requirments
- Competitive fight
- Changes in the specific business environment
- Changes in the business strategy

Picture 7 Uncertainties as prerequisites for the application of agile methodologies

Flexible methodologies offer tools that allow IT projects to be successful in the face of external and internal uncertainties. The project is divided into iterations for which careful short-term planning is carried out. It should be noted that while in the classical iterative model iterations are not limited in time, in flexible methodologies it is customary to divide the project into parts no more than five weeks. The principle of empirical management, when decisions are made based on the intermediate results of the project, allows for transparency of work for the customer and involvement of future users at all stages of development. Flexible methodologies allow changes to be made quickly, and thanks to constant communication and transparency of processes, the client is always aware of the status of project progress, difficulties and possible failures. [12, p. 144].

In practice, the following flexible methodologies are popular:

1. Extreme Programming (XP);
2. Scrum (Scrum);
3. Lean development (lean);
4. Development managed by functionality (fdd);
5. Kanban;

6. Crystal Clear.

2.2 Theoretical model of the PM system

Let's draw up a theoretical representation of the IT project management system. A system should be built, which aims to implement the portfolio of projects in the company as a tool to achieve the strategic goals of the organisation. The visualisation of the project management system is presented below in Picture 8.
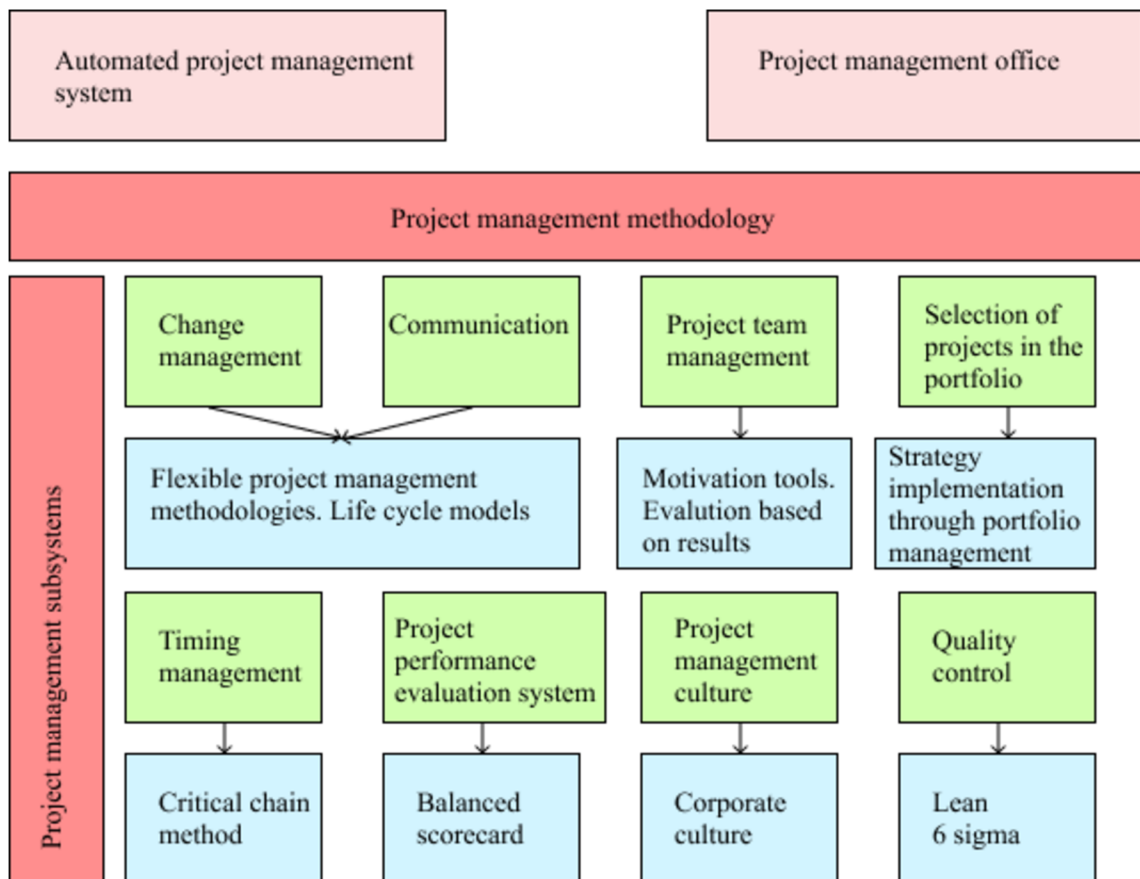
Picture 8 Theoretical model of IT project management system

For project management in a company, it is necessary that there are tools for defining and separating activities: which activities of a company belong to the project, and which is more appropriate to be attributed to the current processes. The project selection system should ensure that the company has a portfolio that supports its strategy.

Since IT project managers often run several projects in parallel, the CM system should have mechanisms and tools to identify project priorities (the mechanism for adjusting priorities should also be flexible and adapt quickly to changes).

For the successful implementation of complex IT projects, in an uncertain environment where the requirements for project content are constantly changing and complementing, the NC system must include an efficient communication system. The company should have a large number of small groups with independence and responsibility.

The organisation should have a small number of rules, observed by all, applied to enhance coordination and synchronisation - daily product formation, immediate search and correction of errors, step-by-step stabilisation. Effective communication, both internal (within teams and functional groups) and external. Flexible methodologies are effective for managing communications in IT projects. Flexible methodologies ensure the adaptability of the production process needed to adapt to the changing environment, and help to create an environment of constant interaction with the customer and users of the project product.

An effective project management system in an IT company must necessarily include a change management system. Control of IT projects, the requirements for which are constantly changing and supplemented, is impossible without a well-functioning change management system. Change management is a key component of flexible management. All adjustments to the content of an IT project must be controlled. To do this, it is necessary to apply methods of change management, which, in particular, are spelled out in the PMBOK knowledge.

Critical chain project management allows projects to be completed as early as possible. Completion of projects as soon as possible reduces overall losses. The CCPM facilitates the flexibility of organisations in responding to changing needs and can complement all flexible methodologies.[11,p. 25].

When applying methods that shorten the duration of projects to the minimum possible, it is necessary to constantly monitor the quality of the project. The project management system in an IT company should include effective quality control tools. One approach that has proven effective in practice is the six sigma concept developed by Motorola. Based on the use of statistical methods, the six sigma concept can be an excellent complement to the PM system based on flexible methodologies and the CCPM [14, p. 212].

The efficiency of all systems changes over time, due to changes in the environment, system decisions that have been made in the past may be irrelevant at some point. Thus, in order to maintain a sufficient level of efficiency in the project management system, it is necessary to apply systematic thinking in its critical analysis. The use of TOC (Theory of Constraints) as a way of thinking can help to identify the limitations of the existing PM

system in a timely manner and take action to address key issues and related undesirable outcomes. [14, p. 213]

2.3 Principles of purpose and methodology of information systems

The information system is a complicated complex of heterogeneous components that interact with each other and create the necessary consumer properties of the system. Consider the information system as the whole enterprise infrastructure involved in the process of information and documentary flows management. The task of the information system implementation project includes the creation (adaptation) and commissioning of the complex. In the process of implementation there is a need to implement a single IT strategy of the enterprise, which will adequately combine the development (creation) of software and hardware parts of the system in parallel with the complex work on the development of the existing IT infrastructure of the company. [21, p.130]

Rational organisation of projects of introduction of information systems is described in standards (international, state, corporate), which are often called methodologies of implementation.

Implementation methodologies are usually developed by leading information system manufacturers taking into account the specifics of their software products as well as the scope of implementation. The positive feature of such standards is their practical orientation. They are well-developed, tested, time-tested working instructions and project document templates. Such standards are usually far from theoretical abstractions, focused on the specifics of specific systems, and contain the best experience. But standards also have drawbacks: even methodologies designed for systems close to class are not interchangeable. The following are good examples of methodologies:

- Microsoft - team "OnTarget", "MSF (Microsoft Solutions Framework)", "Business Solutions Affiliate Methodology";
- SAP Company - methodologies "Procedural model of SAP", "ASAP (Accelerated SAP)";
- Oracle company- "OracleMethod" methodologies.

This diversity of standards allows organisations to choose an implementation strategy based on them and establish their own implementation procedures. Adapting methodologies to the needs of a particular enterprise is not so much the translation of texts and document templates into Russian as the adjustment of approaches to Russian conditions. In this case, the recommended deadlines and task sequence are usually revised, methods of collection, verification and transformation of source data are created, solutions for integration with legacy systems are developed.

For the Client of the information system the main results of the methodology are:
- Creation of a solution that best meets the requirements of the client;
- Maximise the use of project resources;
- Minimising the time and cost of implementing project risk mitigation.

At the same time, the organisation of work according to the documented methodology is useful for the system developer such as:
- Methodological basis for training new staff in standard implementation techniques is emerging;
- Internal costs for the organisation and implementation of projects are reduced;
- Interaction and understanding between project team members is improved;
- More efficient sharing of resources between projects, teams.

Despite the variety of existing methodologies, their content includes the following components: a description of the composition and structure of the complex of works of the implementation project, the rules of managing such a project, the organisational structure of the implementation team.

Structuring of the complex of works consists primarily in separation of phases (stages) of the project. The division of the project into phases (3-4 months) is due to the high complexity of the projects and the considerable time spent on the implementation of information systems and allows to obtain significant results in a shorter time frame, to realise the following advantages in the organisation of the project:

- Project document data are not obsolete;

- After completion of each phase of the project, it is possible to refine or adjust tasks to the solution in subsequent phases;
- Project risks due to organisational changes in the customer's company during the project are reduced;
- The project budget and payment schedule are optimised.

The design of the project phases and the phasing of the work depends on the specific methodology, but it is possible to distinguish the type of phases that are present to some extent in all methodologies and are determined by the implementation logic itself. These are the stages of project definition, inspection of the object of automation, analysis of survey results and system design development, system creation (customization), system start-up, system maintenance.

The next step is to highlight the work processes performed at different stages of the projects. The composition and sequence of the processes are determined by the specific methodology and serve as the basis for project planning - for the construction of a hierarchical structure of works.

Thus, the implementation methodology is constructed as the intersection of two different areas of knowledge: specific technology of product creation - information system - and fairly universal technology of project management.

Project management is based on project management standards. These standards ensure the concentration of best practices in the field of project management, create the basis of interaction between project teams, form the basis for certification of specialists in the field of project management, They provide an opportunity to systematise knowledge in this specific field. At the same time, project management standards usually do not provide clear definitions of how actions should be performed. Standards define what needs to be done to effectively manage the project, and how this should be done is defined in corporate documents developed on the basis of these standards. Typically, the standard fixes the definitions of the main subject area concepts, defines the project management participants, the required knowledge areas and the processes to be implemented.

The main participants of the project are:
- Project manager (ProjectManager) - the person responsible for project management;

- Project Sponsor (Project Curator) - the person providing project resources and any administrative support; determines priorities, ensures interaction with functional units, approves changes; Internal projects are usually responsible for project results;
- The customer (consumer) of the project (ProjectCustomer) is the person inside or outside the organisation who will use the results of the project;
- The head of the functional unit - directs resources to approved projects;
- Functional Project Leader - unites the efforts of the project participants in a function or department (it is with him that the project manager interacts);
- The leader of the work packages unites the efforts of individuals within the work packages.

The content of the fields of expertise is quite similar in different standards. We will mainly focus our work on standard recommendations of PMBOK (a set of project management knowledge) developed by American Institute ANSI (AmericanStandardsInstitute) supplemented by information from PRINCE2. Under this standard, project management is based on nine areas of expertise, which will be discussed in more detail in the following sections.

From the point of view of management, the information systems projects have no fundamental features. It is particularly important for the implementation project to be in line with the strategic development goals of the organisation. When creating an information system it is necessary to focus on the benefits that the consumer expects from it. If the project is focused on the needs of the Customer, the point of concentration of efforts and evaluation of success will be the business-return (business-value).

The second aspect of project management relates to the achievement of project objectives within the allocated time and approved budget. These tasks are accomplished by managing the project at all stages of its life cycle. The example of the project life-cycle model shown in Figure 9 shows the typical composition of the project phases and their relationship to the information system design processes.
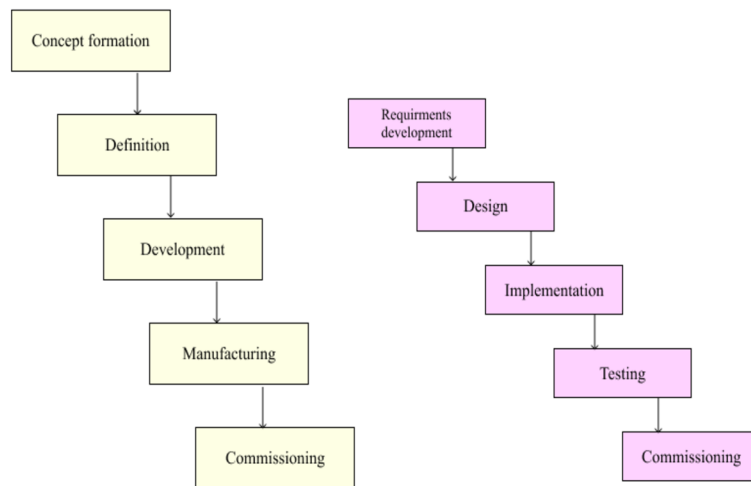
Picture 9 Step-gateway project life-cycle model

Project management is based on the concepts of:

- Formation of responsibility centres for the execution of the project as a whole (integration responsibility centres);
- Integral and predictive planning (and control);
- Project team formation and management.

The first of these concepts provides for the organisation to have certain project responsibility posts. The most important roles and responsibilities are presented in figure 10. Each of these roles is assigned specific project management responsibilities.
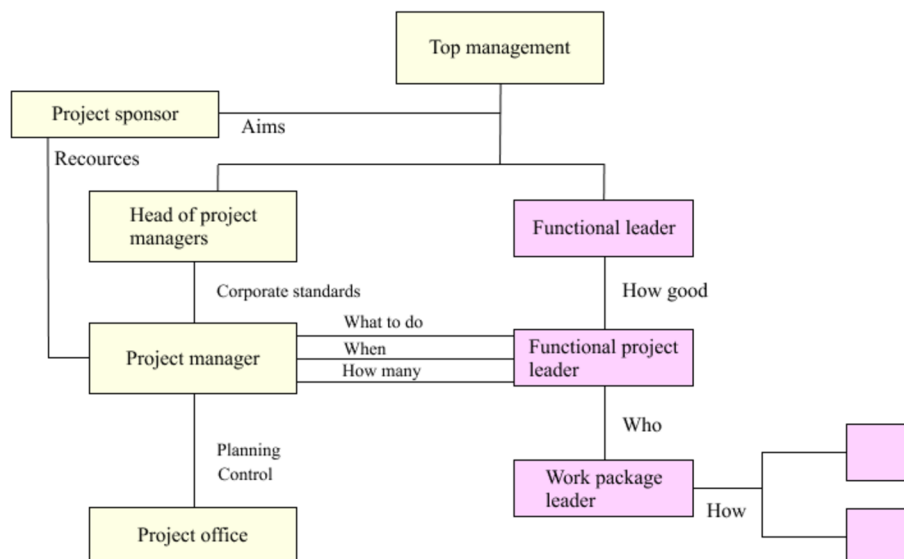
Picture 10 Project participants and their tasks

In most cases, the project manager is the main figure in project management. The organisation of its management is fundamentally different from the management of regular work, and this is taken into account in the content of project management standards.

The concept of integrated and predictive planning means that planning and control should cover all units involved in the project throughout the project life cycle and take into account: project schedule, cost, risks, technical aspects of the product to be created. Project documents should contain a set of interconnected plans and monitoring procedures should include regular reviews. And the last part of the triad of concepts is organising a workable team and managing this team. In order to achieve these objectives, each project will include the following activities on human resource management : planning and staffing, team building, project team development, project team management. In project management, an important role is to develop the organisational structure of the project.

Organisational structure of the project - a project-specific, temporary organisational structure that includes all participants and is designed to successfully manage and achieve project objectives.

The need to develop the organisational structure is due to the fact that for the execution of the project a project team is created - a new temporary working team consisting of specialists of various structural units of companies from the Contractor and from the Customer. As with any new team, project roles (temporary positions), roles, responsibilities, responsibilities, authority and rules of engagement, as well as an organisational chart reflecting the reporting lines, should be defined for project team members. At the same time it is irrelevant, for what period of time the project team will be created - for several months or several years. The project structure is determined by the complexity, scale of IP development and implementation, the number and specialisation of the project team members. The project team may include both full-time and part-time professionals. If the introduction of the information system is carried out with the involvement of a third-party organisation - the Executive, it is necessary to form a project team not only from the Contractor, but also from the Customer, after which to determine the permissible interaction between the members of the teams of the Contractor and the Customer (who, with whom, on what issues he interacts), i.e. to establish the rules of interaction.

Well-structured organisational structure of the project will ensure its effective management, planning, execution within the planned time frame, at a certain quality level.

The first task in the organisational structure of the project is to decide which type of structure is best suited for the project. Different types of structures have certain advantages.

We will consider the main types of organisational structures:
- Functional Organisation

A hierarchical organisation in which each staff member has one direct supervisor, the staff are divided into groups (divisions) by areas of specialisation. Each group (department) is managed by one person with competence in the field - a functional manager (head of department).

- Matrix Organization

An organisational structure in which the Project Manager shares with the functional managers (divisional chiefs) the responsibility for assigning priorities and managing the performance of the project appointees.

- Projectized Organization

Any organisational structure in which the Project Manager has sufficient authority to set priorities, use resources and manage the work of the project designees, as well as financial authority within the project budget.

3.BUILDING A CORPORATE PROJECT MANAGEMENT SYSTEM

3.1 Recommendations on the organizational structure

- Large-scale, long-term and costly projects usually require a project structure or a balanced and strong matrix structure.

- -Small, short and low-cost projects can be managed through a functional or weak matrix structure.

The matrix structure is optimal for most projects, as well as a good compromise between functional and design structures.

Organisational chart of the project.

After selecting the organisational structure of the project, the Project Manager should define the organisational chart, which will reflect the relationships of the project team, reporting lines.

3.2 PMBOK Management as the foundation of corporate project management system

The results of innovative IT projects can be characterised by novelty and usefulness and, therefore, patent value [15, p. 284].

The main reasons for conducting patent activity are :
- Reducing the risk of intellectual property misuse and enhancing competitive advantages;
- Additional revenue from licensing activities;
- Access to technology through cross-licensing;
- Improving the business reputation and image of the economic actor [16].

Despite the objective importance of patent activity, this indicator for domestic economic entities is currently quite low. Thus, the indicator of the number of granted patents of the employed population of the country for Russia is only 0.34 units. /thousand, for the U.S. 1.89, for Japan 4.56, and for the Republic of Korea 4.71.

Protection of innovative software as intellectual property is «important not only for the software industry, but also for other branches of the economy» [17, p.52].

Let's consider the legislative regulation of software patenting in some countries. Thus, in Russia and the European Union, intellectual property of software is protected exclusively by copyright. In the USA, software rights are guaranteed by the mechanism of «double protection» - copyright and patent. At the same time, although there is a

«gap» for software patents in Russian legislation, it is important to consider the high degree of globalisation of the software market - this fact requires domestic economic entities claiming recognition of their products internationally, take into account aspects not only of national, but also foreign (including international) legislation.

At present, the development of the domestic ICT sector is related to the objective need to rapidly increase the number of IT projects and the share of innovative projects in their total number for increasing the competitiveness of the Russian economy and maintaining an acceptable level of information and economic security of the country, as well as activating the patent work of Russian economic entities, especially in the ICT sector. In modern conditions, the solution of this task is possible only on the condition of consolidation of efforts and Unification of the competences of economic entities. [15, p. 286].

The growth in the number of possible applications of information technologies, the expansion of the associated problem field and the increase in the amount of accumulated knowledge lead to the expansion of IT projects on various criteria. The IT project in this case means the project in which the IT component makes up the majority of the budget [18, p.304]. The IT component here means «costs of work of internal and external IT service manpower, hardware, telecommunication equipment, licences, costs for the first year of support, consulting work on development or adjustment of applications, as well as on expansion of channel capacity» [19, p.120]. Figure 11 presents a possible classification of IT projects.
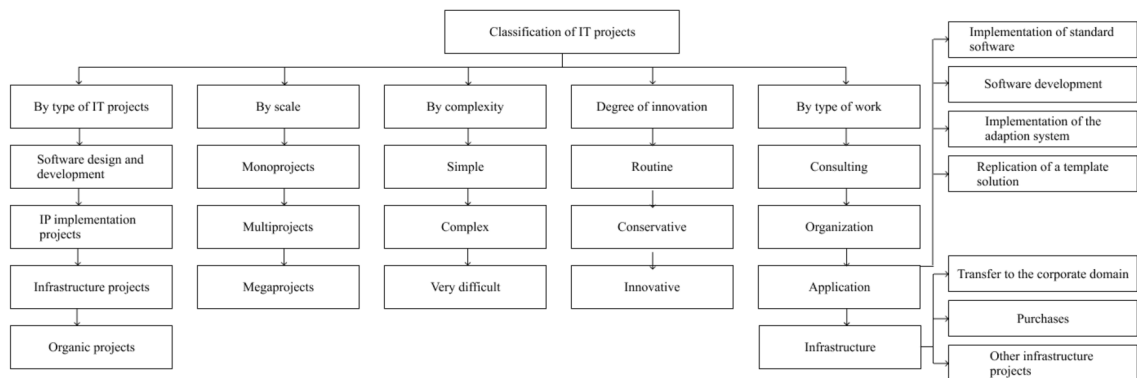
Picture 11 Classification of IT projects

The project approach is now considered the most effective management concept for managing complex processes, including software development [12, p.163].

According to this management concept, a project that is limited in time, unique, unique and results-oriented is considered to be managed [21, p.148]. The introduction and development of project management information systems has made the project management process more formalised and visible, which has significantly expanded the scope of the project approach [22, p. 110].

The conceptual models are based on the theory of process management, business process reengineering, project management and quality management. Examples include the Capability Maturity Model (CMM), Projects IN Controlled Environments (PRINCE) and the Rational Unified Process (RUP). Empirical models are based on a generalisation of successful IT project practices - examples include Agile, Scrum, Crystal family, eXtreme Programming (XP).

Predictive methodologies are based on early planning of tasks and resources for the entire project duration, while adaptive (such as Scrum, Agile, XP) are based on the assumption of incomplete and constantly changing requirements.

The purpose of maturity models (for example, CMM, Capability Maturity Model Integrated) and process models, is to manage the IT divisions of the organisation. Individual and group practices are aimed at increasing the efficiency of developers' work. Project methodologies are designed for the management of implementation projects (Oracle AIM, SignatureScala) and software development (RUP, MicrosoftSolutionsFramework - MSF, Crystal, XP, Agile, Scrum).

3.3 ITIL, PRINCE2 and PMBOK project management standards

Project management based on the PMI PMBoK standard allows one to choose the most suitable project format, depending on complexity, urgency, importance, technology, number of participants, habit (routine) characteristics of the project. As separate project companies are created in exceptional cases for very large and complex projects, the main project activity is carried out by an organisation with an established structure. Most often it

is a functional structure, the most common in Russia. In fact, the PMBOK standard is recognized as the standard of project management knowledge. However, in the UK and Europe, the preferred project management methodology is PRINCE2, which is required by the UK government in all projects launched in the country. This will provide an overview of the PRINCE2 standard as well as identify common features and differences between it and PMBOK. In conclusion, a way to establish the relationship between these two approaches to project management and complement each other is proposed, and how the PRINCE2 approach can improve the effectiveness of the PMBOK knowledge base. [11, p. 98]

PRINCE2 is a standard that has been developed for the UK Government and is being actively applied by the UK Government and is widely distributed worldwide. PRINCE2 belongs to the public domain, as it offers improper guidance on the most effective project management. The methodology is intended for general use. The PRINCE2 standard has gained support in the form of strict accreditation, including accreditation of educational institutions, trainers, practitioners and consultants. PRINCE2 is a structured process-based methodology that focuses on how eight specific components can further reduce risks in projects of any format. PRINCE2 identifies and focuses on the elements it considers key to the successful evaluation and completion of the project. This methodology allows you to organise the process to combine these elements, which is necessary to reduce the total risks of the project, as well as provides a way of their maintenance. If the "PMBOK Guide" offers a vague and overly general approach to integrating knowledge domains into a coherent whole, PRINCE2 offers an effective way to organise them. In essence, PRINCE2 says: "Applying these elements in this way is the most effective way to reduce project risks and ensure the quality of its implementation". [11, p.103].

The PRINCE2 components and processes are compatible with PMBOK, but PRINCE2 does not include all areas of knowledge and detailed data noted in PMBOK. The PRINCE2 methodology pays great attention to critical aspects, so the project manager must still attract the full power and scope of the PMBOK methodology, as well as other sources, for the project management work. The objective of PRINCE2 is to organise and supplement project management knowledge, and it is expected that the study and implementation of this methodology will lead to a level of expertise that will fill all gaps in PRINCE2. In the

PRINCE2 methodology, the volume and content of the processes and components must vary depending on the size and nature of the project. [11, p.108]

PRINCE2 includes 8 elements:
- Business rationale;
- Organisation;
- Plans;
- Means of control;
- Risk management;
- Quality in the environment of the project;
- Configuration Management;
- Change Management.

The existence of a viable business case is a basic condition for project control in PRINCE2. The business case is reviewed by the project managers prior to the start of the project and at each major decision during the project implementation. The project will be closed if, for any reason, the business rationale disappears.[11, p.110].

Owing to the need for the project manager to give regular instructions to staff who report to a different management structure, there is a need for a senior management organisation to provide oversight to ensure that the full range of resources works for the project. In addition, it is necessary for management to make decisions on feasibility, taking into account the investment in the project, and the responsibility for its implementation should lie with the project manager. In PRINCE2 such supervision is carried out by the project management.

4.STAGES OF PROJECT DEVELOPMENT

4.1 Project management model

Let's study the project management model and highlight the main stages of project development.

Phase 1 - Definition of requirements.

In the first stage there is an interaction of managers and management of companies through personal meetings and communication by mail. The customer sends a request for a commercial offer, attaching a general description of the system, after which there is a personal communication of the manager for more precise formation of requirements to the software. After agreeing on the main functional requirements for software, a document «Technical requirements» or a technical project which is approved by both parties. [8, p. 68].

Sometimes the Technical Requirements are attached to the request of the offer, but very often the Customer himself can not fully describe what he needs.

On the basis of technical requirements, a commercial proposal for software development and related documentation is formed, indicating the cost and timing of development, as well as the necessary equipment.

If the customer is satisfied with everything, the development contract is signed.

PHASE 1 SUMMARY : Technical requirements, contract.

Phase 2 - Design.

The overall duration of the phase is 2.5 months.

At this stage, the work of managers with the participation of the main developer takes place, as the main developer creates the architecture of the future software, describes the technical side of the project. After that the manager makes the following list of documents:

1. Subject matter survey report;

2. Specific terms of reference;

3. Description of information support;

4. Description of the equipment package;

5. Description of the organisational structure;

6. Description of the software;

7. List of user and group rights;

8. Explanatory note to the technical project

In the documentation the manager describes in detail the functionality of the program, technical support, program modules, user rights, methods of interaction of users with the program. If you have any questions, the manager will contact the customer's representatives for clarification.

The design phase takes a long time due to the need for a detailed description of the program details. After completion of the documentation, a detailed project schedule is drawn up and a project progress report form is agreed.

In this project, a detailed timeline plan is implemented in the form of a table with tasks, which indicates what is accomplished, what is planned, and for which items there is a delay (indicating the reasons for the delay). This report must be sent to the Customer every two weeks. [8, p. 69].

PHASE 2 SUMMARY : Timeline, reporting formats, documents:

1. Subject matter survey report;

2. Specific terms of reference;

3. Description of information support;

4. Description of the equipment package;

5. Description of the organisational structure;

6. Description of the software;

7. List of user and group rights;

8. Explanatory note to the technical project.

Phase 3 - Implementation.

In this stage the development of the software, as well as the remaining documentation and reporting is done.

The customer does not see any real development results for a long time as development starts with the server part of the software that is not visible to the user.

The manager regularly prepares reports according to the agreed form.

Let us consider the problems that arise on a real example:

The system was integrated with 14 video surveillance systems, which requires access to them.

Integration with each system was planned for a period of time.

The customer was given access to only half of the systems on time, so:

1. The timetable was not followed, as integration components were first developed with the systems to which access was available.

2. After a long time not providing access to systems, with the customer it was agreed that we write «emulators» of video surveillance systems and develop integration components on emulators, at the same time, for the development of emulators, the customer had to provide a correct information model for the transmission of data from the video surveillance system (in order to avoid having to rewrite the integration component after obtaining access). This took additional time, which made development impossible.

3. After the development of integration components on system emulators, we had real access to the systems and found out that they had a different data information model, so we had to rewrite the integration component again, which means extra time.

4. Some CCTV systems were replaced during the development process.

Also, six months later, it became clear that the role model of users needed to be adjusted slightly or that some other adjustments were needed, which also took time. A particular difficulty here is that the developer writes the code for a month, then it goes to the next module, and going back to the previous module after a while will take him much longer than making adjustments at once while writing. Again, increased development labour. [8, p. 70].

On the part of managers:

1. Making adjustments to documentation written in the previous step is an unplanned time.
2. A huge amount of time is spent interacting with the customer in terms of requests for access, coordination of changes, descriptions in reports of reasons for shifting schedules, etc.

Also at that time there was no system of interaction between manager and developer. Managers did not know what stage the project was at until they asked the programmers about the progress of their work. Thus, before the deadline for the next report, the manager asked the developers what they had done, which was not done when it would be finished, so the developers were distracted with the managers in unplanned time.

Interaction with the customer even on technical issues went only through managers. For example, developers need additional information on access to systems: they sent a request to their manager, who contacted the manager of the customer, who sent a request to someone else, there was constant sending of questions/answers, which made the speed of transmission very slow. [8, p. 71]

Additional documentation under development at this stage:

1. Acceptance testing programme and methodology;
2. List of machine carriers;
3. Pilot operation programme;
4. User training programme;
5. User manual;
6. System programmer's manual;
7. Structural diagram of the complex of technical means;
8. Operating manual.

At the end of this stage, the manager independently checks the functionality of the software according to the program and test procedure, after which the customer is informed that the software is ready for testing. After that, a commission consisting of representatives of the company and the customer, which takes place according to the program and method of testing.

PHASE 3 SUMMARY: developed documentation, developed by the software on a demo stand, ready for trial operation.

Phase 4 - Pilot operation

The overall duration of the phase is three weeks.

At this stage, a log of the experimental operation on the trial stand is compiled, which reflects all the shortcomings identified in the testing process. The demo-stand in this case is tested by representatives of the customer and a limited group of future users of the system.

PHASE 4 SUMMARY: Software ready for installation on servers.

Phase 5 – Installation

The overall duration of the phase is 2 weeks.

At this stage, developers are given access to the customer's servers on which the software will be installed. Developers install system-wide software, fine-tune the work of system components. At the same time, project managers interact on issues of signing of certificates, billing, etc.

PHASE 5 SUMMARY: Developed and installed software at the customer's facilities, signed certificates, closed contracts.

Phase 6 - Technical support.

Once the design is completed, the following technical support modalities are agreed:
- Technical requirements for technical support;
- Level of quality of service delivery;
- Quality assessment metrics;
- Fines in case of violations.

PHASE 6 SUMMARY: Signature of the contract and technical support for the system.

4.2 Website development

Phase 1 - Definition of requirements.

The customer makes a request for website development.

The manager communicates with the customer for the formation of basic requirements. After agreeing the requirements, the technical task and the IP for development is formed, where the time and cost are indicated.

PHASE 1 SUMMARY: Terms of reference and proposal

Phase 2 - Design.

At the design stage, design models and prototypes of the future site are developed. The designer designs - the manager agrees with the customer - passes the comments to the designer - the designer corrects.

There is no direct interaction between the customer and the designer.

The problem of this phase is that Customers try to describe all sections of the site in as much detail as possible (up to the names of sections), without realising that you can change the title of the section at any time with the help of the Administrative Panel.

As a result, it takes a lot of time to adjust the details that are not the most important and can be clarified during the development of the site. At the same time, interaction with the customer at this stage is quite difficult, as for three weeks of interaction it seems to him that he wants one thing, then it seems that he needs to do the other way, in the end he has to redo all models and prototypes.

Also at this stage a plan-timetable for development is being developed.

Phase 3 - Development.

At the stage of development interaction with the customer is practically not carried out, according to the design layouts and prototypes, functional modules are developed, integration with the 1C- Bitrix Administrative Panel. At the end of the development phase, the website is shown to the customer.

At the final stage of development the website is shown to the customer, who wants to make adjustments.

Phase 4 - Installation

The installation is the final stage of website development. After making all the adjustments, the site is uploaded to the production server, the managers prepare the closing documents.

The methodology of project management can be determined for each project individually, but there are some features in the implementation of different types of projects.

4.3 Project development

4.3.1 Large projects or state orders

When working with large projects, the customer - the state company imposes its specificity. Development should be carried out according to the state standard, using detailed schedules. Independence in the selection of methodologies is only within the team, which can agree with the project manager on the rules of interaction between the team members.

In such projects, the developer's communication with the customer develops as follows: Customer - Manager – Developers.

Since the development is based on detailed documentation developed in the previous stages of work with the customer, the developers do not have autonomy in this case. Development of detailed functionality is proceeding according to a clear plan. [8, p.92].

Criteria for choosing a cascade project management model:
- Specificity of the work of state-owned companies;
- Scale and complexity of projects.

4.3.2 Projects with commercial customers

In projects of this type, the scheme of cooperation is determined by agreement with the customer. There are customers who prefer the state standard documentation. Interaction with such companies is close to working with state customers. Another group of customers is less demanding on detailed documentation, and customer representatives interact not only with managers, but also with developers. In this case, the rate of exchange of information is much higher, the customer prefers to see direct results rather than performance reporting.

In the second case, documentation most often describes what the end user should get, rather than how it should be implemented.

Developers in this case make much more decisions than in the first case.

Criteria for selecting a project management model:

- Specification and accuracy of the customer's requirements;
- Scope of the project;
- «Mutual understanding» with the customer and established interaction.

The choice for a more flexible development is possible only if there is a common vision of the program between the customer and the contractor and the established interaction between them. Otherwise, the use of flexible methodologies and insufficiently detailed planning can lead to disagreement and different interpretations by specialists. [8, p. 103].

4.3.3 Small website development projects

For small projects, the choice of management methodology always rests with the project manager and the development team itself. The detailed documentation depends most often on the wishes of the customer.

Detailed documentation and clear plans are convenient when working with government customers, as well as when the customer has an accurate vision of which website he would like to receive. [8, p. 105]

Interaction with the customer is carried out either through the manager or through the designer, who through personal communication clarifies the customer's wishes and develops models and prototypes.

Such projects may also involve iterative development where the site is a multi-page resource that provides various information.

Until recently, software development was largely based on a cascade project management model.

This model offers a number of advantages, such as: clear definition of objectives, reduction of risks, as well as in the implementation of large innovative projects allows more transparent reflection of the desired outcome. [9, p. 67].

Also this method has a number of disadvantages, such as:

- The complexity of making changes to both the documentation and the software itself;
- High planning and documentation costs;
- In the case of long-term projects, some requirements may no longer be relevant by the time development is completed;
- Choosing not the most efficient technologies to achieve the desired goals (when the developer knows what function the user needs, he can independently determine the best implementation of this function, and in a cascade management model the developer has no freedom of choice).

Due to the limitations of the cascade software development model, more flexible methodologies have been developed that could lead to a more dynamic development process, responsive to change. In modern conditions, a «ideal» method of software development management has not yet been developed, which will be as effective as possible in the implementation of any project, herefore, companies need to combine different methods based on project requirements and conditions.

An appropriate combination of methodologies known to date will take advantage of both cascade and agile development management methodologies.

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4.4 Description of resource management implementation actions

Having analysed the management model, we can highlight the following advantages and disadvantages (Table. 1):

Project type	Advantages	Disadvantages
Large-scale projects	Low risk as requirements are strictly described by the contractor; A thorough description of the software being created, that is highly likely standardized by customer or state-regulatory object;	High administration costs; Low flexibility, difficulty making changes; Likelihood of obtaining an outdated product at the time of development completion; Lack of independence for developers; Long interaction chains that take up a lot of time.
Medium - small scale projects	Reduction of risks; Transparency of requirements for the performer.	Difficulty in the planning process; High costs for constant changes to documentation.

Table 1 Advantages and disadvantages of the model

After examining the advantages and disadvantages, we can identify the parameters required for the successful implementation of the project:

1. Interaction between customer and contractor. It is necessary that the contractor and the customer had a common vision of the goal of the project, as well as an established communication in order to ensure that the development of the product was as effective as possible and as a result received exactly what the customer needs.

2. Interaction between members of the development team. If there is no communication within the team, writing a multicomponent system may cause problems when connecting different modules. Also, sometimes developers need to discuss how best to solve a given problem or use the most appropriate technology.

3. Comprehensive but not excessively detailed documentation. The project documentation should provide all participants with a clear understanding of the product being developed.

4. Decision-making capacity of developers. Today, there is a huge range of technologies, programming languages, libraries, using which you can write a particular software, but no one will make a better decision in choosing, except for the development team itself.

5. Project transparency for all stakeholders.

Table 2 highlights the stages of a conventional cascade model and the option of combining a cascade model, where each stakeholder has access to the product or program under development, which reflects the entire course of work, the time to exchange letters and gather information is greatly reduced. [9, p. 89].

Parameter	Actions of improvement
Interaction between the customer and the performe	The interaction between the customer and the performer should not only be at the planning stages, but also throughout the entire project, and it is better to build it on the "show what you have done" key rather than "write a report". It may be possible to coordinate regular meetings with the customer to demonstrate the created product, determine the accuracy of the development trajectory, and build short-term plans for the future. This will allow the software to be kept up to date at all times and also increase the image and trust in the performer. It is also necessary to have the presence of key developers, as they must interact with the customer, know what they need and, most importantly, why they need it, in order to create a product that maximally satisfies the customer's goals.

| Interaction between members of the development team | It is necessary to organize daily short meetings. This will lead to the following:

All participants will always be aware of the progress of the work;
The manager will not interrupt the developers at an "inappropriate" time, as there will be a designated time for this;
The difficulties of the developers will be resolved much faster if they work on them not alone, but together.
Most developers will not be thrilled, but over time this will pass as they will work as a team and create a cohesive product, rather than developing each of their modules individually.
It is also necessary for managers to communicate with developers at the planning stage. The task of the manager is to tell the customer why the product is needed, the task of the developers is to plan how they will create the needed product in the most effective way together. |

Exhaustive but not excessive documentation	In the case of developing a complex and fairly new product, there is much more useful functional documentation than, for example, GOST documentation, such as Vision, SRS, SDD. Writing such documentation allows you to see what functionality the final product should have and how the user will interact with it. First, a general vision of the system is written, then a description of the program behavior is written, which may include UML diagrams, and then developers write a description of the system architecture. Such documents contain much more useful information and their writing does not require as much time. Any person who takes in hand only the SRS document will understand what product is being developed.

The ability for developers to make decisions	Developers should participate in project planning and the development of the system architecture, and in the choice of technologies.

| Transparency of the project's progress for all stakeholders | Firstly, it is necessary to create a demonstration version of the project as soon as possible, where regular changes will be released, and this version will be available to interested parties, in particular to managers who will see what has been developed at the moment. This will also allow for the detection of bugs at an early stage, which will significantly simplify their resolution. Secondly, an online project management system should be established, where anyone can at any time see who is working on which task and when the release of the next functions is planned. The manager always needs task control, so this will not increase his time, but will save time on email correspondence and report preparation. |

Table 2. Actions to improve the cascade model

	Waterfall management model	Combining agile methodologies and waterfall model
Duration of the planning stage	Greatly increased due to the need to design all details of the future complex system at an early stage.	Depends on the complexity of the project, but lower than in the waterfall model.
Flexibility	Difficult to make changes to documentation and code.	Easy to make changes, which is also facilitated by timely identification of errors.
Administrative costs	High	Correspond to the scale of the project.

Interaction between the customer and the performer	Most often it is in the form of reporting.	The customer and the performer work together to create software that is relevant and useful to the user, decide what and how to do better, determine priorities, etc. The customer communicates not only with managers but also with developers.
Interaction within the team	Interaction within the team is rare, managers bother developers and developers report to managers.	Smooth interaction occurs when developers consult with each other and managers learn about the progress of work and problems at a certain time.
The ability for developers to make decisions	Developers must strictly follow the documentation.	Developers can participate in the development of documentation if necessary, and have the right to decide how to develop the required functionality.
Transparency of the development process	To determine the stage of development, the customer needs to contact the manager, who in turn communicates with the developers.	Any interested party can at any time see what stage the development is at.

Table 3. Stages in Cascade Model

The product covered in this work is a system that helps to organise collective work in the company. In other words - this is a site that collects all the necessary data about employees and customers of the company. With this resource, you can set and perform tasks, schedule work time and communicate with colleagues. The contents of this product are shown in Pic. 12. [9, p. 91]
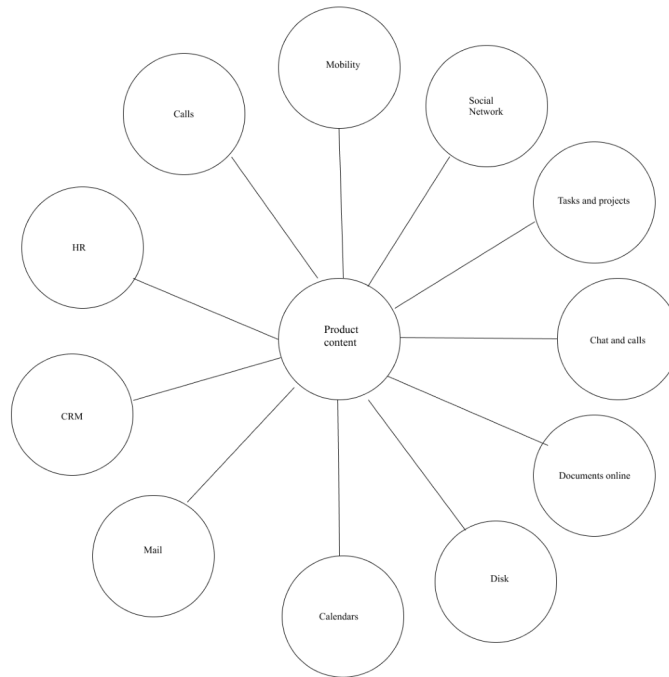
Picture 12 Product content

An important feature of software development is that the tools of the corporate portal are complemented by familiar elements of social networks. This makes communication within the company easier, making communication convenient, easy and accessible. Just as quickly and easily you can communicate with colleagues, solve work issues, and work together on tasks and projects.

The element «Tasks and projects» helps management to set tasks and control their execution, and subordinates - to prevent delays in execution time. To connect to the task of colleagues, to evaluate the work, to take into account the time spent, to plan the time.

The element «Chat and Video Calls» allows colleagues to communicate, share information with minimum time.

The «Drive» element provides users with access to shared folders.

The «Calendars» element facilitates the planning of joint meetings and events.

Element «Mail» allows to connect mailboxes or domains of the organisation.

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The element «Calls» allows making calls to city and mobile phones.

Element «HR» allows the use of tools of motivation.

Element «Mobility» allows the installation of software on smartphones. Software development accompanies management and customer service.

Each project that is created, from the creation of an idea to its complete completion, goes through a series of successive stages, the overall duration of which determines the life cycle of the project. But it is worth noting that the life cycle of an IT project is different from the standard of the life cycle. In the table. 4 The characteristics of the stages of the IT project life cycle are considered. [9, p. 102].

Project Life Cycle Stage	Description
I — Conceptual Stage	Collecting initial data. Analyzing initial data. Identifying the need for the project. Formulating the goal of the project. Main requirements for the project. Necessary resources. Formulating the project concept and its expertise. Approving the project concept.
II — Design	Forming the project development team. Developing and concretizing the concept. Determining the structure. Making task estimates. Developing an implementation budget.
III — Development	Operational planning of work. Monitoring progress. Developing execution technological processes. Establishing business contacts. Legal documentation. Determining (calculating) product quality indicators. Pricing calculation.

IV — Final Stage	Planning the process of completing the project. Testing the completed product. Preparing and equipping personnel for the operation of the developed system. Preparing necessary instructional and regulatory documentation. Transfer of the developed system to the customer.

Table 4. Project Life Cycle Stages

Another life cycle characteristic can be considered as phases (Fig. 13):

- Phase of the concept.

- Design phase.

- Implementation phase.

- Completion phase.


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Initiation → Planning → Implementation → Completion
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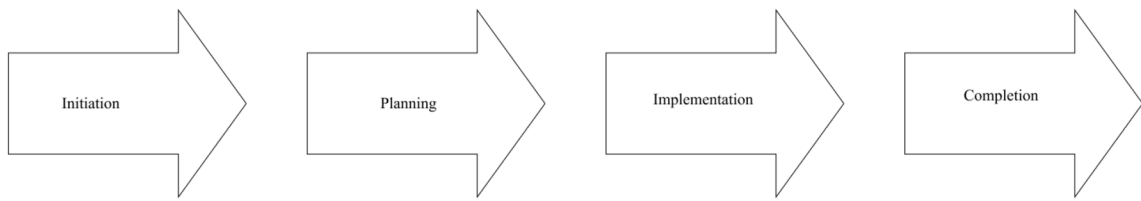
Picture 13 Project life cycle stages

The project activity standard is an essential document in the project life cycle.

The Project Activity Standard is a comprehensive document detailing all management procedures for all phases of the project life cycle. The phasing within the innovation project standard represents a consistent detailing of the work, including the development of the project concept and methodological foundations of project management (Fig. 14).
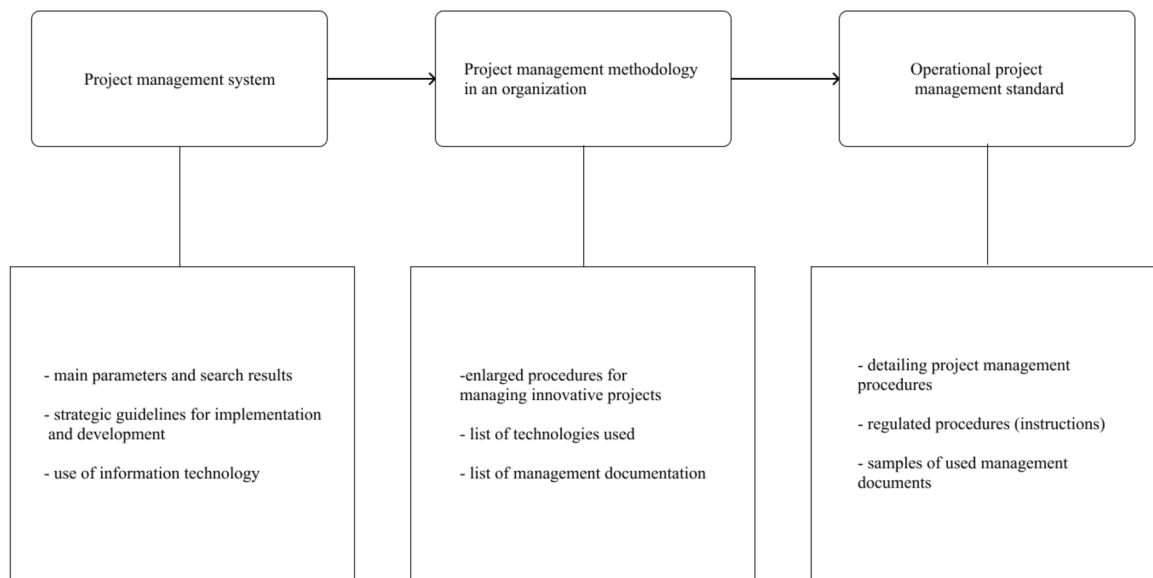
Picture 14 Stages of formalisation of the standard of management of innovative development projects
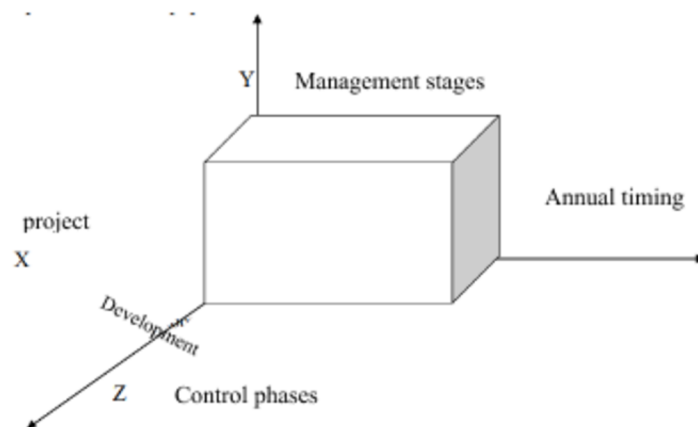
Picture 15 Spatial representation of innovation project management processes

In this section, the complete model of enterprise architecture is made, the business processes that exist at the enterprise, modelled in accordance with the IDEF0 methodology, the model of information architecture at the enterprise is made. Bottlenecks in business processes of working with clients of the organisation are identified.

The need to use the model of open innovation in science-intensive budget organisations was substantiated above.

Currently, the company has a priority task to gain a significant share of the Russian market for high-tech products. In a tight competitive environment, the only model that can provide innovation breakthroughs to external markets is open innovation. [15, p. 288]

In this model, instead of increasing budget allocations for own development, it is possible to propose the creation of a new innovation culture, ensuring a transition from a focus on internal development to an open process of innovative project activity.

In order to graphically display the duration and sequence of operations, a Gantt diagram has been developed (presented below). The project on development of the multifunctional product «Client-centric system» assumes that the period of execution of the tasks described in the hierarchical structure of work will take 1 year. Some tasks were planned in parallel to reduce project time. [9, p.122].

In any cloud-based IT project, the most expensive operations are software architecture development, layout design for all possible versions: mobile, tablet, desktop and browser versions. The graphics and software layout of applications are also among the most time-consuming tasks. [19, p. 142].

The process of placing a new product on the market requires considerable prior action. Preparation for the market launch can be divided into five stages:

Stage 1 - Development of a marketing strategy

The purpose of the stage is to identify the most promising market segments or to select the target audience through the analysis of the market situation.

To achieve the goal of the company, it is necessary to conduct various studies of consumers, their behaviour and attitude to the product; and the methods of sale and promotion used in the target market.

Stage 2 - Definition of concept.

At this stage of product development, the company's work with potential customers is especially important. Methods used include expert participation, creative panel discussions and in-depth interviews.

Stage 3 – Creation of a product formula.

This stage consists in testing various characteristics of a product: from its speed, planned and possible functionality, capacity, coverage, etc., to consumer's attitude to the product.

Stage 4 - Support the finished product.

It is carried out with the help of brand, packaging and other elements of the marketing complex. This stage involves testing software, functionality and other controls, as well as determining the price sensitivity of buyers.

Stage 5 - Comprehensive testing.

Just before introducing the finished product on the market, it is necessary to conduct final testing, after which it becomes clear whether the product is worth releasing.

5 CASE STUDY BLOOMEX INC.

5.1 Situation in the company Bloomex

Bloomex's operations are complex, with the company operating in multiple countries and managing a range of projects simultaneously.

The company's website development project aims to provide a seamless online experience for customers, while the CRM development project focuses on streamlining customer management processes. Third-party integrations are being implemented to enhance the company's service offering, while the delivery app development project aims to improve the efficiency of the company's delivery operations. POS system development is also a crucial project for Bloomex, as it enables the company to manage transactions across all its physical and online stores. Data warehousing is another essential project that allows the company to store and manage data effectively, while state orders processing ensures the smooth handling of customer orders across various regions.

However, managing these projects across multiple teams, time zones, and locations is proving to be a significant challenge for Bloomex.

1. Confusion and errors in project data tracking and reporting:

- A lack of standardized procedures for recording and reporting project data, leading to confusion when trying to access important information.
- A lack of clearly defined roles and responsibilities for information management, resulting in confusion about who is responsible for updating certain information.

- Insufficient training and support for employees in terms of information management systems and tools, leading to confusion and errors in data entry.

2. Difficulty in understanding and meeting customer requirements:

- An absence of processes for gathering and incorporating customer feedback into product development, resulting in a lack of understanding of customer needs and preferences.
- A lack of dedicated resources or budget allocated for researching and staying up-to-date on industry trends, resulting in a lack of understanding of customer requirements.
- Limited engagement with customers and lack of regular customer surveys, resulting in a lack of understanding of customer needs.

3. Difficulty in meeting project deadlines:

- A lack of clear project timelines, resulting in unrealistic expectations and last-minute rushes to meet deadlines.
- Insufficient staffing levels to handle the workload, resulting in excessive overtime for existing team members.
- A lack of effective delegation and task management systems, resulting in a bottleneck in the completion of tasks.

4. Issues with the quality of software products:

- A lack of proper testing processes in place before releasing software to customers, resulting in potential defects or issues in the product.
- Insufficient resources or budget allocated for testing and quality assurance, resulting in a lower level of product testing.

5. High turnover rate among employees:

- Insufficient employee retention and engagement initiatives, leading to high turnover rate among employees.

5.2 Examples of improved efficiency of a developing project

On the basis of the study the problems of the project management system have been identified. Since the organisation can be characterised as a project, due to the specificity of its activities, the current situation within the company is a serious obstacle to effective functioning.

The problems described in the previous chapter can be detailed and divided into two groups: problems with organisational activities and problems that affect the income of the organisation. [20, p. 56]

The first group of issues is:

- Untimely updating of important information and «confusion» of information flows;
- Low preparation for changes in customer requirements.

The issues that affect an organisation's income include:
- Frequent overtime of work;
- Low level of internal software product testing;
- High risks associated with personnel (illness, dismissal).

5.3 Implemented solution for the company Bloomex

To solve these problems, based on the specifics of the organisation, it is advisable to refine the current methodology of project implementation - Scrum. This approach is cost-effective and speeds up the acceptance of change and leverages a high level of corporate cohesion. [13, p. 115]

The following activities helped to improve management in the company:

5.3.1 Poker planning and t-shirt size method

Poker planning is a consensus-based evaluation method. Agile teams around the world use Poker Planning to evaluate unfinished products. Poker Planning can be used with historical points, ideal days or any other unit of appreciation. [13, p. 116]

Poker Planning is a flexible, consensus-based assessment and planning method. To start a poker planning session, the product owner or client describes the task or function for the team.

Each evaluator «holds a deck of cards» Poker Planning with values such as 0, 1, 2, 3, 5, 8, 13, 20, 40 and 100. Values represent the number of points, ideal days or other units in which the team evaluates.

Evaluators discuss this function by asking questions to the product owner as needed. When the function is fully discussed, each evaluator selects one card to present their opinion. All cards are then revealed simultaneously.

If all evaluators choose the same value, it becomes evaluative. If not, evaluators discuss their estimates. Developers with high and low ratings should justify them by giving arguments. After further discussion, each evaluator selects the scorecard again, and all cards are revealed again simultaneously.

The poker planning process is repeated until a consensus is reached or the evaluators decide that the flexible assessment and planning of a particular element needs to be deferred until more information is available.

When should we participate in poker planning?
Most teams hold a Poker Planning session after an initial technical assignment is written or there is a general understanding of the product. This session (which can take several days) is used to generate initial estimates useful for determining the size or size of the project.

Since product backlog elements (usually oral) will continue to be added throughout the project, most teams will consider it appropriate to conduct subsequent rapid assessment and planning sessions once per iteration. This is usually done a few days before the end of the iteration, as the whole team is together at that time.

Does Poker Planning Work?
Teams at Poker Planning constantly report that they are getting more accurate scores than any other technique they have used before.

One of the reasons why Poker Planning leads to better ratings is that it brings together many expert opinions. Since these experts form a cross-functional team from all disciplines in the program project, they are better suited for the evaluation task than anyone else.

Having completed a thorough review of the literature on software evaluation, Magne Jorgensen, PhD from Simula Research Lab, came to the conclusion that «the people most competent in solving the problem should evaluate it».[13, p. 118]

Second, during the planning of poker, a lively dialogue begins and participants are encouraged to justify their scores. Researchers have found that this improves the accuracy of estimation, especially for elements with high uncertainty, as we see in most software projects. [13, p.120].

Determining the size of a T-shirt is one of the methods of determining the size of the task, allowing decomposition of the work, usually used in flexible projects. This is a method of relative evaluation.

In **T-shirt size method**, Instead of using multiple planners, here, items are classified by T-shirt size: XS, S, M, L, XL.
The term derives from the T-shirt sizes used in the United States. Instead of T-shirts with dimensions 4, 5, 6, etc., there are only a few sizes: Very small (XS), small (S), medium (M), large (L) and very large (XL).

When measuring tasks, the development team was asked to assess whether they consider the workload to be very small, small, medium, large, very large or huge. Once evaluated, the development team can think more dynamically about the burden of the task. The dimensions can be converted to a numeric value after the evaluation is completed.

Steps:
Make S, M, L, XL cards
The owner of the product will explain the task to be evaluated, and the development team will ask questions, if they have any questions, any problems or ambiguities. For example, related to design. Do you need to learn something new before starting design / HTML / jQuery, etc.

Related to writing new functionality. Do we have a ready library of code classes, or do we have to write it from scratch?

Testing related - any specific settings required for modular testing?

Each developer gives the task a T-shirt size and the benefits are:

- This is a very informal strategy and can be used quickly with many tasks;
- This is a popular method of flexible relative evaluation;
- Enforcement evaluation in one of the fixed sets of dimensions allows the process to go faster;
- This is a good way to introduce conditions for relative evaluation;
- This is very effective for assessing the production task;
- T-shirt sizes can be a great way to get to know relative scores;
- Each size can be assigned a numeric value (in hours).

By combining this with the previous - Poker planning, we have our own rating system for all incoming tasks. Instead of standard Poker Planning cards we use cards with T-shirt sizes.

- XS - 1 hour,
- S - 4 hours,
- M - 1 working day (8 hours),
- L - 2 working days,
- XL - week (5 working days).

This allows the entire project team to operate task estimates in one relative system.

The assessments were adopted after discussions with the technical director and technical managers of the project teams.

Thus, if the task exceeds the maximum «size» (estimated more than 5 working days), it is considered insufficiently decomposed and requires the intervention of the technical director.

If the developer decides to estimate the problem in 10 hours, which is the intermediate between the sizes of cards M and L, then he should choose one of the options:

- Decompose the problem to smaller ones (for example, XS, XS, M). - If the decomposition is difficult, choose a larger card (in this case, L).

Everyone in the development team will raise their cards simultaneously. The development team will discuss the differences.

The project manager explains the tasks further or clarifies the misunderstanding, if any. The team will begin the task until everyone agrees on the same size.

Consider the rating system with a real example:

During the Poker Planning, two tasks were discussed, including:

- update the registration page interface
- develop the checkout page.

Two developers (P1 - first developer, P2 - second) took a page and evaluated them with the same size L (16 hours) each. During the discussion it became clear that the pages have the same elements that one programmer can write, and the second will only have to reuse:

- telephone number confirmation field - the challenge is to work with an external SMS system
- city selection unit (automatic location selection by Geo IP) - entry with dynamic loading of cities from the database, automatic location detection with the possibility of user editing or location selection on the map

In standard planning, such pages are done sequentially with common components to avoid duplicating the work. Collectively, it was decided to divide the primary tasks into the following sub-tasks for each page:

1. Page layout (M - 8 hours)
2. Development of telephone number confirmation component (S - 4 hours)
3. Development of the city selection component (S - 4 hours)
4. Integration with backend API (XS - 1 hour)

In that case, P1 took paragraphs 1, 2, 4; and P2 took paragraphs 1, 3, 4, respectively, for its pages. And it turns out that each of the developers will spend 13 hours on their own

tasks, which is 3 hours less than the original estimate. Parallel work of two programmers will speed up the work process and optimise the time costs. [13, p. 158].

5.3.2 Creation of a generalised backlog

Product Backlog is a prioritised list of business requirements for a future project. At the moment, requirements from the customer come in the form of a technical assignment and are supplemented as the development.

In this case it is important not to «go for it» at the customer and all requirements outside of technical specification to collect a separate list (document). In this case, the customer will receive his project without delay, and will be able to start operations. This item also increases the loyalty of the client and remains in the company for technical support and development of its resources.

It was decided to create a new task backlog. Checklist items add all wishes of the Customer as they appear, going beyond the estimate.

Picture 16 Backlog task

5.3.3 Finalisation of technical support

Since the development team is located in different cities of the Russian Federation and the world, the management has no possibility to obtain the physical presence of the entire staff.

Recommended used software is Bitrix 24.

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However, there is a lack of regular functionality for correct and productive work of the whole company. It was decided to improve the following functionality:

- Guest access to the Customer portal.

The customer only sees his project. The display of blocks required for the development team is limited.

Добавить Заказчика

Форма добавления клиента (Заказчика)

Имя в формате "Имя (внутреннее название компании)"*
(внутр. название как в карточке Компании)
Фамилия*
E-mail*
Должность (необязательное поле)
Отметьте, если пользователь не должен видеть акты, счета, отчеты.

Зарегистрировать

Picture 17 Adding a customer

- Assign tasks to projects, add required fields.

When adding one of the customer's employees to the task, the task is automatically tied to the project.

Added binding of tasks between each other. I.e. without a technical task the design task cannot start.
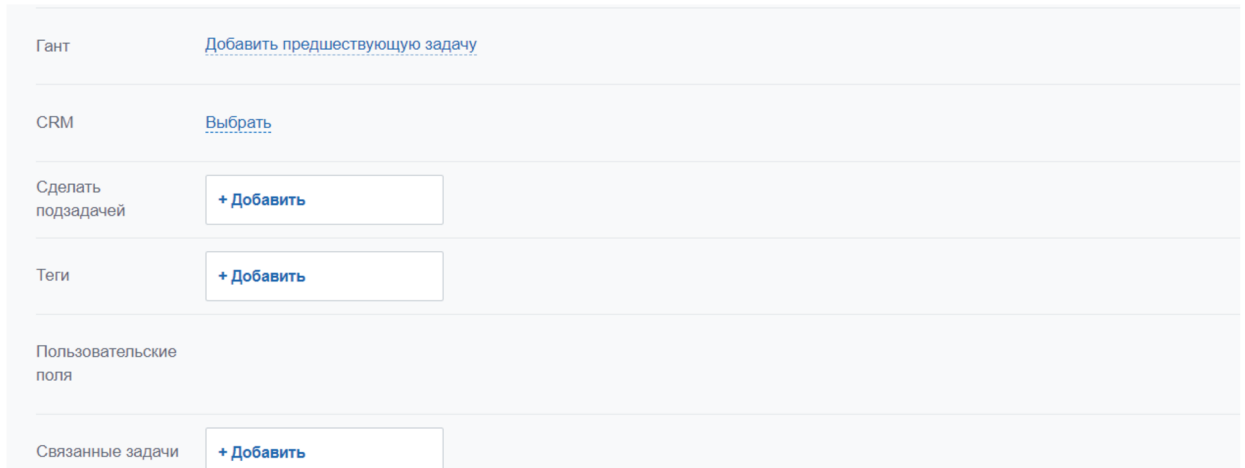
Picture 18 Adding related tasks and Gantt diagram

- Linking documentation to the project

All invoices and certificates (scanned by the clerk), terms of reference and additional agreements can be viewed directly at the system. This allows you to avoid storing documentation at the manager. When changing the project manager, there is no need to transfer files, no data loss when the local media crashes.
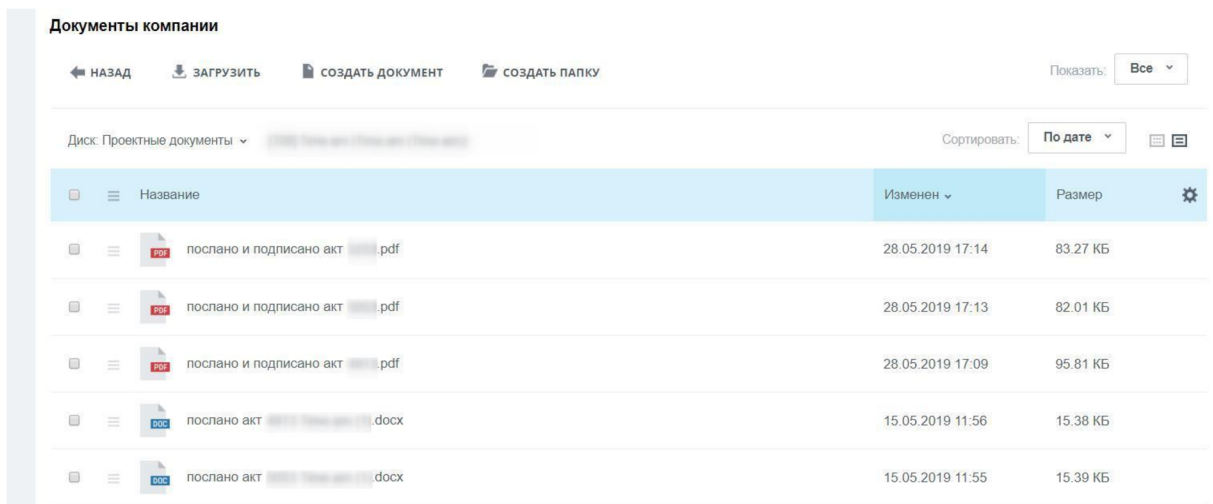
Picture 19 Documents in company card

Mobile access is also possible if necessary.

- Display of the time spent on the task for the customer.

The company can work with specialists of different levels (junior, middle, senior).

Accordingly, the time spent on the same task would be different.

Multiplier is implemented for each specialist. Average time is calculated by the middle level. For each developer, the level is determined individually by the technical director (Senior can make 1.5 times faster. The multiplier of such a developer will be 1.5). Junior developers will do longer. However, it is the «headache» of the company - training and ensuring the growth and development of a specialist. It can have a multiplier of 0.8. The rest of the costs are covered by the company. [18, p. 323]

Комментарии (233)	История (317)	Время (136ч 21м)	Файлы (34)	Избранные комментарии (0) ↻
Дата	**Автор**	**Время**		**Комментарий**
18.02.2019 11:39:10		00:01:48		(1.6M)
19.02.2019 18:09:05		01:54:06		(1.6M)
29.03.2019 17:55:28		11:02:28		(2M)
02.04.2019 18:04:04		13:18:51		(1.6M)
03.04.2019 15:10:55		09:15:13		(1.7M)
22.04.2019 17:58:39		13:58:55		(1.7M)
14.05.2019 15:54:19		10:09:44		(1.7M)
14.05.2019 17:58:31		02:20:40		(1.7M)
15.05.2019 18:03:51		14:16:05		(1.7M)

Picture 20 Time multiplier

- Addition of Customer's employees with limited access.

Several people from the Customer can work on the project. However, 1C does not need to see project invoices or other documentation, part of tasks (Fig. 20).

Such users see only the task in which they are added

5.3.4 Use of the tender platform.

Technical resource support tasks are volatile and vary in scale and effort. With the increase of staff part of the team may be unemployed during the «calm». If the staff is not increased, sometimes teams do not cope with the load, which leads to delays and other negative consequences.

The use of the tender platform removes the issue of resources - giving part of the tasks to the contract.

Here we apply the points in the previous paragraphs.

During the initial implementation, each bidder saw the ratings of other performers. Thus, he could reduce the price for winning the tender. However, as the practice of freelancer can lower the rating for winning the tender so much that it is lower than the real cost of work. In this way, the Contractor is demotivated, can do the work carelessly and in the future stop participating in tenders at all. [18, p.349]

It was decided to hide the assessment of the other performers. In this way we see independent evaluations of several Performers and choose the optimal or discuss with each of the reasons for the placed bets.

Picture 21 Assessments 1

5.3.5 Weekly reports and daily synchronization

Daily schedules of the team shortened «useful» working time.

It was decided to reduce the reports to once a week. This allows managers to quickly monitor the progress of the team, to identify «weaknesses» in a timely manner, but do not hinder the work.

Daily "morning coffee" synchronization call is a scrum ritual that allowed every member of a team to be "on the same page" - and discuss possible occurred blockers, predict and escalate problems.

5.3.6 Resource planning

It can be difficult to distribute developers among managers, especially when most of the developers work remotely. It was decided to develop a resource allocation table. For each task the manager can request the necessary specialist with the indication of the planned time. [18, p. 351].

Picture 22 Resource request

Requests are collected weekly, on Friday. All data is received by the responsible person, who compiles the table. The manager can accept or reject the request, transfer the task to another specialist or change the planned time.

So we get a table with a list of specialists and days of the week. This makes it easier to plan the time for developers, for each day there are projects with an indication of the time that can be spent on the implementation of a particular task.

If the task was implemented faster - the specialist proceeds to the next item. After the introduction of this table, questions on the revisions appeared. Fixing bugs, transferring to a production site, etc. are small tasks for which it is necessary from 10 minutes to 1 hour. It is difficult to plan such tasks. It is difficult to predict the time of verification by the Customer.

It was decided to use the 7/1 system. This system implies that a specialist's working day - 7 hours, instead of 8. Requests for resources are made on the basis of this calculation. Every day, each specialist has one hour to make minor changes in the order of priority tasks. If there are no such tasks, the specialist continues to work on the last task or can go to the next day's projects. [18, p. 356].

5.3.7 War conflict and project management

During the conflict between Russia and Ukraine, I faced a challenging situation as a manager at an IT company. The project we were working on involved both Russian and Ukrainian programmers, and the ongoing conflict caused significant disruptions to their work. The constant bombings and sirens during working hours made it difficult for our Ukrainian team members to continue working, as their safety was at risk. As a result, we had to quickly devise a strategy to manage our resources effectively and ensure that our project continued without any significant delays.

We decided to divide the tasks of our Ukrainian team members among our Russian team members to prevent a bottleneck in our project. We dedicate tasks that were not dependant on other ones to Ukranians. This solution allowed us to continue working on our project while ensuring the safety of our Ukrainian team members. We also provided our Ukrainian team members with the necessary support to work from home or safe locations when possible.

The resource management strategy we implemented allowed us to complete our project on time and within budget despite the challenging circumstances. Moreover, the successful completion of this project demonstrated the importance of effective resource management in ensuring the success of IT projects in times of crisis.

5.3.8 Gantt diagram

The Gantt diagram is the most obvious way to visualise project tasks on a timescale. By weekly updating the diagram we show Customer all the shifts, and can easily diagnose the causes of delays, take action. Within two weeks after the introduction there were noticeble changes in the behaviour of the Customer. Decisions were made more quickly, tasks were checked. [14. p. 263]

Picture 23 Ghantt Chart 1

5.3.9 Regulations

The final aspect in the management of resources was the writing of a single document regulating the actions of the collective company. It describes in detail and records all the innovations adopted. The current version definitely requires improvement, for example, regulation of communication of a specialist with the manager or manager with the Customer, solution of conflict situations, etc.

After the presentation of the first version of the rules of procedure, a large number of comments and proposals to improve the working process were adopted. The general immersion of the team in the discussion showed ways of possible development of the company from a new perspective. [22 p. 134]

Bloomex

Регламент менеджера проектов V1   (04.2022)

Picture 24 Regulations

Results

The described improvements were initially implemented for only two project managers. Each of them had 2 projects for development, 3-4 projects for technical support.

Feedback was extremely positive. It was decided to implement development for the whole company.

There was an immediate positive dynamic:

- Time spent by the Project Manager on task control (Fact/plan ratio) has been reduced. There was more useful time - the opportunity to take more projects - increased productivity and total profit of the company, respectively;

- Customer's loyalty and involvement in the development process has increased as the composition of tasks has become more transparent. The developer reports in the task on each of the items. Customers easily began to operate on T-shirt size terminology;

- Simplify the assignment of tasks to developers based on their T-shirt qualifications. Junior developers should give priority to small size tasks (XS, S). Middle and Senior can take more complex tasks. This minimises the risks of failure of the term and the task;

- The introduction of Poker Planning has improved the useful communication between professionals and the overall understanding of the project within the team. This has a positive impact on staff development in related areas;

- The number of staff initiatives in the joint discussions has increased. [22, p. 153].

The direct implementation of the methodology in the company took 4 hours (introductory presentation + session of questions - 2 hours, discussion of the issues during the first week of work - 2 hours). The hours spent on development have already paid off in the first month of use of the product. [22, p. 154].

In parallel with the introduction of innovations, the team collects feedback for further improvements of the system, if necessary.

Thus, it can be concluded that the implemented developments have had a positive impact on the work of the company.

Conclusion

Despite the large number of research in project management, there is no one-size-fits-all template.

By comparing different IT company resource management methodologies, the advantages and disadvantages of each system were identified. By combining the best aspects of the methodologies, points were introduced that increase the efficiency of the developed product in the company.

The development and implementation of business innovations is a labour-intensive task, but one of the most basic. The conducted analysis is important for making changes and tracking the dynamics of growth of the company's performance. The changes have had a positive impact on the company's status.

Work will continue on studying «weaknesses» of the company and development of a set of measures to increase the efficiency of employees and to increase the loyalty of customers to the company.

Thus, it is safe to say that the work done had a positive impact on a small part of the IT market. The planned presentation will help other companies in the industry to improve their performance and work more efficiently.

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