

Czech University of Life Sciences Prague
Faculty of Economics and Management
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Diploma Thesis

**Application of agile methodologies as a contemporary
approach to project management - case study of
PersiLab company**

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DIPLOMA THESIS ASSIGNMENT

Aleksandr Gladkikh

Economics and Management

Thesis title

Application of agile methodologies as a contemporary approach to project management – case study of PersiLab company

Objectives of thesis

Aims of the Diploma Thesis:

- Compare traditional approaches of project management with agile methodologies, to identify significant differences between them and select the scope of agile methodologies.
- Analyze projects that were built by using agile methodologies in case mobile development outsourcing company and make recommendations based on the result of the analysis.

Methodology

This thesis is compound of two main parts which are divided into chapters and subchapters. The theoretical part is based on the collection and analysis of the different methods and approaches of project management, in particular the traditional and agile methodologies.

Practical part can be divided into two parts. The first part is focused on the comparison and identification of the best applications of agile and traditional methodologies. Also in this part will be constructed a comparative model between traditional and agile methodologies. The second part will focus on the case study of Russian mobile development outsourcing company using reports from JIRA system. In this part projects that were built by using agile methodologies will be analyzed.

The proposed extent of the thesis

Approx 60 – 70 pages

Keywords

project management, agile methodologies, scrum, Russian company, Krasnodar region, software development, PerciLab company

Recommended information sources

- Anderson, David J.: Agile Management for Software Engineering. Upper Saddle River, NJ: Prentice Hall, 2004. ISBN: 0-13-124071-4.
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- Schwaber, K.: Agile Project Management with Scrum. Washington: Microsoft Press, 2003. ISBN: 0-7356-1993-X.

Expected date of thesis defence

2016/17 SS – FEM

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Declaration

I declare that I have worked on my diploma thesis titled "Application of agile methodologies as a contemporary approach to project management - case study of PersiLab company" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on date_____

Aleksandr Gladkikh

Acknowledgement

I would like to thank Ing. Richard Selby, Ph.D. and head of PersiLab company, for their advice and support during my work on this thesis.

Application of agile methodologies as a contemporary approach to project management - case study of PersiLab company

Summary: This thesis provides analysis and comparison of traditional approaches of project management and agile methodologies, to identify significant differences between them and select the scope of agile methodologies.

In the current conditions of a rapidly changing and developing market, it is important to keep up with pace of market development and technology. Particularly, it is connected with field of information technologies. In such areas science is developing rapidly and the project, which is created for several years, may lose its relevance by the end of development. Therefore, it is important to always be prepared to change the concept of the project or add something new during the development. Agile methodologies were created for this purpose. The following thesis provides analysis and recommendations about identified areas where agile methodologies can be successfully used.

Also in the case study part, projects were analysed that were built by using traditional and agile methodologies in case mobile development outsourcing company. Based on the analysis, mistakes in management are identified and recommendations are given for choosing an appropriate methodology for project management.

Keywords: project management, agile methodologies, scrum, Krasnodar region, software development, PersiLab company.

Využívání agilních metodik jako moderního přístupu k řízení projektů - Případová studie firmy „PersiLab“

Souhrn: Tato diplomová práce vychází z komparativní analýzy tradičních a agilních metodik projektového řízení.

V současné době trh se rychle mění a vyvíje se, proto je důležité držet krok s časem. To se týče zejména oblasti vyspělých technologií, kde věda se rozvíjí tak rychle, že projekt, vytvořený během několika let, může ztratit svůj význam a aktualitu dokonce i na posledním stadiu řízení. Proto je důležitá buď změna koncepce projektu, nebo neustále zavádění novinek během řízení projektů. Právě k tomu, bylo vytvořeno agilní projektové řízení. Diplomová práce klade důraz na oblasti, ve kterých používání agilních metodik je nezbytné pro efektivitu projektů.

Práce obsahuje případové studie, ve kterých jsou zanalyzované projekty pod vedením jak tradičních tak i agilních metodik. Na základě této analýzy jsou vyjádřené problémy, týkající se výběru vhodné metodiky řízení projektů.

Klíčová slova: projektové řízení, agilní metodiky, scrum, Krasnodar kraj, stvoření software, PersiLab společnost.

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List of abbreviations

AACE	The American Association of Cost Engineers
AIPM	Australian Institute of Project Management
AMP	Association for Project Management
ANSI	The American National Standards Institute
CCTA	Central Computing and Telecommunications Agency
CPM	The Critical Path Method
DOD	The United States Department of Defense
EVM	Earned Value Management
IDEA	International Data Encryption Algorithm
IEEE	Institute of Electrical and Electronics Engineers
IMPA	International Project Management Association
ISO	International Organization for Standardization
IT	Information Technology
PERT	The Program Evaluation Review Technique
PMAJ	Project Management Association of Japan
PMBOK	Project Management Body of Knowledge
PMI	Project management Institute
PRINCE	PRojects IN Controlled Environments
REST	Representational State Transfer
SEI	Software Engineering Institute
SOAP	Simple Object Access Protocol
UK	United Kingdom
WBS	Work Breakdown Structure
XML-RPC	Extensible Markup Language Remote Procedure Call
XP	Extreme Programming

1 Introduction

In modern civilization, science plays a special role. Technological progress of the 20th century, which led to the developed countries to a new quality of life, based on the application of scientific achievements. Science is not only changing the field of production, but also has an impact on many other areas of human activity, ranging regulates them, rearranging their means and methods. Project management approaches also are changing and improving. This is especially clearly seen in high-tech areas as IT. In such areas science is developing rapidly and the project, which is created for several years, may lose its relevance by the end of development. Therefore, it is important to always be prepared to change the concept of the project or add something new during the development. Agile methodologies were created for this purpose.

With the development of new technologies, the emergence of new materials and methodologies, people's priorities and desires are changing. The market is also changing to meet the needs of people. In such a rapidly changing environment, the use of heavy-weight traditional methodologies may not be profitable, or even harmful to the project. Traditional approaches with careful planning and staginess of each action lose mobility and adaptability to changes. Also, such methodologies lack feedback from the end user during project development. This fact is key point in projects aimed at the consumer. On the other hand, the traditional model of project management has good system of planning, control and accounting.

2 Objectives and Methodology

2.1 Objectives

The main objective of this thesis work is to analyze projects that were built by using agile and traditional methodologies. The following analysis can help project managers avoid mistakes and take into account the peculiarities of application of agile projects.

Aims of the Diploma Thesis:

- Compare traditional approaches of project management with agile methodologies, to identify significant differences between them and select the appropriate scope of agile methodologies.
- Analyze projects that were built by using agile methodologies in case mobile development outsourcing company and make recommendations based on the result of the analysis.

Research questions:

- What advantages have agile methodologies in comparison with traditional project management model?
- What is the suitable scope of agile methodologies application?
- What problems may appear in companies that use Agile methodologies?

2.2 Methodology

Methodology of the thesis is based on analysis of available information sources and knowledge bases. This thesis is compound of two main parts which are divided into chapters and subchapters. The theoretical part is based on the collection and analysis of the different methods and approaches of project management, in particular the traditional and agile methodologies.

Practical part can be divided into two parts. The first part is focused on the comparison and identification of the best applications of agile and traditional methodologies. Also in this part will be defined significant differences between traditional and agile methodologies. The second part focused on the case study of Russian mobile

development outsourcing company using reports from JIRA system. In this part projects that were built by using agile and traditional methodologies will be analyzed. The analysis of the projects used metrics from book "Agile Metrics in Action: Measuring and Enhancing the Performance of Agile Teams" by Christopher W. H. Davis.

Also in thesis work were used next methods: observation the problem, analysis different project management approaches, relation analysis between agile and traditional project management methodologies, comparison different expert's opinions to make research more objective, inductive and deductive research approaches, synthesis of conclusions and recommendations.

3 Literature Review

3.1 Project management

Project management is applied in today's business world to a variety of different projects. Principles established in the 1950's have prescribed that methods and procedures should be applied to every project in a uniform way. Such uniform implementation should ensure robustness and applicability to a wide range of projects, from the simple and small projects to most complex and large ones.

3.1.1 Definitions

The project in any organization is the cooperation between departments in order to achieve a common goal is clearly defined. The process of planning, organization and management of resources to achieve organizational goals is called project management.

“A project is a temporary endeavor to create a unique product, service or result.” – definition of project according “Project management Institute – PMI”. (Project management Institute, 2013)

International Project Management Association (IPMA) defined project as a time and cost constrained operation to realize a set of defined deliverables (the scope to fulfill the projects objectives) up to quality standards and requirements. (IPMA, 2006)

Association for Project Management (APM) affirm that project is a unique, transient endeavor undertaken to achieve a desired outcome. (APM, 2012)

Project Management Association of Japan (PMAJ) in their guidebook “A Guidebook of Project & Program Management for Enterprise Innovations” mentioned that project refers to a value creation undertaking based on a specific, which is completed in a given or agreed time frame and under constraints, including resources and external circumstances. (PMAJ, 2015)

In ISO 10006:2003 can be found that the project is a unique process consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements including constraints of time, cost and resources. (ISO 10006:2003, 2003)

Australian Institute of Project Management defined a project as a temporary endeavor undertaken to create a unique product, service or result in order to achieve an outcome. (AIPM, 2008)

Software Engineering Institute defined a project as a managed set of interrelated resources that delivers one or more products to a customer or end user. The set of resources has a definite beginning and end and operates according to a plan. (SEI, 2006)

Harold Kerzner in his work “Project Management: A systems Approach to Planning, Scheduling and Control” wrote that project can be considered to be any series of activities and tasks that: have a specific objective to be completed within certain specifications, have defined start and end dates, have funding limits, consume human and nonhuman resources, are multifunctional. (Kerzner, 2013)

J. Rodney Turner defined project as a temporary organization to which resources are assigned to do work to deliver beneficial changes. (Turner, 2008)

As can be seen from the definitions above, the overall essence of the project does not change.

In the above sources, you can also find the definition of Project management. If we generalize the definitions, we can say that the process of planning, organization and management of resources to achieve organizational goals is called project management.

Project management is very important in the production of goods and services. The generation of ideas to the final production of the product or service, each step can be assigned to individual projects category. Each project requires a project manager who leads the project to its logical conclusion.

The process of project management must involve and use knowledge, skills, tools, and techniques to project activities to meet the project requirements.

In book called “PMBOK Guide” is written the following definition of project management: “Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.” (Project Management Institute, 2013)

Any project during its implementation goes through different stages, referred to in aggregate project life cycle. For the implementation of the various project management functions necessary steps, which are referred to as the project management processes.

The project management processes can be divided into six main groups, implementing a variety of management functions:

1. initiation process – a decision on the beginning of the project;
2. planning process – definition of the objectives and criteria for success of the project and the development of workers' schemes to achieve them;
3. execution processes – coordinating people and other resources to implement the plan;
4. analysis Processes – Definition of conformity of the plan and the execution of the project goals and success criteria and decision–making about the need for corrective action;
5. management Processes – identify necessary corrective actions, their coordination, approval and use;
6. completion of the process – the formalization of the project and to the orderly settlement of its finale.

Below shows the main objectives of project management according to PMBOK:

–effective management of human, financial and material resources within the constraints of cost and time of execution of projects;

–reduce the cost of products (services) by optimizing the realization of the project costs;

–reducing development time, production and delivery of products and services to the customer (consumer) by the concentration of resources and the rational organization of the project implementation process;

–optimal use of scientific and production potential of the company, the balanced development of its production capacity;

–attract additional investment to implement the most important projects;

–raising the level of remuneration and motivation of employees in high–quality and productive work;

–reduce costs for the maintenance of management of the company by reducing the size, increasing the flexibility and efficiency of its work;

–the introduction of production and economic activities of the Corporation of modern methods and technologies of management, improve the efficiency of the strategic, tactical and operational management of the company;

–development of new products and services, the introduction of new scientific and technical developments and advanced technologies that enhance the company's competitiveness. (Project Management Institute, 2013)

General definition of project management goal can be summarized as follows:

"The goal of project management is to achieve predefined objectives with the previously known limitations and feasibility of the options, responding to the risks."

A typical project has following characteristics:

Timeline: A project has a definite timeline with measurable starting and end point.

Resources: A project has limited resource of capital and manpower.

Tools: Special type of tools and techniques are used for project management (Gantt Charts, etc.).

Team: Project management requires diverse team stretching across departments and functions.

Project management methodology helps:

- substantiate the expediency of investment;
- develop an optimal scheme of financing of works;
- a plan of work, including the terms of works execution, resource consumption, necessary expenses;
- optimally organize the execution of works and the interaction of project participants;
- implement planning and quality management;
- carry out the analysis and management of project risks;
- optimally plan and manage contracts;
- analyze the deviation of the actual implementation of the planned works and predict the consequences of a deviation;
- simulate corrective action on the information model of the project and to make informed management decisions;
- keep the project archive and analyze the experience of their implementation, which can be used in other projects, etc.

Project activities of people engaged throughout the history of mankind. In XX century, there was a project management discipline, reflecting the advanced scientific and

practical approaches in this area. The founders of the Western practice of project management methods are the following scientists. Frederick Taylor, Henry Ford, Henry Gantt, Harrington Emerson and others made a huge contribution to the development of project management. Their merits include the creation of a "mechanical" approach to project management, "authoritarian management of the project", theory of management, the theory of effective business activities, efficient production management and other important discoveries.

What does the term "agile" mean? This term is not in the context of software development clearly defined. The origin of the term of agility in manufacturing is defined as “the ability to successfully sell low-cost, high-quality products with short delivery times and in different capacities that by the adaptation to the needs of the user provide increased value for customers“. (Vokurka, 1998)

Next, the word Scrum will be used in the thesis. Schwaber and Sutherland in their work “The Scrum Guide” define Scrum as a process framework that has been used to manage complex product development since the early 1990s. Also they wrote that “Scrum is not a process or a technique for building products; rather, it is a framework within which you can employ various processes and techniques. Scrum makes clear the relative efficacy of your product management and development practices so that you can improve”. (Schwaber, 2016)

When analyzing projects, the reports provided by PersiLab were used. Company used the JIRA system to generating reports.

JIRA is a proprietary issue tracking software product, developed by Atlassian Inc. It provides bug tracking, issue tracking, and project management functions. JIRA provides a simple transition to agile development. The main features of JIRA for agile software development are the functionality to plan development iterations, the iteration and time tracking reports and the bug tracking functionality.

3.1.2 Brief history of project management

It is known that The International Project Management Association (IPMA) was founded in 1965. Project Management Institute (PMI) was launched to promote the project management profession in 1969. It seems that project management profession is not so old.

Y.C. Chiu wrote in his book "The Introduction to the History of Project Management: From the Earliest Times to A.D.1900" on the initial stages of the emergence of Project management. Below are the main points of the history of project management according to the works of Y.C. Chiu.

What if we take into consideration the ancient Egypt and pyramids of Giza? From my point of view the great pyramids were great projects and they needed thorough project management plan. The Pharaohs built the pyramids and today archaeologists still argue about how they achieved this feat. Ancient records show there were managers for each of the four faces of the Great Pyramid, responsible for overseeing their completion.

“Other great ancient project is the Great Wall of China. Since the Qin Dynasty (221BC-206BC), construction of the Great Wall had been a large project. According to historical data, the labour force was organized into three groups: soldiers, common people and criminals. The Emperor Qin Shihuang ordered millions of people to finish this project.” (Chiu, 2010)

These historical projects have a story to tell. Project management did not just appear in the 20th century. It has been invented many years ago.

Mark Kozak-Holland in his book "The History of Project Management" noted that important stage of project management development was “The Gantt chart” made by Henry Gantt (1861 – 1919). One of the forefathers of project management, Henry Gantt, is best-known for creating his self-named scheduling diagram, the Gantt chart. It was a radical idea and an innovation of worldwide importance in the 1920s. One of its first uses was on the Hoover Dam project started in 1931. Gantt charts are still in use today and form an important part of the project managers' toolkit. (Mark Kozak-Holland, 2011)

The following are significant events from the history of project management according to the book Mark Kozak-Holland 2011.

Early practitioners of project management and the associated specialties of planning and scheduling, cost estimating, cost and schedule control formed “The American Association of Cost Engineers” (AACE) in 1956. It has remained the leading professional society for cost estimators, cost engineers, schedulers, project managers and project control specialists since. AACE continued its pioneering work in 2006, releasing the first

integrated process for portfolio and project management with their Total Cost Management Framework.

Dupont Corporation invented “The critical path method” (CPM) in 1957. CPM is a technique used to predict project duration by analysing which sequence of activities has the least amount of scheduling flexibility. Dupont designed it to address the complex process of shutting down chemical plants for maintenance, and then with maintenance completed restarting them. The technique was so successful it saved the corporation \$1 million in the first year of its implementation.

The United States Department of Defense's US Navy Special Projects Office developed “The program Evaluation Review Technique” (PERT) for the U.S. Navy's Polaris project in 1958. PERT is a method for analyzing the tasks involved in completing a project, especially the time needed to complete each task and identifying the minimum time needed to complete the total project.

The United States Department of Defense (DOD) created the WBS concept as part of the Polaris mobile submarine-launched ballistic missile project. After completing the project, the DOD published the work breakdown structure it used and mandated the following of this procedure in future projects of this scope and size. WBS is an exhaustive, hierarchical tree structure of deliverables and tasks that need to be performed to complete a project. Later adopted by the private sector, the WBS remains one of the most common and useful project management tools.

“In 1975, Simpack Systems Limited created “PROMPTII” method. Development of PROMPTII was in response to an outcry that computer projects were overrunning on time estimated for completion and original budgets as set out in feasibility studies. It was not unusual to experience factors of double, treble or even ten times the original estimates. PROMPTII was an attempt to set guidelines for the stage flow of a computer project. In 1979, the UK Government's Central Computing and Telecommunications Agency (CCTA) adopted the method for all information systems projects.” (Mark Kozak-Holland, 2011)

Scrum is an agile software development model based on multiple small teams working in an intensive and interdependent manner. In their paper, 'The New New Product Development Game' (Harvard Business Review, 1986) Takeuchi and Nonaka named Scrum as a project management style. Later they elaborated on it in, 'The Knowledge

Creating Company' (Oxford University Press, 1995). Although Scrum is intended for management of software development projects, it can be used to run software maintenance teams, or as a general project management approach.

First published by the PMI as a white paper in 1987, the PMBOK Guide was an attempt to document and standardize accepted project management information and practices. The first edition was published in 1996, followed by a second in 2000, and a third in 2004. The guide is one of the essential tools in the project management profession today and has become the global standard for the industry.

Although the earned value concept has been around on factory floors since the early 1900s, it only came to prominence as a project management technique in the late 1980s early 1990s. In 1989, EVM leadership was elevated to the Undersecretary of Defense for Acquisition, thus making EVM an essential part of programme management and procurement. In 1991, Secretary of Defense Dick Cheney cancelled the Navy A-12 Avenger II Program because of performance problems detected by EVM. The PMBOK Guide of 1987 has an outline of Earned Value Management (EVM) subsequently expanded on in later editions.

Published by the UK Government agency CCTA, PRjects IN Controlled Environments (PRINCE) became the UK standard for all government information systems projects. A feature of the original method, not seen in other methods, was the idea of 'assuring progress' from three separate but linked perspectives. However, the PRINCE method developed a reputation for being too unwieldy, too rigid and applicable only to large projects, leading to a revision in 1996.

The Standish Group collects information on project failures in the Information Technology (IT) industry with the objective of making the industry more successful, showing ways to improve its success rates and increase the value of IT investments. The CHAOS report is its biennial publication about IT project failure.

An upgrade to PRINCE was considered to be in order, and the development was contracted out, but assured by a virtual committee spread among 150 European organisations. Originally developed for Information Systems and Information Technology projects to reduce cost and time overrun; the second revision became more generic and applicable to any project type.

The American National Standards Institute (ANSI) recognizes PMBOK as a standard in 1998, and later that year by the Institute of Electrical and Electronics Engineers (IEEE).

In February 2001, 17 software developers met at The Lodge, Snowbird, and Utah resort to discuss lightweight software development methods. They published the Manifesto for Agile Software Development to define the approach now known by the same name. Some of the manifesto's authors formed the Agile Alliance, a nonprofit organization that promotes software development according to the manifesto's 12 core principles.

In September 2012, the International Organisation for Standardisation published "ISO 21500:2012, Guidance on Project Management". It is the result of five year's work by experts from more than 50 countries. The standard is designed for use by any organization, including public, private or community groups, and for any project, regardless of complexity, size and duration.

3.1.3 Classification of projects

Projects implemented in various fields, different specialists are significant differences between them. Therefore, the choice of a particular approach to the management of a specific project you first need to understand the peculiarities of the given type, or the type of project.

“Classification by field of activity (type of project):

1. Technical (construction of a building or structure, the introduction of a new product line, software development, etc.).

2. Organizing (reform of existing or creation of new enterprises, the introduction of a new control system, an international conference, etc.).

3. Economic (the privatization of the enterprise, the introduction of financial planning and budgeting system, the introduction of a new tax system, etc.).

4. Social (the reform of the social security system, social protection of vulnerable layers of the population, overcoming the consequences of natural and social unrest).

5. Mixed (projects implemented in several areas – for example, the company restructuring plan, including the introduction of financial planning and budgeting system, the development and introduction of special software, etc.).” (Abdikeyev, 2010)

Classification by dimensions (class project):

Monoproject – individual projects of different types and purposes, having a specific purpose, clearly defined the scope of finance, resources, time, quality, and involves the creation of a unified project team (investment, innovative and other projects).

Multiproject – complex project, consisting of a series monoproject and requires the use of a multi–project management (reform of the existing and creation of new enterprises, the development and implementation of in–house multi–project management system).

Mega project – target programs of development of regions, industries and other entities, including in its membership a number of mono – and multiprojects, i.e. megaproject can be characterized as a program of projects – complex projects, united by a common purpose. (Abdikeyev, 2010)

Classification in terms of project financing (scale of the project):

In terms of financing projects can be divided into small, medium and large. Depending on the industry, the scope of activities of the Executive of the company and the country in which the project is being implemented, funding levels for the projects of the same type will be significantly different.

In the Russian practice to small projects include projects with funding of up to \$200–300 thousand, and the projects with funding of more than \$10–15 million, already referred, usually to large.

Classification by the project purpose (purpose of the project):

–Investment: the main objective – the creation or renewal of fixed assets of organizations that require investment.

–Innovation: The main objective – development and application of new technologies, organizational innovation, know–how and other innovations, ensuring the development of organizations.

–Research.

–Training and Education.

–Mixed. (Abdikeyev, 2010)

Classification by duration of the project (project duration):

–Short–term – up to 1 year.

–Medium–term – from 1 year to 3 years.

–Long–term – more than 3 years.

Classification by level of difficulty (the difficulty or complexity of the project):
Simple, Complicated and Very complicated.

Classification by geography:

- The project is implemented within any city.
- Regional project.
- International project.

Classification as to the enterprise, projects can be External and Internal.

Classification by the level of organization (within the company):

- Local – on the level of the structural unit, the branch office.
- Corporate – at company level as a whole.

These types of classification can be found in the book: Information Management by Abdikeyev N. M.

3.1.4 Brief history of agile.

In February 2001, 17 software professionals published a manifesto that was based on some light weight processes (iterative and incremental like SCRUM, XP etc.) formally known as “manifesto for agile software development” to define the approach agile software development. The “Agile manifesto” includes 4 values and 12 principles. Some of these authors established a non-profitable organization named as, “Agile Alliance” that promotes Agile software development 5. Each Agile methodology applies the four values in different ways, but all of them based on them to guide the development and delivery of high-quality, working software.

The Four Values of The Agile Manifesto according (<http://agilemanifesto.org/>):

- *Individuals and interactions* over processes and tools;
- *Working software* over comprehensive documentation;
- *Customer collaboration* over contract negotiation;
- *Responding to change* over following a plan.

As can be seen from the Agile values, creators are not denied the right part of the sentence, they attached more importance to the left side than the right. Based on the values presented above, Agile 12 principles were formulated and presented in “Agile Manifesto”.

The “Agile Manifesto” had defined 12 principles which are as follows (<http://agilemanifesto.org/>):

P1: *Customer is everything increases his satisfaction by rapid delivery of software;* provide him modules of his desired software as soon as possible.

P2: *Welcome and inclusion of late changing requirements;* try to respect most of the coming requirements and try to mold the requirements easy to implement.

P3: *Continuous delivery of working software (in small time periods);* deliver software modules in weeks or months so customer can see development process is going on.

P4: *Enhancement of technical excellence and good design by keeping continuous attention;* keep an eagle eye on whole process and make it more effective.

P5: *Simplicity is essential;* software development process should be less complex and adaptable.

P6: *Progress measurement through working software;* working software is always most well-known measurement parameter.

P7: *Face to face communication is the best communication;* because it provides un-manipulated ideas.

P8: *Develop projects in healthy environment with trustworthy motivated employees;* these employees know their duties very well always show cooperative nature.

P9: *Have self-organizing teams;* self-manageable and self-decision makers for small changes.

P10: *Self judgment at regular intervals to become more effective;* managers should judge themselves as well as their development process for adapting advancements.

P11: *Sustainable development, ability to maintain a constant pace;* Try to escape from situations like – “do half of projects in three months and then forget it for a year”.

P12: *Co-operation between developers and business persons;* all developers and managers should understand that only with their combined efforts they can lead towards success.

Practical methodologies and frameworks, which were based on the values and principles of Agile, came next. Currently, the choice of such methodologies is quite extensive.

3.2 Overview of project management methodologies

There are many methodologies for project management. It is not possible to describe them all within the framework of one thesis. Below, the main points of the traditional management model and agile project management methodologies will be described. The reason for this choice of methodologies is determined by the goal, to compare the proposed methodologies in the framework of writing the thesis.

3.2.1 Description of traditional methodologies

The basic idea of traditional approach is that projects are relatively simple, predictable and linear with clearly defined boundaries which all makes it easy to plan in detail and follow that plan without much changes (Andersen, 2006; Boehm, 2002; Boehm & Turner, 2003; Cicmil, Cooke–Davies, Crawford & Richardson, 2009; Collyer, Warren, Hemsley & Stevens, 2010; DeCarlo, 2004; Leffingwell, 2007; Saynisch, 2010; Shenhar & Dvir, 2007; Williams, 2005; Wysocki, 2007). The ultimate goal of the traditional project management approach is optimization and efficiency in following initial detailed project plan, or, having said in usual way, to finalize project within planned time, budget, and scope (DeCarlo, 2004; Shenhar & Dvir, 2007; Wysocki, 2007).

Traditional project management methodology can be used in all sectors, but is most common in the construction industry. It is also known as a cascade or waterfall model, due to the fact that it offers a sequence reminiscent of the flow of phases. The methodology identifies seven successive stages of project management:

1. Determination of requirements.
2. Design.
3. Implementation (construction, production ...).
4. Introduction.
5. Testing and Debugging.
6. Setting.
7. Operation and maintenance.

The transition to the next phase of the project is only possible if the previous step is completed and accepted by the customer. The usage of this methodology is the most

preferably in the projects which is the result of a material product (for example, construction projects, installation of equipment, etc.). And for the implementation of which requires a specific sequence of actions. In addition, the plans drawn up may be re-used for similar projects in the future.

However, on the other hand, the cascade model of project management requires investment in planning. Usually the first two phases occupy between 20 and 40% of the total time of the project on the methodology. Due to the structured approach, changes in the scope of work is slow, which makes the methodology is not responsive and not appropriate in cases where the client is not sure what he wants to get the result.

3.2.2 Description of Agile approach

Agile software development is a set of iterative and incremental software engineering methods that are advocated based on an “agile philosophy” captured in the Agile Manifesto (Fowler and Highsmith, 2001). While mostly repackaging and rebranding previously well-known good software development practices, the agile movement can be considered as an alternative to so called traditional software development methods.

Traditional methods focus on up-front planning and strict management of change, but agile methods were designed to accept and efficiently manage change (Highsmith and Cockburn, 2001). Agile methods have been both criticized and advocated, and research has shown that accommodating change may be a factor in both success and failure (Boehm, 2002). It has been shown that agile methods have improved satisfaction of both customers and developers, but on the other hand there is evidence that agile methods may not be a good fit for large undertakings (Dybåand Dingsøy, 2009). A proposed solution is that each organization seeks its own balance of agile and plan driven methods (Boehm, 2002). Two of the most popular agile methods are Extreme Programming (XP) and Scrum (Hamed and Abushama, 2013). Scrum is a method focusing on the project management viewpoint of agile development (Schwaber and Beedle, 2002), prescribing time boxing, continuous tracking of project progress, and customer centricity. The XP development method is a collection of practices for enabling efficient incremental development (Beck, 1999). In practice, many agile development implementations combine the two in some way (Fitzgerald et al., 2006).

Agile methods are "methods that are trying to focus on the primary objective of effective software development, i.e. the creation of working software (without defects)"(Hunt, 2006).

Next we will talk about the most popular practical methodology Scrum. The Scrum method was firstly defined by Ken Schwaber in his first book “Agile Development with Scrum” which was published with Mike Beedle (Sutherland, 2010).

This methodology is used in software development. Schwaber noted the Scrum feature that in the beginning the vision of the final product has to be declared. The vision might be vague at first, after during the project it will become clearer as the project moves forward (Schwaber, 2003).

In this methodology, it is very important to honor the roles identified in The Scrum Guide. Schwaber and Sutherland identified three main roles in Scrum projects:

1. Product owner;
2. Scrum master;
3. Development team.

The creators of the Scrum methodology defined the features and responsibilities of each key role in the project.

Schwaber and Sutherland defined the Product Owner as responsible person for maximizing the value of the product and the work of the Development Team, how this is done may vary widely across organizations, Scrum Teams, and individuals. (Schwaber, 2016)

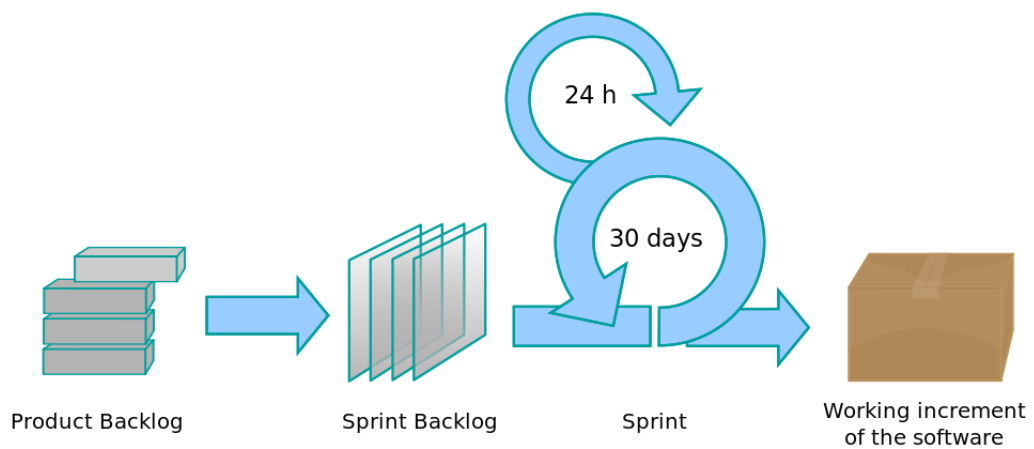
Schwaber and Sutherland also believed that the Development Team consists of professionals who do the work of delivering a potentially releasable Increment of “Done” product at the end of each Sprint. Only members of the Development Team create the Increment.

Schwaber in his works noted the importance of the position of Scrum Master. Schwaber and his colleague determined that “Scrum Master is a servant-leader for the Scrum Team. This person helps those outside the Scrum Team understand which of their interactions with the Scrum Team are helpful and which are not. The Scrum Master helps everyone change these interactions to maximize the value created by the Scrum Team.” (Schwaber, 2016)

Also a very important concept in Scrum is the sprint. Schwaber and Sutherland defined “Sprint as a time-box of one month or less during which a “Done”, useable, and potentially releasable product Increment is created. Sprints best have consistent durations throughout a development effort. A new Sprint starts immediately after the conclusion of the previous Sprint. Sprints contain and consist of the Sprint Planning, Daily Scrums, the development work, the Sprint Review, and the Sprint Retrospective.” (Schwaber, 2016)

Simplified development process using Scrum is shown in the figure below. The tasks are created and recorded in Backlog, then Sprint Backlog is compiled and the sprint begins. Sprint lasts up to 30 days. Every day there are 15-minute meetings, where team members share the results of the previous day. At the end of the sprint, the team gets the working increment of the software. A more complete description of Scrum is given in the thesis "Agile Methods in Project Management" by Petr Hradil.

Figure 1 Scrum Process



Source: <https://habrahabr.ru/post/247319/>

Sutherland noted that Scrum belongs to the Agile family, so Scrum welcomes changes in requirements at any time (Product backlog can be changed at any time). This makes it difficult to use Scrum in fixed-cost/fixed-time projects. Ideology Scrum argues that it is impossible to anticipate all changes in advance, so it makes no sense to plan the

entire project, limiting ourselves to just-in-time planning, i.e., plan only the work that needs to be done in the current Sprint. (Sutherland, 2010)

3.2.3 Metrics for project evaluation

There are many ways to evaluate the project, but not all of them are suitable for agile projects because of the design features of the project. The metrics for evaluating Scrum projects will be discussed below. Christopher W. H. Davis in his book "Agile Metrics in Action: Measuring and Enhancing the Performance of Agile Teams" described a large number of metrics applicable to Agile. Dave Nicolette also described the metrics. In his book "Software Development Metrics" he described popular metrics for software development as a whole. The following are the metrics and explanations, according to the authors mentioned above.

Accuracy of estimation of the problem

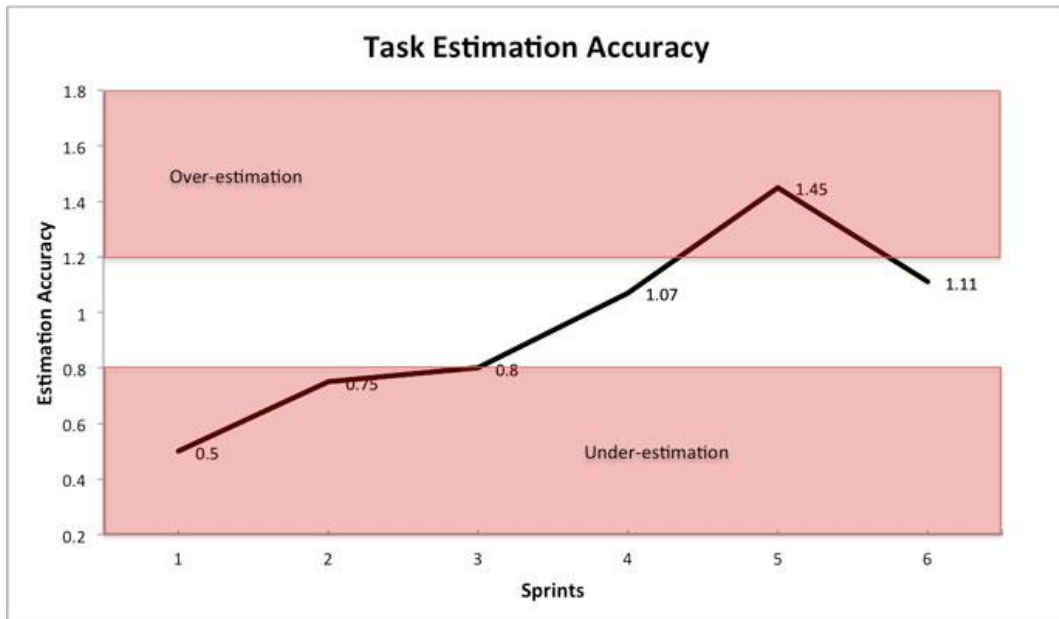
To calculate this metric, managers takes (The sum of the 'initial estimates' of all problems) divide by an amount of (The sum of the 'completed time' for all tasks) and (The amount of 'remaining time' for all tasks). (Davis, 2015).

This metric can be generated at the end of the sprint and at the end of the project or also it can be generated every day. Note that some companies like to keep track of the 'completion time' for tasks. The ability to generate this metric is another reason for keeping track of the 'completion time' for each task.

This metric shows how well the team evaluates more detailed pieces of work. If received value is 1, your scores are accurate, > 1 says that you overestimated.

The estimates obtained will never be a guarantee, but we must try to narrow the gap between assessment and reality. With this metric, we can track where the team has re-underestimated. Then next time, when we will make assessments, it will be possible to make adjustments, and, thus, take these identified factors into account.

Graph 1 Task Estimation Accuracy



Source: [http://agilerussia.ru/practices/scrum-metrics/\(1.11.2016\)](http://agilerussia.ru/practices/scrum-metrics/(1.11.2016))

As can be seen from Graph 1, in the first sprint the team underestimated team work, but hit the target in sprints 2, 3 and 4. Team overestimated in sprint 5, but teammembers put everything in its place in the sprint 6.

Impact of difficulties

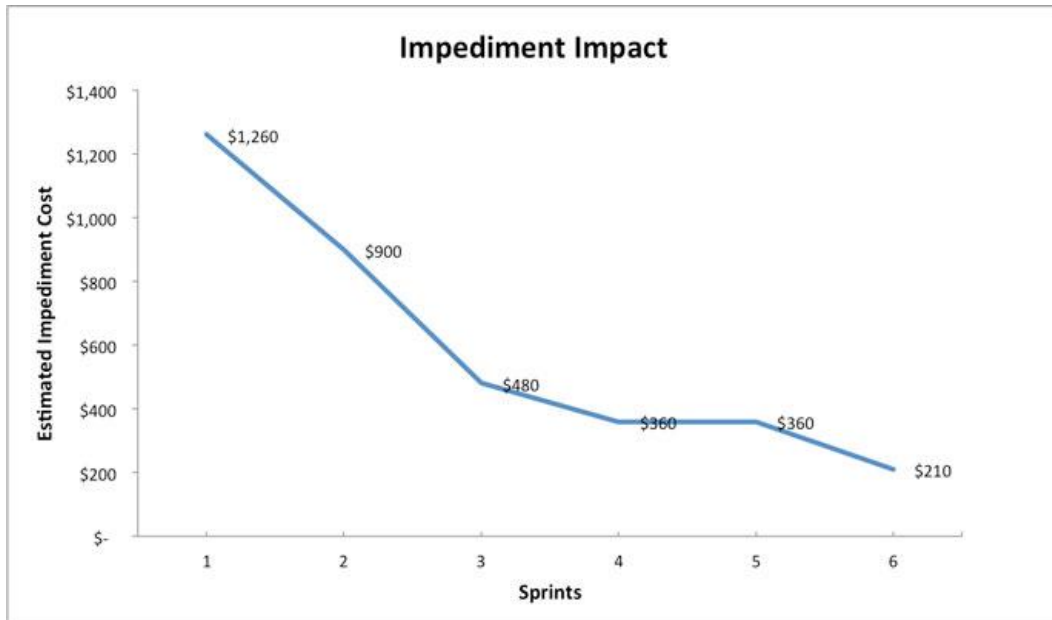
To calculate this metric, managers multiply (The amount of 'time spent' on all difficulties during the sprint) by (Hourly pay for a team member on average). (Nicolette, 2015)

This metric can be generated at the end of each sprint.

The metric of Impact of difficulties points to threats in the project and possible causes of delays.

How do we influence it? - When there is a clear idea of how much time the project takes trouble, it is easier to calculate the real costs/impact. This presentation in terms of money gives a powerful weapon to Scrum Master. It allows you to convince business to help remove these annoying difficulties in future sprints.

Graph 2 Implement Impact



Source: [http://agilerussia.ru/practices/scrum-metrics/\(1.11.2016\)](http://agilerussia.ru/practices/scrum-metrics/(1.11.2016))

It can be seen from the figure above that as soon as the amounts began to appear, which go to difficulties, the number of difficulties began to fall precipitously.

Burn Down chart

“The Burn Down Chart can be used to show outstanding work for a release or for a sprint and in both cases, the chart represents the amount of work remaining for the completion of the release or sprint versus time.” (Proulx, 2009).

To calculate this metric, managers takes (Total time for all tasks completed during the sprint) plus (Total time for all difficulties) and minus (Total time of assessments for the sprint tasks).

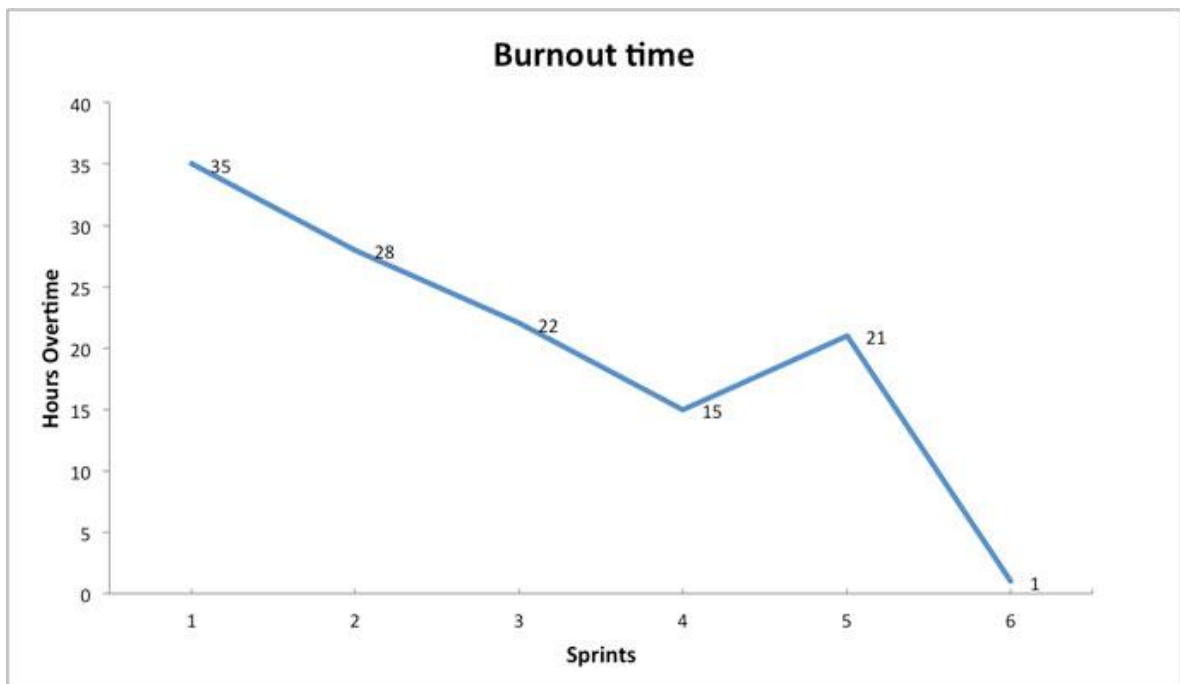
This metric can be generated at the end of each sprint.

The resulting burn down diagram looks perfect, but it does not mean that you have no difficulties, and that the team has everything perfectly appreciated. On the contrary, this may mean that the team is working until night and switched to overtime. Perhaps it looks like a noble crusade, but here there is an effect of masking your problem, this leads to team burn-out and suboptimal work. If your result > 0 , then your team spends more time than

expected. This is normal, if it happens sometimes, i.e. closer to the end of the project. But if the burn time is always great, you guarantee that your quality and morale begin to fall.

Achieving goals by overtime is a symptom of sloppy estimates, or too much difficulty or change of work schedule. Track with this metric what problem led to overtime, and start working with the causes, not with the symptoms.

Graph 3 Burnout time graph



Source: <http://agilerussia.ru/practices/scrum-metrics/>(1.11.2016)

It can be seen from the Graph 3 above that as the team's ratings get better, additional working hours are reduced. There was a small spike in the fifth sprint, but we took it under control in the sixth. In general, the trend is good.

Average speed

To calculate this metric, (The sum of all 'sprint rates) divided by (Number of sprints).

This metric can be generated at the end of each sprint.

Metric shows the size and number of user stories (and /or other product backlog items) that the team makes on average in a typical sprint.

Estimated time of delivery

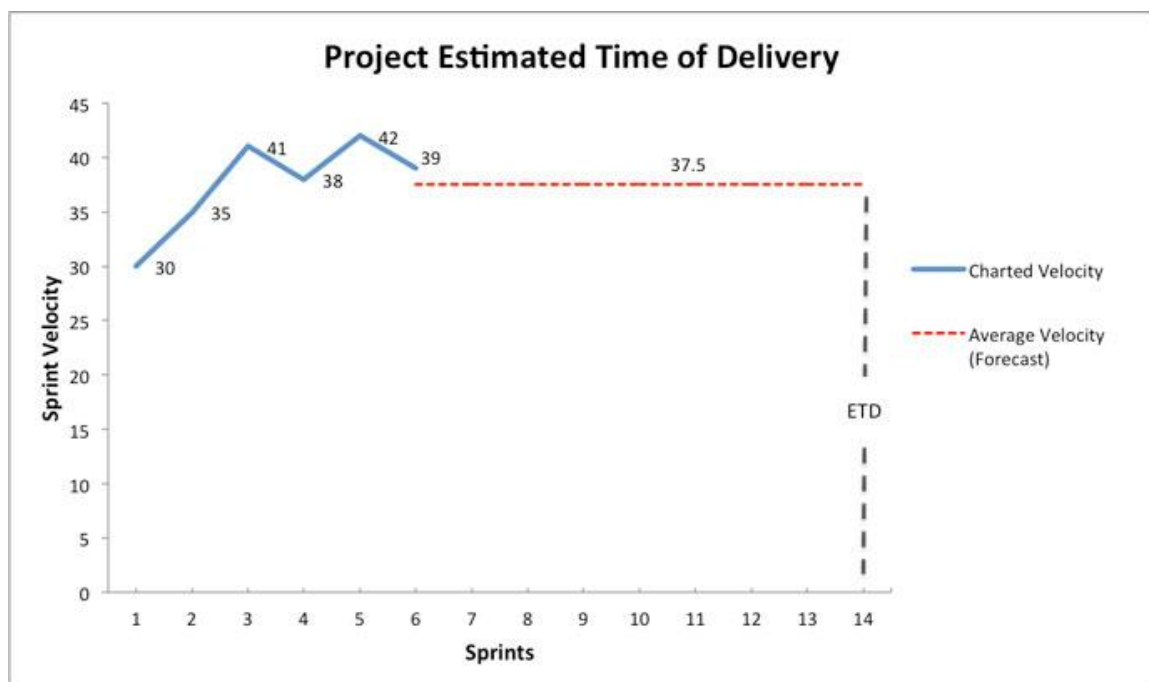
“To calculate this metric, you need to take (The total number of remaining story points in the product backlog) is divided by (Average speed).” (Nicolette, 2015)

This metric can be generated at the end of each sprint.

This metric gives us a rough estimate of when the entire backlog will be done, based on the average speed of the team.

This metric gives us the value of the time variable, so if necessary, we can adjust one or more additional variables. Remember the 'iron triangle' of project management, consisting of variables - time / quality / project scope / resources. Since we do not need to change the 'definition of done' (quality) and resources (in order to maintain team stability), in reality this metric tells us whether or not to narrow or widen the scope of the project.

Graph 4 Project Estimated Time of Delivery graph



Source: [http://agilerussia.ru/practices/scrum-metrics/\(1.11.2016\)](http://agilerussia.ru/practices/scrum-metrics/(1.11.2016))

Graph 4 shows the real speed in sprints 1 - 6, for the work that we have already finished. At the end of the sixth sprint, we left 300 story points in the product backlog. Dividing 300 points at an average speed of 37.5 points for a sprint, we estimated that we will finish the work by the end of the 14th sprint.

There are many other metrics that could be generate, but beware of one of the syndromes that Scrum is trying to cope with, this paralysis is an analysis. The metric should be used as a signal to help you make significant and useful improvements.

4 Own work analytical part

4.1 Comparison of “Agile” and “Waterfall” methodologies

This chapter is focused on the comparison and identification of the best applications of agile and traditional methodologies. Also in this part constructed a comparison model between traditional and agile methodologies.

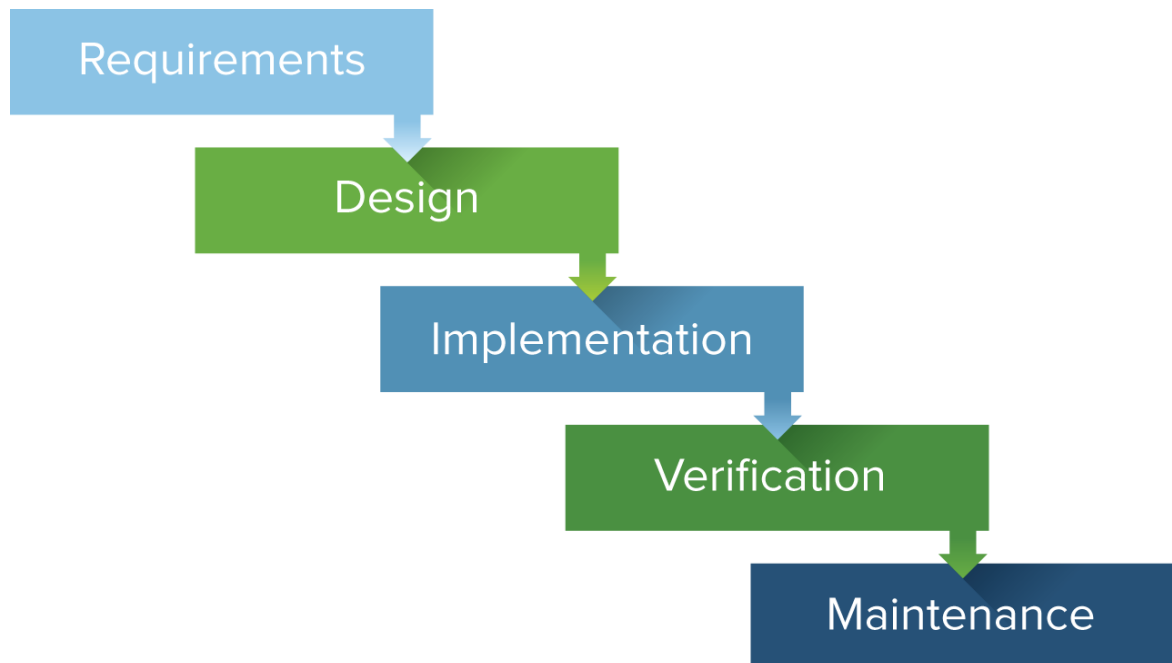
When comparing Waterfall and Agile, it is necessary to realize that Waterfall is an approach well described and detailed. But Agile is, rather, a set of practices and principles that somehow support various methodologies for flexible project development.

4.1.1 Traditional model

The Traditional or cascade (further Waterfall) model associated with the manufacturing and construction industries, both highly structured environments where you cannot easily change something or it can be too expensive or sometimes impossible. The first formal description of Waterfall is attributed to Winston W. Royce in a 1970. Herbert D. Benington criticized this model and believed that in life everything works differently and cannot be all perfectly planned, he also argued that in the real world, an iterative process occurs anyway.

The waterfall model can be graphically represented as Figure 2.

Figure 2 “Waterfall” model



Source: <https://www.smartsheet.com/agile-vs-scrum-vs-waterfall-vs-kanban>

The figure above shows the algorithm of the cascade model of project management. This model is straightforward.

After studying the Waterfall methodology of project management, advantages and disadvantages of traditional model can be defined. The following statements apply for software development projects.

One of the main advantages of the waterfall model is the detailed structure, which facilitates the application of this model to inexperienced teams. Just because of the clear structure, projects using this model are easily controlled. It is convenient to monitor the resources, risks and time of the project.

The advantages include:

- Easy to use and manage;
- Discipline is enforced;
- Requires a well-documented approach.

On the other hand, the rather strict structure of the model does not allow anything to be changed when the project is launched. From this point of view, it can be said that the weak point of the waterfall model is the need to clearly define the customer's requirements

prior to the start of the project. This fact indicates that the end user has no influence on the project, on its goals and requirements. Also worth noting is the high price of making changes to the project. This circumstance is very important, because errors and problems can be identified to the testing phase, which is a rather late stage for the project and making changes. Similarly, adherents of the traditional model lead a large number of related documentation, spending a lot of useful time on it.

The disadvantages include the following items:

- Changes can't be easily accommodated;
- Software isn't delivered until late;
- Gathering accurate requirements can be challenging.

The main field where the waterfall model shows itself perfectly is construction or other spheres where the sequence of actions on the path to achieving the result is very important.

Currently, the "waterfall" model is widely used in such areas as construction, mass production of something in large plants, as well as in any projects where careful planning and strict control at all stages of the project is necessary. In such projects, the waterfall model is excellent.

In IT, Microsoft is the most famous company, which still uses the traditional approach to project management. This is due to the good automation of development processes and the need to maintain detailed documentation.

In general, the waterfall model is an excellent management methodology, which has a large number of good practices. This model is excellent for industrial projects, construction and any other, which can be planned in detail.

4.3.2 “Agile” model

Agile itself does not apply; instead there are practical project management methodologies that are built on the basis of agile. This is can be visualized using Agile umbrella. As you can see from the figure below, Agille combines many practical methodologies, such as Scrum, Kanban, Crystal and others.

The picture below shows the Agile Development Cycle. Here are the phases in the Agile development cycle. Many of these phases happen in parallel. It's important to note

that these phases are not happening in succession. Phases of cycle are flexible and always evolving.

Figure 3 Agile development cycle



Source: <https://www.smartsheet.com/agile-vs-scrum-vs-waterfall-vs-kanban>

As you can see from the figure above, Agile is not a straightforward process. Agile evolved from different light approaches of software development in the 1990s and is a response to some project managers' dislike of the fixed, linear Waterfall methodology. It focuses on flexibility, continuous improvement, and speed.

A distinctive feature of Agile methodologies is the iterative approach to solving the problem. This approach implies cyclicity between the phases of planning, implementation, verification and evaluation. This cyclicity reduces the impact of serious risks at an early stage of the project and minimizes the costs of eliminating errors. Also, iterative approach helps to organize effective feedback between the development team and

the end user, which simplifies understanding of customer requirements and project adaptation.

Another feature of Agile is the user's involvement in the development process from the very beginning of the project. This feature allows developers to more precisely distinguish the necessary product features for the user. Thus, developers can more accurately prioritize tasks.

It is also worth noting that when using Agile approach due to the provided iterations in the development and subsequent adjustments, the product can change after next iteration. Such changes have minimal impact on the cost of work, in contrast to the traditional methodology, where only after the final assembly the user can try out the product and notice the flaws. Usually in such cases, changes can be either very expensive or impossible due to some features and technologies.

The advantages include:

- Change is embraced;
- End-goal can be unknown;
- Faster, high-quality delivery;
- Strong team interaction;
- Customers are heard;
- Continuous improvement.

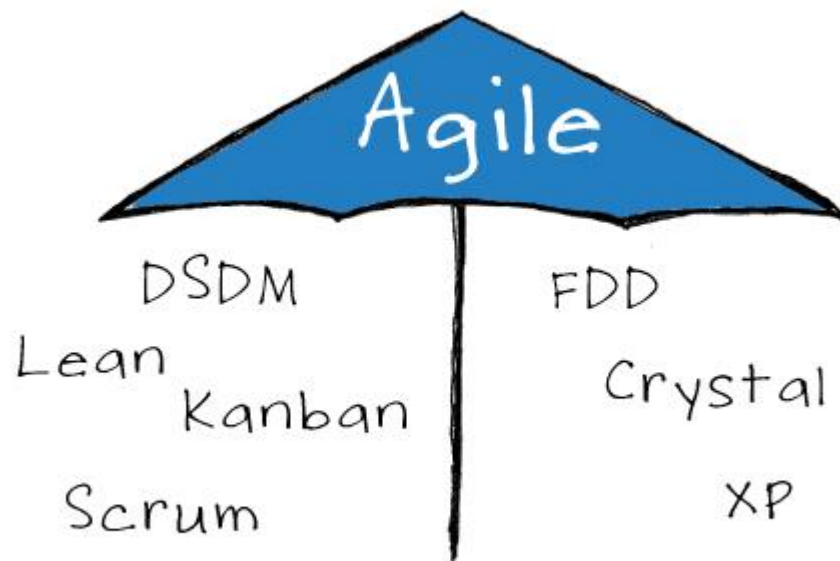
It is important to note that agile principles are about making a team. This statement indicates that using agile methodologies each member of the team can independently make decisions and be responsible for the decisions made. This feature indicates that team members should be professionals in their business, which will allow them to make effective decisions.

Disadvantages include:

- Planning can be less concrete;
- Team must be knowledgeable;
- Time commitment from developers;
- Documentation can be neglected;
- Final product can be very different.

As noted earlier Agile is a system of values, not a practical methodology. Practical methodologies such as Scrum, Kanban, Extreme Programming, Crystal and others, are based on the principles and values of Agile Manifesto. This situation can be represented as "Agile umbrella" in Figure 4.

Figure 4 Agile “Umbrella”



Source: <https://www.agilizing.us/agile-coaching-sta-je-kome-treba/>

Scopes of implementing agile methodologies are software, commercial software, where is important to find functionality for customers in the shortest time.

Herman Gref, president of “Sberbank”, notes: "Earlier Agile was a way of writing code, but today it is a way of existence for all organizations. The requirements change so quickly, the world changes so quickly. And we make so many mistakes in traditional technologies that we cannot put up with this. In order to raise the speed radically, it is necessary to change the entire control system and the entire system of our work with you."

Agile software development was born from the principles of Lean manufacturing and organizational learning. These ideas weren't based on software to begin with. And, many

practices in Agile, like stand-up meetings or visual management, can be applied to any industry.

There are few examples of applying agile approaches outside the IT sphere. Nevertheless, several examples are known where agile methodologies are used in different spheres of human activity.

First example, Kate Sullivan, a corporate lawyer on The Lonely Planet legal team, has transformed the legal affairs service delivery with Agile approach. The team uses whiteboards and cards, morning stand-up meetings, task prioritization, weekly iterations and regular retrospectives.

Agile could definitely be applied to projects outside of software development. Companies just have to find the right method and approach for your needs. It is possible to start with boards and cards, a work backlog, stand-up meetings, or iterations (weekly planning meetings) to see how your team responds.

It is also known the usage of agile approaches in education. Teaching children by Agile methodology.

There are three main areas of application of Agile in education:

- Agile in the development of training products;
- Agile-learning: the formation of an individual educational trajectory;
- Agile as a pedagogical technology.

Dutch educators from the city of Alphen-an-den-Rein were the first to apply the agile approach in school education. Business community in Holland support such initiative, there is now a special fund “eduScrum”, which informs teachers and schools about this methodology. The following experience was written by Jeff Sutherland in his book "SCRUM. The revolutionary method of project management", and now such advanced schools are beginning to appear in other countries.

Another area where you can pay attention to the values and principles of Agile is the public administration. Of course, first you need to adapt Agile to this area. On the one hand, planning in public administration is very important and everyone knows the long-term plans, which may lose relevance by the middle of their life cycle. Agile approach will allow the state to receive instant feedback on their actions and adjust them according to the needs of the population.

The same agile approaches are actively used in the banking sector. So famous "ING Bank" implements agile in its projects. Also, the management of "Sberbank" makes attempts to rebuild the work of the IT department under agile approaches.

Google, Netflix and Spotify are quite large and successful companies that widely use Agile methodologies in their work. This allows them to quickly adapt to the requirements of the rank and technical progress. Due to these qualities, Google finds the new market segments faster and gets their share.

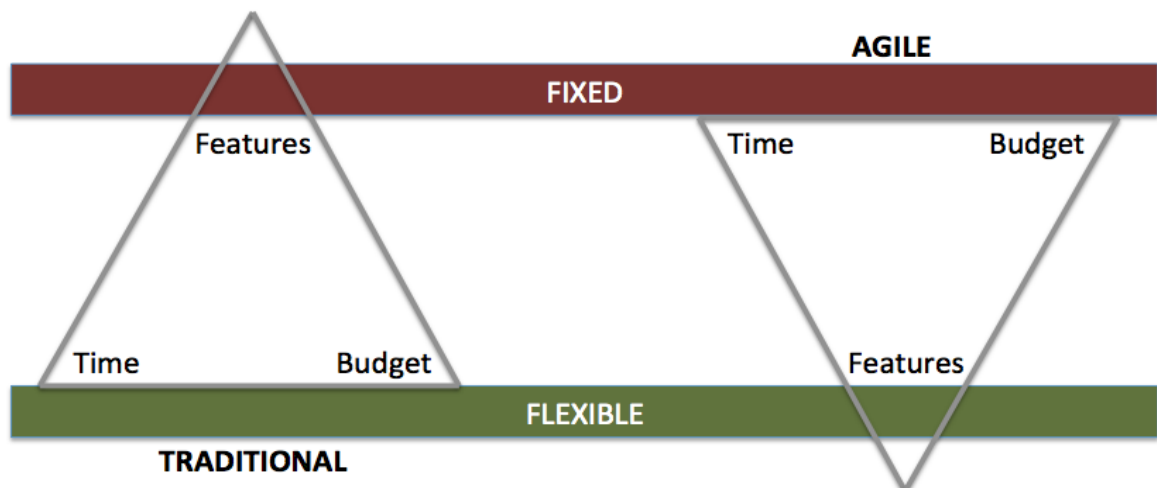
Despite all the advantages and dignities of Agile, there is no need to apply this approach wherever possible. There are many projects that are perfectly implemented by the waterfall methodology, where there are good practices. In such projects, the use of agile is inexpedient and not justified.

4.1.3 Comparison of methodologies

This part of the diploma contains information about the comparison of the traditional approaches to management with agile methodologies, to identify significant differences between them and select the scope of agile methodologies.

Comparing the traditional model with Agile, necessary to remember about Iron Triangle Paradigm (Figure 5).

Figure 5 Iron Triangle Paradigm



Source: <http://www.solutionsiq.com/3-paradigm-shifts-of-agile/> (10.01.2017)

As can be seen from the figure above, in the traditional methodology, the number of features is fixed, and time and budget are flexible. In agile methodologies, on the contrary, the time and budget are fixed, and the number of features is flexible. This situation works under ideal conditions. In practice, in projects with a flexible methodology, there are problems with the correct evaluation of time and budget, which turns time and budget into flexible.

The Agile concept in many cases makes the interaction between management and development more close and productive.

Therefore, the answer to the challenges of the ever-changing IT market can be precisely the finding of an optimal balance between the development methodology, the adjustment of the business model, the concept of promotion and management.

It is worth noting that some practical agile methodologies are oriented towards "killing" non-viable and irrelevant projects. With this approach, unnecessary projects do not move beyond the initial stages. This circumstance allows not to spend resources, time and money on a project that will not be of interest to anyone, which reduces the risk of the customer to go bankrupt or lose a significant amount of money. Unlike Agile, when using a cascading model of project management, the user will receive the product at the final stage of the project. This is due to the specifics of this methodology.

Differences between "Waterfall" model and Agile methodology can be summarized in two words: Fixed and flexible. "Waterfall" – a much strict, hard process, while Agile flexible and constantly evolving. Here's how they differ:

"Waterfall" is a structured process that does not start a new stage until the previous is completed. On the other hand, Agile is a flexible process that enables navigation within the project as you like.

Agile model is consistent and not a linear process.

Waterfall projects usually include certain requirements in advance, while demand is expected to change and will be developed in Agile projects.

Waterfall projects cannot be changed what has been done in the previous steps, while Agile very well suited for change.

Among agile and waterfall little in common; Agile was created specially as a waterfall opposite. However, you can say that Agile and Waterfall have the same goal. Both want to effectively deliver quality products.

Given that the Waterfall model is very different from Agile methodologies, it was decided to highlight the strongest and most significant differences in methodologies. The result is presented in Table 1.

Table 1 The strongest differences between the waterfall and agile

	ADVANTAGES	DISADVANTAGES
Waterfall	A clear and simple process structure, convenient for teams with little experience.	Requirements are defined and fixed at the very beginning, which deprives the process of developing flexibility.
	Qualitative and detailed documentation.	The project spends more time and resources.
	In the project, you can easily track the resources, risks and time spent.	The client sees only the finished product; it is extremely difficult to change anything.
	The tasks of the product are stable from start to finish.	Absence of feedbacks between the stages of development.
Agile	Adjustments to functional requirements are built into the development process to ensure a competitive advantage.	It is impossible to calculate the exact amount of work due to constantly changing requirements.
	The project is divided into short and transparent iterations.	Since Agile is more a philosophy than a process, it is necessary to dive into the system and accept it, which is not required for every project.
	Minimizing risks through a flexible process of making changes.	The team must be highly skilled and experienced, customer-oriented.
	Quickly get the first working version of the product.	New requirements may conflict with the existing architecture or functionality.
	Less improvements due to continuous testing and customer involvement.	With all the adjustments and changes, there is a risk that the project will never end.

Source: Author

Speaking about comparison of methodologies, do not forget that Agile is widely distributed in software development projects. It is also necessary to take into account existing practices and statistics. In 2015, the Standish Group published the Chaos Report,

which compares Agile and "Waterfall" IT projects outcomes. Below is the table from this report.

Table 2 Comparing the success of projects

Size	Method	Successful	Challenged	Failed
All	Agile	39%	52%	9%
	Waterfall	11%	60%	29%
Large	Agile	18%	59%	23%
	Waterfall	3%	55%	42%
Medium	Agile	27%	62%	11%
	Waterfall	7%	68%	25%
Small	Agile	58%	38%	4%
	Waterfall	44%	45%	11%

Source: altogetherAgile.com

From the table above it is clear that agile projects are more successful for any dimension of the project. It is also evident from the table that small projects are almost equally successful both with the use of Agile and using the Waterfall methodology. This is due to the short duration of the project, which can be more carefully planned.

Comparatively low success of IT projects using Waterfall methodology is due to the fact that this approach does not have frequent and open feedback loops. As General Stanley McChrystal notes, in *Team of Teams: New Rules of Engagement for Complex World*, "Efficiency remains important, but the ability to adapt to complexity and continual change has become an imperative". (McChrystal, 2015)

Customers of IT projects from countries of the post-Soviet space prefer to use a cascade model when ordering a project. First, the awareness of these countries about technology and any new approaches to project management is not enough. The benefits of using the iterative model of the project life cycle, which underlies all agile approaches to project management, are not very clear to many customers. But the key minus is obvious:

the customer cannot get a list of requirements to the project result at the start of the project. This list in agile is updated in the course of the project, and changes are made to it until the end of the project. And here the customer is triggered by a sense of danger: if we do not prescribe all the requirements for the result at the start of the project, then the performer will accurately make us not the product that we expect, and the project terms and budget will end there.

It is also worth noting that the absence of a person who assumes responsibility for the quality of the project does not inspire confidence in the customers. This leads to the desire of customers to give the project to the executor "on a turn-key basis" and not to spend on the project their precious time. And when using agile it does not work out that way - the customer representative should spend at least 5-10 hours every week on the project, otherwise the agile project will not take off. Also, many customers have a lack of trust in the professionalism of the performer. After all, the team working on agile should help the customer in the course of the project to understand what the most priority requirements should be implemented in the product and, most importantly, correctly implement these requirements, so that the product of the project becomes operational and the project goals are achieved.

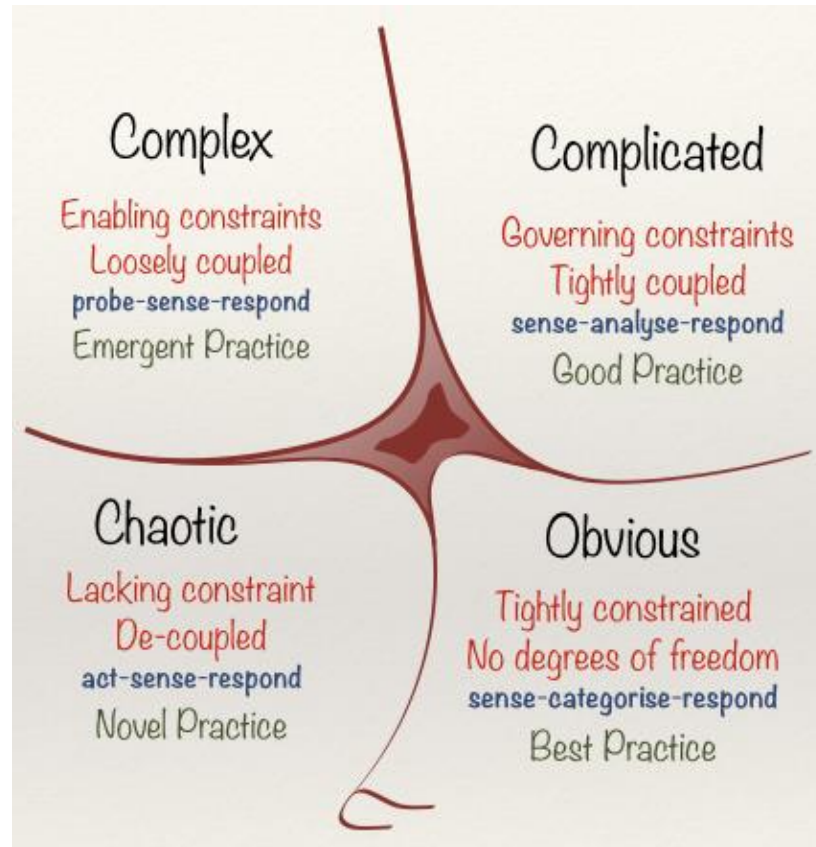
4.2 Choosing the appropriate management methodology for the project

Choosing the appropriate methodology for project management is a very important stage. Many managers in the choice of methodology are guided by the company's internal policy. It means that, if the company uses a waterfall model, then the managers of this company will continue to use the same model. Any attempts to change the methodology will be met negatively. The same situation with flexible methodologies, the agile approach is used in many IT projects. But is it justified? Let's say the essence of the project is clear to everyone and there is a clear idea of how to do it, then there is no need for flexibility and you can use the waterfall model to manage the project. Many managers and developers are obsessed with one methodology and prefer to work on it.

Dave Snowden developed and offered the Cynefin framework. Cynefin proposes four decision-making contexts – simple, complicated, complex and chaotic those enable

managers to identify how they feel situations, and to make sense of their own and other people's behavior.

Figure 6 Cynefin model



Source: <http://www.leaninfo.ru/2015/04/03/kak-upravlyat-predpriyatiem-v-usloviyah-krizisa-i-neopredelennosti-model-kenevin/> (20.02.2017)

Cynefin framework is a decision-making method based on the typology of phenomena. Dave Snowden, a native of IBM's Knowledge Management Institute, is a consultant and expert who became world famous in the early 2000s. "Cynefin" is one of the leading frameworks in complexity theory that won the Academy of Management awards, as well as those mentioned on the cover of the Harvard Business Review in November 2007.

Cynefin framework has been widely used since 2003 by foreign companies and its main feature is to make previous experience a major assistant, not a dogma and the only

true solution for transforming management systems. Snowden suggests that the organization be viewed as a complex adaptive system that is continuously evolving and always in a certain unique state that requires managers to make new ideas and decisions.

Based on this model, most of the projects can be classified and appropriate management methodology be chosen for them.

The manager can use the waterfall model if the projects are suitable for the categories Obvious or Complicated. This approach will ensure a smooth progress of the project and compliance with the already existing algorithm due to existing best practices and good practices.

If the project fits into the concept of Complex, it's worth using agile methodologies. The use of agile methodologies is due to the probe-sense-respond approach. This approach provides quick adaptation to the complexity of the project, as well as a rapid response to changing desires, technologies and any other variables that affect the project.

Which methodology to use depends on the following several factors:

Nature of work: is there a clearly defined result? Website development is creative and therefore suitable for a flexible method. The development of a transactional system, where there is a well-defined result, is more suitable for a waterfall method.

Client type: whether it agrees to work iteratively, does it have time to check and comment on regular iterations?

Your manager's opinion: which method he prefers, how easily does he adapt?

The idea of IT in an organization: is IT perceived as a valuable partner or an inevitable evil? In the latter case, use the waterfall method.

Internal or external client: is your client internal or external? The waterfall method is suitable for external customers, from which you can demand compliance with a signed contract, unlike domestic customers, which can force you to make changes, having the support of management.

The project manager must choose the method that best meets the needs of the clients. The problem arises when there are disagreements. In such cases, choose the method that gives the best result, and pacify all those who do not agree.

Ultimately, both methods can implement your project. It's about managing your customer's expectations and producing a quality product. Once you reach the end of the path, no one cares how you have succeeded.

4.3 Summary

Based on the analysis above, recommendations were made about choosing an appropriate methodology for project management.

Agile development model is useful if:

1. The project involves an experienced team.
2. The final functionality of the product is still unknown, and changes must be made as quickly as possible.
3. The end user is "brewed" in the project from the very beginning.
4. It is necessary to quickly develop the working software.
5. This is a startup project.

Choose a Waterfall model in cases where:

1. The requirements for the project are stable and practically unchanged;
2. The quality of the product is much more important than the time and resources expended;
3. The project is developed on outsourcing;
4. The end user only accepts the result of the work, not participating in the process.

It is necessary to say that both models will help to realize project. First of all, project manager chooses an option that will allow him or her to make quality products and effectively manage company's budget.

It is also worth noting that the methodology does not exist at all in order to reduce the "overhead", or just increase the efficiency of the team. Methodologies are created to improve the manageability, predictability and effectiveness of project management.

Despite all the advantages and dignities of Agile, there is no need to apply this approach wherever possible. There are many projects that are perfectly implemented by the waterfall methodology, where there are good practices. In such projects, the use of agile is inexpedient and not justified.

5 Case study

This case study is conducted to study and analyze projects that were built by using agile methodologies and traditional in case mobile software development outsourcing company and make recommendations based on the result of the analysis. The analysis based on reports from JIRA system, which used for project management purposes and time tracking by PersiLab company. In the analysis of projects, the metrics described above will be used.

5.1 Organization

PersiLab – is a professional team of mobile developers, designers and managers, behind which are dozens of implemented projects, thousands of lines of code and only satisfied customers. Their mission is to make mobile applications that develop the business of company customers. The company was officially founded on December 5, 2015. Until this point, the director has been working as a mobile application developer in freelancing. First he took small projects, and then he improved his skills and took projects more difficult. So the director recruited a team and founded the company.

The company specializes in developing mobile applications. PersiLab also develops software for user devices and creates mobile applications for smart devices.

5.1.1 Organization performance

PersiLab company is included in the TOP 5 in the rating of mobile application developers in Krasnodar by end of 2016 year. They released 37 applications. Information presented on the site <http://www.ratingruneta.ru/apps/krasnodar/> (1.01.2017).

5.1.2 Finance performance

The financial performance of the company PersiLab cannot be calculated in full because of the lack of data provided. However, some financial indicators can be calculated. All indicators are relevant for the company in the period from January 1, 2016 to January 1, 2017.

According to the data provided, Revenue for the submitted period is approximately equal to 3854000 rubles. Net expenses are equal to 3564000 rubles. Thus, Net Profit is equal to 290000 rubles. Approximate growth of Net Profit is 24000 rubles per month. That is quite insignificant for the development and promotion of business.

Net Profit Margin for the analyzed period was at the level of 7.5%, which indicates a high competition in the mobile application development market in the Krasnodar region.

These indicators are typical for companies at the stage of start-up. The company had a slow start and a small number of projects at the initial stage. However, PersiLab is growing rapidly and developing competently in the mobile application market. The company's clients are not only in the Krasnodar region, but also in other regions of the country. That shows the company's orientation to the expansion of the client base and the lack of territorial barriers.

5.1.3 Team

PersiLab is a young and ambitious company in the mobile development market in the Krasnodar region. This small company is developing rapidly and growing.

At the initial stage, the company had 5 employees. Of these, 1 architect, 1 project manager, 1 iOS developer, 1 Android developer and 1 designer. The head decided to hire new employees after several successful projects.

At the moment there are 20 employees in the company:

- iOS developers – 7;
- Android developers – 5;
- Project Managers – 3;
- Testers – 2;
- Designers – 2;
- Architect – 1.

The company operates on the principle of full employment of its employees. It means that everyone always has tasks and work. Such approach ensures effective use of working resources and limits from idleness at work.

5.1.4 Project management

PersiLab company mainly uses agile methodologies for project management. This is due to the rapidly changing desires of the customer, as well as the convenience of obtaining early feedback from the customer. The company has experience in developing applications using agile methodologies, such as Scrum, Canban, Extreme Programming and Crystal. Also, the company is experienced in using traditional waterfall model in project management.

The stage of choosing project management methodology is very important. Each project is considering and analyzing separately. In general, project managers prefer iterative and incremental approaches. This is due to the specifics of the company's activities.

Evaluation of the project is very important and the company approaches this issue very carefully. The company is going to a meeting and assessing the requirements of the customer. Based on the data obtained, a summary table is compiled with estimates of time, complexity and priority. Next, the project budget is estimated based on the data obtained earlier. Also in the assessment of project implementation time include a time reserve for force majeure situations, difficulties and similar situations. Such analysis helps to more accurately determine the timing and budget of the project.

5.1.5 JIRA system

The system is based on Java EE and runs on several popular database management systems and operating systems.

The main element of accounting in the system is the task. The task contains the name of the project, the topic, type, priority, components and content. The task can be expanded with additional fields (also new user fields can be defined), applications (for example - photos, screenshots) or comments. The task can be edited or simply change the status, for example, from "open" to "closed". What transitions between states are possible is determined through a customized workflow. Any changes in the task are logged.

JIRA has a large number of configuration options: for each application, you can define a separate type of task with its own workflow, a set of statuses, and one or more

views. In addition, with the help of so-called "schemes" you can define for each individual JIRA – project its own access rights, behavior and visibility of fields and much more.

Due to the universal approach, it is possible to adapt JIRA for many non-core tasks, for example, requirements management, risk management, up to implementation of a small reservation system, automation of the recruiting process.

“For integration with external systems supports interfaces SOAP, XML-RPC and REST. It comes with integration tools with version control systems such as Subversion, CVS, Git, Clearcase, Team Foundation Server, Mercurial and Perforce. There are add-ons that allow Jira to be integrated into integrated development environments, including Eclipse and IntelliJ IDEA. Translated into many languages, including Russian, English, Japanese, German, French, Spanish.”(<https://ru.atlassian.com/> 25.11.2016)

Third-party developers are provided with the tools to develop extensions to the system – plug-ins. Developers of extensions can upload plug-ins for sale on a special section of the site Atlassian.

The use of the service costs \$ 75 per month. For this amount, the company provides access to the program for 15 people. These data can be included in the analysis as the cost of the methodology.

Time tracking reports include wishes of the customer, a description of the problem, the priority of the job, the planned time, the actual time of execution of each step and accuracy. Also the program ranks epics, user stories, tasks and subtasks. An example of the report is presented in the Appendix.

5.2 Agile project analysis

Cardio marker (further Project A) – is software for cardio tracker device, as internal software for the device, and the application for the smartphone. The complexity of the project was a lack of understanding of the software functionality, both on the part of the customer and on the part of the performer.

This project can be classified as a complex innovation technical short-term monoproject.

On the part of the project management, it was decided to work using agile methodologies, in particular Scrum. The choice is explained by the wide experience in

working with this methodology, the excellent combination of uncertain result and the usage of short sprints to provide the customer with an early prototype, for collecting feedback and correcting errors.

At the beginning of the project the technical task of the customer looked small, but with the progress of the project it increased several times. The project manager was scheduled two iterations, in the end, four turned out.

5.2.1 Team

Several employees participated in project A: project manager, architect, two developers, tester and designer.

Communication within the team was built on open communication between team members. This was achieved through an open working environment and relaxed working environment. Also were used technical tools for communication, such as telephone, skype, JIRA and other means of communication. Weekly meetings were held. The team members communicated more with each other instead of writing a lot of documentation. Tracking the progress of the project was provided with help JIRA service. Weekly and 15-minute morning meetings were held.

Based on the fact that the company being researched is small and has a small number of employees, some employees perform several functions at once in the company. In this situation project manager also held the position of Scrum master, which could lead to an incorrect evaluation of both the financial part of the project and the time evaluation.

5.2.2 Project

Project A. Cardio marker is software for cardio tracker device.

Using time tracking reports, you can calculate the amount of time spent on one task and the number of tasks performed in a single sprint. Based on these data, the duration of the following iterations can be predicted. Velocity is the ratio of Total time spent to the number of completed stories, but for greater accuracy, sub-tasks will be used instead of stories.

First iteration contains 5 epics, 17 stories and 53 sub-tasks. 3 sprints were held for 2 weeks. Below is the summary table of the first iteration, full table is in Supplement 1.

Table 3 “Cardio marker” time tracking table, iteration 1

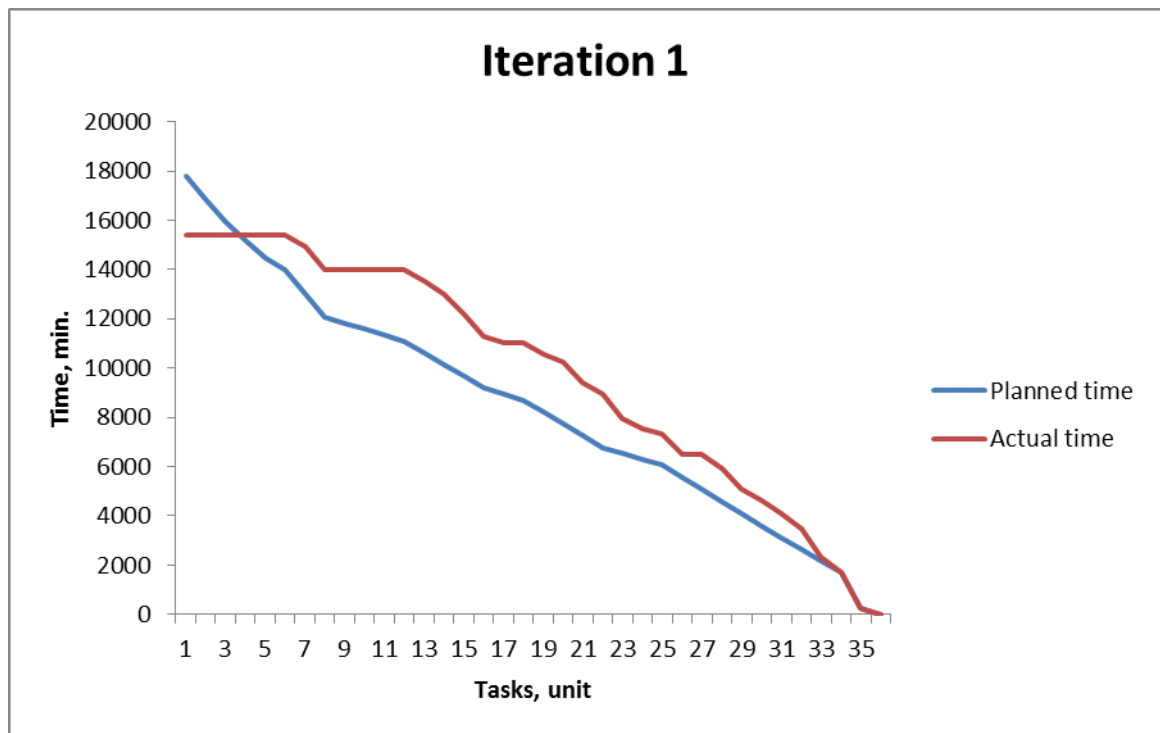
Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Total	19260	6960	15420	-3120	-16

Source: PersiLab company

On average, the programmer spent 291 minutes implementing one sub-task, which is long enough and could take up a whole working day. Almost 18 sub-tasks were solved for one sprint.

Below is the Accumulated delay chart, which tracks the team's lag behind the planned schedule.

Graph 5 Accumulated delay chart for Project A, First iteration



Source: Author

From the graph above it can be seen that the work at the beginning of the project went quickly. The actual time of the tasks was less than planned. Based on the results of

the initial phase of the project, the Project manager decided to reduce the planned time to the next stages. This was done to prevent standby specialists. This decision was wrong.

As you can see from Graph 5, after a good start, there was a noticeable lag behind the planned schedule of works. This is caused by difficulties in the work of programmers. The company's specialists have not yet encountered similar problems and in the course of their work found a lack of skills and competence for conducting this project. They had to learn new technologies on the go, which affected the speed of development and the quality of the product at this stage.

Despite these circumstances, by the end of the first iteration, a working product was obtained. The product worked, but required improvements, as indicated by the customer at the meeting. Also, the customer decided to increase the number of product features, which meant an increase in development time. So the second iteration of product development began.

Second iteration contains 6 stories, 26 sub-tasks. Below is the summary table of the second iteration, full table is in Supplement 2.

Table 4 “Cardio marker” time tracking table, iteration 2

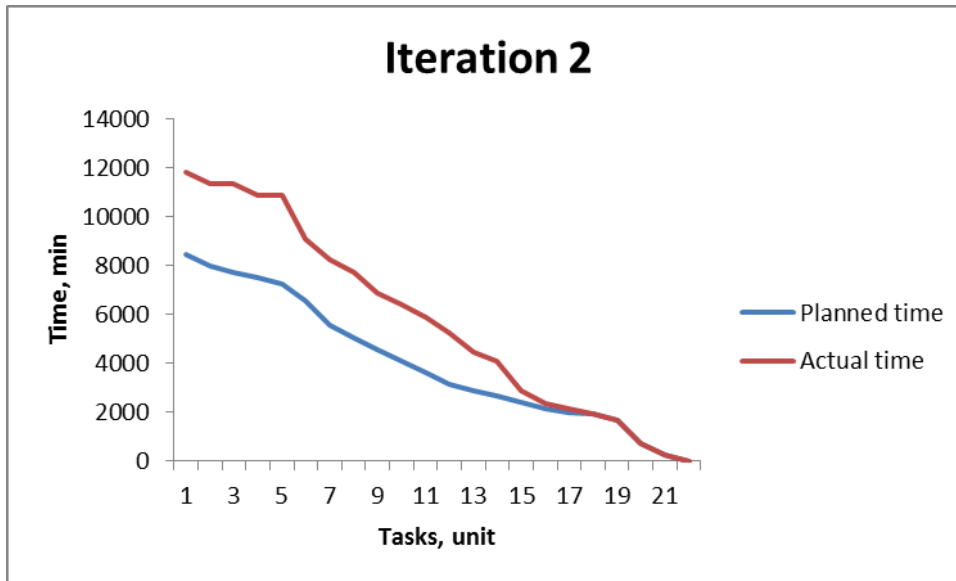
Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Total	8940	1200	11850	-4110	-45

Source: PersiLab company

The average programmer spent on the implementation of one sub-task 455 minutes, which is long enough. 2.5 sprints were held. For one sprint, more than 10 sub-tasks were implemented. This is due to sufficiently capacious tasks on the part of the customer. Due to lack of time, it was decided to take an additional week to solve the remaining tasks. This week is displayed as 0.5 of sprint.

Below is the Accumulated delay chart, which tracks the team's lag behind the planned schedule.

Graph 6 Accumulated delay chart for Project A, second iteration



Source: Author

From the figure above it can be seen that mistakes were made in estimating the effort and time of the project. Since the beginning of the second iteration, programmers have faced difficulties and misunderstandings of the customer's requirements. Because of such circumstances, at this stage, an attempt was made by management to review the financial side of the project, but this initiative was unsuccessful because of the strict contract concluded earlier.

Third iteration contains 7 stories, 16 sub-tasks. Below is the summary table of the third iteration, full table is in Supplement 3.

Table 5 “Cardio marker” time tracking table, iteration 3

Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Total	8520	1200	10770	-3450	-40

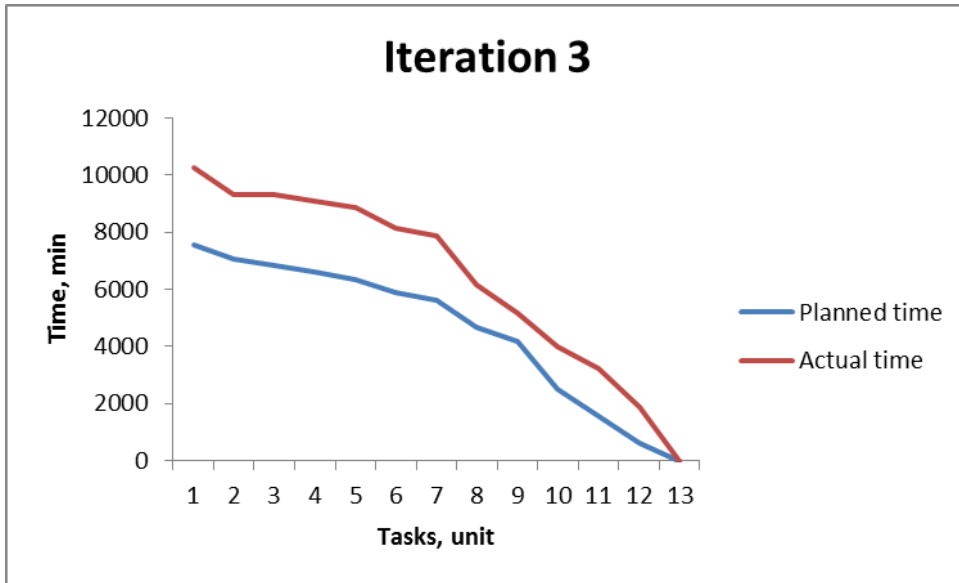
Source: PersiLab company

On average, the programmer spent 141 minutes implementing one sub-task, which is several times faster than in the previous iterations. There were 2 sprints. Almost 8 sub-

tasks were implemented for one sprint. This is due to the customer's understandable requirements and the available experience of using the necessary technologies at this stage.

Below is the Accumulated delay chart, which tracks the team's lag behind the planned schedule.

Graph 7 Accumulated delay chart for Project A, third iteration



Source: Author

The figure above shows the progress of the third iteration. The significant difference between “Planned time” and “Actual time” is excellent for the whole project. This situation is associated with an incorrect assessment of the necessary time on the part of the project manager. Also, the workload of specialists and the shortage of workers in the company played an important role in the significant deviation.

The problems of this stage are related to the desire of management to do more work using less labor and time. Thus, during the implementation of this project, the company's management has accepted several smaller development orders. These actions were related to the need to earn money, because the initial time of the project "Cardio Marker" was stretched. The contract with the customer did not allow demanding additional financing for payment of costs, which put the company's management at a disadvantage in relation to employees.

Fourth iteration contains 32 stories, 67 sub-tasks. Below is the summary table of the fourth iteration, full table is in Supplement 4.

Table 6 “Cardio marker” time tracking table, iteration 4

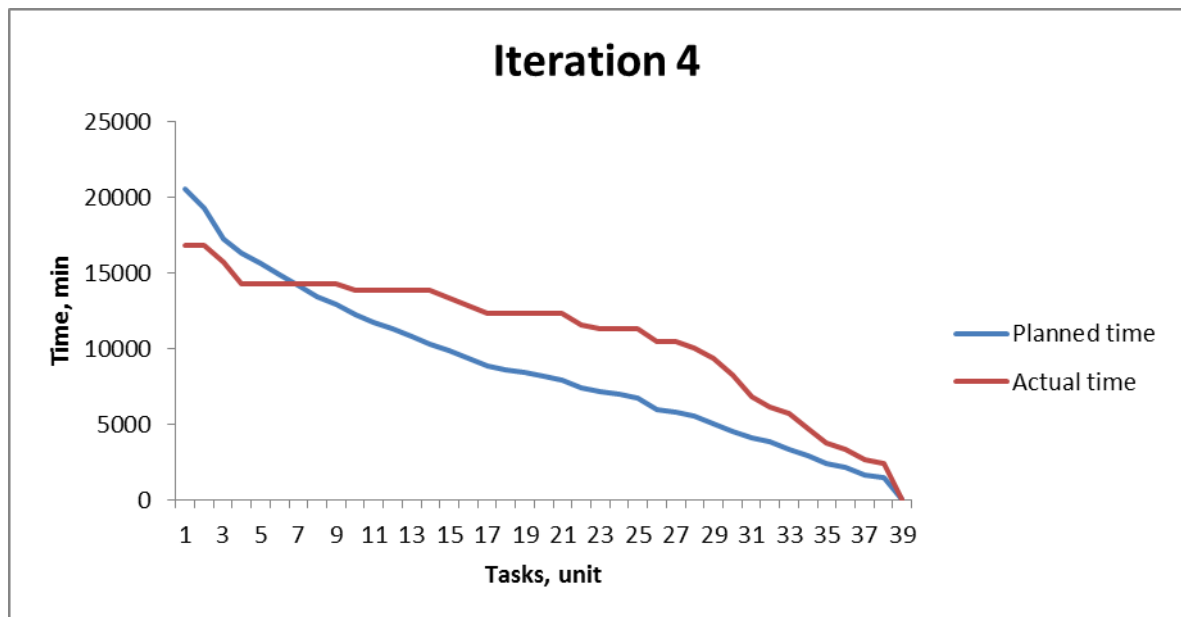
Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Total	21720	13260	16830	-8370	-38

Source: PersiLab company

On average, the programmer spent 251 minutes implementing one sub-task, which is 2 times slower than in the third iteration. This fact is associated with a large number of shortcomings and necessary improvements in the final stage of the application build. 3.5 sprints were held. For one sprint, 19 sub-tasks were implemented. The fourth iteration ended before the expiration of the fourth sprint and it was not need to delay the project for another week.

Below is the Accumulated delay chart, which tracks the team's lag behind the planned schedule.

Graph 8 Accumulated delay chart for Project A, fourth iteration



Source: Author

As can be seen from the figure above, the first tasks were performed very quickly. This is related to the nature of the tasks assigned. At this stage of the project, there were tasks to fix the existing interface; such tasks did not take much time. Further, more complex tasks followed, to which specialists spent more than the planned time. This situation can be traced in the central part of the graph. After such tasks, lighter tasks remained. The final part of the project the programmers performed quite quickly. They finished earlier for a few days. These circumstances allowed the team to start other tasks and implement the following projects.

Project A contains 5 epics, 62 stories, 162 sub-tasks in total. Below is the total table of all iterations.

Table 7 “Cardio marker” time tracking table

Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Total	58440	22620	54870	-19050	-33

Source: PersiLab company

On average for the whole project, the programmer spent 338 minutes implementing one sub-task, what is a good result for the complexity and ambiguity project. In total, 11 sprints were held. On average, almost 15 sub-tasks were implemented for one sprint.

The project took much more time, effort and resources than it was planned. Planned duration of the project was 2 months. The actual length of the project was 6 months.

The main reasons for this stretching were unclear requirements on the part of the customer and the unfinished device under which the software was developing. Despite this, the project was finished on time and with a time reserve, thanks to the experience of the project manager in planning.

Table 8 Project A. Summary table

Iterations	Stories, (unit)	Tasks, (unit)	Sprints, (unit)	Time for 1 task, (min)	Original Time Estimated, (min)	Total Time Spent, (min)
First	17	53	3	291	19260	15420
Second	6	26	2.5	455	8940	11850
Third	7	16	2	141	8520	10770
Fourth	32	67	3.5	251	21720	16830

Source: Author

From the table above we can distinguish that the tasks for the second iteration were the most complicated. This can be seen from the column "Time for 1 task". At this stage, the specialists spent most of their time on solving this or that task. This situation showed the incompetence of team members in the development of such a product. It is also necessary to take into account the requirements of the customer, which changed almost at each meeting.

It is also worth highlighting the planned time of application development and the actual one at the last iteration. This fact is related to the nature of the tasks that the team had to perform. At the final stage, many tasks were related to the development of the application, which did not take as much time as the tasks at the beginning of the project to create something from scratch. At the same time, the estimation of the time for the fourth iteration occurred on the basis of the number of tasks that the team had to perform, which indicates an erroneous estimate. Such an assessment should be based on the complexity of the tasks, and not just on their number.

It is necessary to allocate incomplete sprints both in the second iteration, and in the last iteration. In the first case, it was decided to take an additional week to solve the remaining tasks. Since the sprint lasts two weeks, the extra week is displayed as a half-week. In the second case, it was decided to finish earlier, because there was no point in delaying the project for another week.

In such projects it is necessary to leave a significant period of time in reserve, to avoid delay in project delivery.

During the project, negotiations were held with the customer to increase the price of the product. Negotiations have reached a deadlock and have not been complete successfully because of the terms of the contract concluded earlier. It was necessary to discuss a similar situation at the stage of concluding an agreement, so that a similar situation does not occur.

Thus, the project turned out to be complex and lengthy. Also, the problems were with the financial part of the project. Problems - fix price for the customer and flexible cost and time for the performer.

5.3 “Traditional” project analysis

“CloudPayments” (further Project B) – is a payment service that offers modern Internet acquiring for iOS platform. Payment on the site without going to the payment page in a convenient "Widget" – pop-ups on your site, payment through social networks, one-click payments, recurring payments (periodic or auto-payments), a recurring payment or "one-click payment", holding, Payment in a mobile application, invoicing by e-mail or SMS, marketplace and many other technological payment tools.

This project can be classified as a complex innovation technical short-term monoproject.

On the part of the project management, it was decided to work using waterfall model with task division into sprints for more convenient project progress control. The choice is explained by the clear task set, understandable task specification and the pure vision of the final product.

To name the used project management model it is possible with several assumptions: the team used the software as when using Scrum, for time tracking, the customer's task was divided into sprints, for the usual control over the progress of the project. This was done at the direction of the company's management, so that the creation of the project would take place in a familiar environment for workers.

Between the company and the customer an agreement was concluded with some assumptions of increasing development time in case of unforeseen circumstances.

5.3.1 Team

For project B, team was formed consisting of project manager, architect, developer, tester and designer.

Communication within the team was built on open communication between team members. This was achieved through an open working environment and relaxed working environment. Also were used technical tools for communication, such as telephone, skype, JIRA and other means of communication. Weekly meetings were held. The team members communicated more with each other instead of writing a lot of documentation.

5.3.2 Project

Project B includes 36 stories and tasks, sub-tasks 61. Below is the summary table, full table is in Supplement 5.

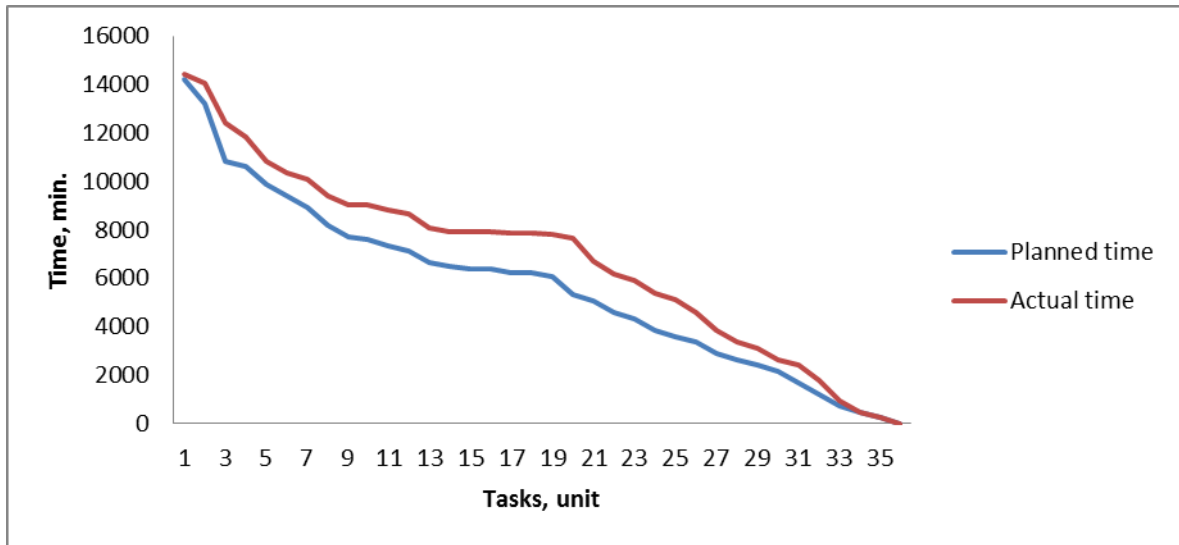
Table 9 “CloudPayments” time tracking table

Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Total	15150	3720	15194	-3764	-24

Source: PersiLab company

Having a time tracking report Velocity can be counted. On average, the programmer spent 227 minutes implementing one task or sub-task, which is almost 2 times faster than in Project A. There were 3 sprints. For one sprint, more than 22 sub-tasks were solved. This situation is explained by clear customer requirements and rich programmer experience in developing and using the necessary technologies.

Graph 9 Accumulated delay chart For Project B.



Source: Author

The actual length of the project was 2 months. Time reserve was 12 days. In this project, the time was calculated more accurately, as can be seen from the graph of Estimated Time Remaining.

In the first half of the project, there was a slight lag behind the schedule, but from the second half of the project the team began to reduce the backlog. The team finished the project on time, with a slight delay, which fit into the terms of the contract.

This project was completed with a slight delay, the backlog was only 40 minutes, which is insignificant. The project was completed successfully due to the following factors: the terms of reference were well formulated, the team solved the tasks directly related to the project and was not distracted by other projects and tasks and also thoroughly calculated the duration and cost of the project.

The customer was satisfied. Also, an order for developing the CloudPayments application for the Android platform has been received, which shows the customer's satisfaction and trust in the company.

Recommendations

After analyzing the information provided by PersiLab projects, mistakes were made in project management. Also, based on the analysis, the following conclusions were made. The researched young small company at this stage of development should choose less voluminous projects, due to the lack of a large team and the experience of large implementation of projects in general. Choosing small projects for implementation, the company will protect itself from complex and ambiguous projects that can drag on and go to the company's loss. Also, members of the company's employees and management will gain experience in conducting projects, negotiations with the customer and in other areas necessary for running a successful business.

From the direction of management, it is necessary to carefully analyze the technical task of the customer. Also it is necessary to specify at the customer all possible inaccuracies and in time to collect feedback. Before taking the project, the company management must notify the customer about the peculiarities of the methodologies used. If you decide to use the agile approach, you need to notify the customer that there will be a need to meet once a week or more often and discuss the result. Employees of the company should strictly follow the methodology and differentiate positions and roles in the project. Given the number of employees and the size of the company, some employees can perform several tasks simultaneously. The company management should not allow one programmer or employee to participate in several projects at once, in order to increase the efficiency and concentration of a specialist on the current project.

The team should carefully evaluate the tasks for the complexity and the required execution time. Scrum-poker can be an excellent tool for solving similar problems.

Conclusion

This thesis is focused on analysis projects that were built by using agile and traditional methodologies. To achieve the aims of the project which were set, was analyzed information about agile and traditional project management methodologies. The answers to the research questions were also found.

The advantages and disadvantages of agile methodologies were highlighted. The strengths and weaknesses of the traditional project management model were identified. As a result, a comparison was made between the traditional methodology and the agile approach to project management to identify significant differences.

Despite all the advantages and dignities of Agile, there is no need to apply this approach wherever possible. There are many projects that are perfectly implemented by the waterfall methodology, where there are good practices. In such projects, the use of agile is inexpedient and not justified. The traditional model of project management has the right to exist.

In the chapter Case Study, two projects were analyzed, information on which was provided by PersiLab for analysis.

During the analysis of the project, potential and actual problems of using the agile approach were highlighted, such as unclear customer requirements, extended terms and a limited budget. As well as problems can be in the wrong calculation of the necessary time or incorrect assessment of the complexity of the job. Based on the results of the analysis of the projects, recommendations were put forward to address the identified problems.

Based on the project management methodologies analysis, recommendations were made about choosing an appropriate methodology for project management.

Agile development model is useful if:

- The project involves an experienced team.
- The final functionality of the product is still unknown, and changes must be made as quickly as possible.
- The end user is participating in the project from the very beginning.
- It is necessary to quickly develop the working software.
- This is a startup project.

Choose a Waterfall model in cases where:

- Requirements for the project are stable and practically unchanged;
- The quality of the product is much more important than the time and resources expended;
- The project is developed on outsourcing;
- The end user only accepts the result of the work, not participating in the process.

The appropriate scope for using agile approach was identified. Not only IT sphere was singled out, but also other, not related to it. For example agile can be implemented into education sector or banking sphere.

It is necessary to say that both models will help to realize project. First of all, project manager chooses an option that will allow him or her to make quality products and effectively manage company's budget.

It is also worth noting that the methodology does not exist at all in order to reduce the "overhead", or just increase the efficiency of the team. Methodologies are created to improve the manageability, predictability and effectiveness of project management.

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Supplements

List of Supplements

- **Supplement 1.** CardioMarker Time tracking report, 1 iteration
- **Supplement 2.** CardioMarker Time tracking report, 2 iteration
- **Supplement 3.** CardioMarker Time tracking report, 3 iteration
- **Supplement 4.** CardioMarker Time tracking report, 4 iteration
- **Supplement 5.** CloudPayments Time Tracking Report

Supplement 1. CardioMarker Time tracking report, 1 iteration

Issue Type	Priority	Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Epic	Medium	Doctor Web Application					
Epic	Medium	Web-based system administrator application					
Epic	Medium	Web application of the patient					
Epic	Medium	Server part					
Epic	Medium	A mobile patient application (iOS, Android)					
Story	Medium	Atlas of Health - comments					
> Sub-task	Medium	> iOS - Add a voice comment	480	480			0
> Sub-task	Medium	> Android - Add a voice comment	480	480			0
> Sub-task	Medium	> iOS - Adding a text comment	240	240			0
> Sub-task	Medium	> Android - Add a text comment	240	240			0
Story	Medium	The mobile application periodically sends its coordinates					
> Sub-task	Medium	> iOS - sending coordinates to the server	240	240			0
> Sub-task	Medium	> Android - sending coordinates to the server	240	240			0
> Sub-task	Medium	> iOS - get the speed, GPS coordinates	240	240			0
> Sub-task	Medium	> Android - getting speed, GPS coordinates	240	240			0
Story	Medium	Data Capture - Comments					
> Sub-task	Medium	> iOS - Add a voice comment	240	240			0
> Sub-task	Medium	> Android - Add a voice comment	240	240			0
> Sub-task	Medium	> iOS - Adding a text comment	240	240			0
> Sub-task	Medium	> Android - Add a text comment	240	240			0
Story	Medium	The user can see the history of changes for each indicator from the Atlas of Health in the form of a Graph indicator. IOS					
> Sub-task	Medium	> iOS - Implement output of the schedule of indicators by dates and preset intervals	480	480			0

> Sub-task	Medium	> iOS - screen layout	240	240			0
Story	Medium	The user can see the history of changes for each indicator from the Atlas of Health in the form of a Graph indicator.					
> Sub-task	Medium	> Android - Implement the output of the schedule of indicators by dates and pre-defined intervals.	480	480			0
> Sub-task	Medium	> Android - screen layout	240	240			0
Sub-task	Medium	CARD-38 > User data modification form	480	480			0
Story	Medium	Connecting and testing the analytics module for Node.js					
> Sub-task	Highest	> Create and connect extension Node.js	960	480	480	0	0
Story	Medium	The server can receive and process ECG files					
> Sub-task	Medium	> Save response from analytics module	240	240			0
> Sub-task	Medium	> Send the received file to the analytics module	480	0	720	-240	-50
> Sub-task	Medium	> Create REST resource	240	0	240	0	0
Sub-task	Medium	CARD-34 > Registration	240	240			0
Sub-task	Medium	CARD-34 > Authorization	240	240			0
Sub-task	Medium	CARD-35 > Registration	240	240			0
Sub-task	Medium	CARD-35 > Authorization	240	240			0
Story	Medium	The user of the mobile application can select the type of data retrieval					
> Sub-task	Medium	> iOS - A screen with a list of data retrieval options	240	0	240	0	0
> Sub-task	Medium	> Android - Screen with a list of data retrieval options	240	0	240	0	0
Sub-task	Medium	CARD-39 > Data modification form	480	0	480	0	0
Sub-task	Medium	CARD-61 > Set up Android notifications	480	0	840	-360	-75
Sub-task	Medium	CARD-61 > Notification Options for iOS	480	0	900	-420	-87
Sub-task	Medium	CARD-36 > Authorization	240	0	240	0	0

Sub-task	Medium	CARD-32 > Complete the stored parameters in accordance with the TOR	240	0			100
Sub-task	Medium	CARD-33 > Set up visible options in Android	480	0	480	0	0
Sub-task	Medium	CARD-33 > Setting up visible settings in iOS	480	0	300	180	37
Sub-task	Medium	CARD-30 > Android app settings	480	0	840	-360	-75
Sub-task	Medium	CARD-30 > iOS app settings	480	0	480	0	0
Sub-task	Medium	CARD-31 > Saving personal data to Android	240	0	960	-720	-300
Sub-task	Medium	CARD-31 > Uploading photos to iOS	240	0	420	-180	-75
Sub-task	Medium	CARD-31 > Saving personal data in iOS	240	0	240	0	0
Sub-task	Medium	CARD-29 > Registration in the Android application	480	0	840	-360	-75
Sub-task	Medium	CARD-29 > Registering with iOS	480	0			100
Story	Medium	An iOS app user can view their profile					
> Sub-task	Medium	> Screen layout	540	0	540	0	0
Story	Medium	Android app user can view your profile					
> Sub-task	Medium	> Screen layout	480	0	840	-360	-75
Story	Medium	Android app user can use the shortcut menu					
> Sub-task	Medium	> Implement the bottom menu	480	0	480	0	0
Story	Medium	An iOS application user can use the main menu					
> Sub-task	Medium	> Implement the sidebar	480	0	540	-60	-12
Story	Medium	Android app user can use the main menu					
> Sub-task	Medium	> Implement the sidebar	480	0	600	-120	-25
Story	Medium	User iOS-application can be authorized by login and password					
> Sub-task	Medium	> Implement authorization and saving of the token for the following requests	240	0	780	-540	-225
> Sub-task	Medium	> Screen layout	240	0	360	-120	-50

Story	Medium	Implement authorization resources by login and password					
> Sub-task	Medium	> For each request, you should wait and check the token	180	0	180	0	0
> Sub-task	Medium	> Create an account model and several test records	60	0	240	-180	-300
> Sub-task	Medium	> Implement resource for authorization	240	0	240	0	0
Story	Medium	Implement access control system					
> Sub-task	Medium	> Implement access control system	960	0	960	0	0
> Sub-task	Medium	> Analyze the future system as a whole	480	0	480	0	0
Story	Medium	Create an actionhero project, configure the swager					
> Sub-task	Medium	> Deploy the project and configure the swager	240	0	240	0	0
Total			19260	6960	15420	-3120	-16

Source: PersiLab company

Supplement 2. CardioMarker Time tracking report, 2 iteration

Issue Type	Priority	Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Story	Medium	The doctor can authorize and register in the web application					
> Sub-task	Medium	> Registration	240	240			0
> Sub-task	Medium	> Authorization	240	240			0
Story	Medium	User can log in and register in the web application		0	480		
> Sub-task	Medium	> Registration	240	240			0
> Sub-task	Medium	> Authorization	240	240			0
Sub-task	Medium	CARD-20> Implement the lower menu	240	240			0
Story	Medium	The administrator can be authorized in the web application		0	240		
> Sub-task	Medium	> Authorization	240	0	240	0	0
Story	Medium	Preservation of personal data on the server					

> Sub-task	Medium	> Complete the saved parameters in accordance with the terms of reference	240	0			100
Story	Medium	Changing personal data in a mobile app	0	0	180	-180	
> Sub-task	Medium	> Saving personal data to Android	240	0	960	-720	-300
> Sub-task	Medium	> Uploading photos to iOS	240	0	420	-180	-75
> Sub-task	Medium	> Saving personal data in iOS	240	0	240	0	0
Story	Medium	Registration in mobile app					
> Sub-task	Medium	> Android app registration	480	0	840	-360	-75
> Sub-task	Medium	> Signing in to iOS	480	0			100
Sub-task	Medium	CARD-26> Screen layout	540	0	540	0	0
Sub-task	Medium	CARD-25> Screen layout	480	0	840	-360	-75
Sub-task	Medium	CARD-19> Implement the lower menu	480	0	480	0	0
Sub-task	Medium	CARD-18> Implement the sidebar	480	0	540	-60	-12
Sub-task	Medium	CARD-17> Implement the sidebar	480	0	600	-120	-25
Sub-task	Medium	CARD-6> Implement authorization and storage of the token for the following requests	240	0	780	-540	-225
Sub-task	Medium	CARD-6> Screen layout	240	0	360	-120	-50
Sub-task	Medium	CARD-5> Implement authorization and saving of the token for the following requests	240	0	1260	-1020	-425
Sub-task	Medium	CARD-5> Screen layout	240	0	510	-270	-112
Sub-task	Medium	CARD-4> Every time you need to wait and check the token	180	0	180	0	0
Sub-task	Medium	CARD-4> Create an account model and several test records	60	0	240	-180	-300
Sub-task	Medium	CARD-4> Implement resource for authorization	240	0	240	0	0

Sub-task	Medium	CARD-3> Implement the access rights management system	960	0	960	0	0
Sub-task	Medium	CARD-3> Analyze the future system as a whole	480	0	480	0	0
Sub-task	Medium	CARD-2> Expand the project and configure the swagger	240	0	240	0	0
Total			8940	1200	11850	-4110	-45

Source: PersiLab company

Supplement 3. CardioMarker Time tracking report, 3 iteration

Issue Type	Priority	Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Sub-task	Highest	CARD-45> Create and connect extension Node.js	960	480	480	0	0
Story	Medium	The user can view and change his / her personal data in the web application		0	960		
> Sub-task	Medium	> User data modification form	480	480			0
Sub-task	Medium	CARD-68> Save response from analytics module	240	240			0
Sub-task	Medium	CARD-66> iOS - Screen with a list of data retrieval options	240	0	240	0	0
Sub-task	Medium	CARD-66> Android - A screen with a list of data retrieval options	240	0	240	0	0
Sub-task	Medium	CARD-68> Send the received file to the analytics module	480	0	720	-240	-50
Sub-task	Medium	CARD-68> Create REST-resource	240	0	240	0	0
Story	Medium	Set notification preferences in the mobile app					
> Sub-task	Medium	> Set up Android notifications	480	0	840	-360	-75
> Sub-task	Medium	> Notification options for iOS	480	0	900	-420	-87
Story	Medium	A doctor can review and change his personal data		0	480		

> Sub-task	Medium	> Data modification form	480	0	480	0	0
Story	Medium	The administrator can view a list of all system accounts in the web application	1440	0	960	480	33
> Sub-task	Medium	> Implement the output of all accounts in the form of a table	240	0	240	0	0
Story	Medium	Set up visible health atlas indicators in a mobile application					
> Sub-task	Medium	> Set up visible options in Android	480	0	480	0	0
> Sub-task	Medium	> Set up visible settings in iOS	480	0	300	180	37
Story	Medium	Configuring your mobile app settings					
> Sub-task	Medium	> Android app settings	480	0	840	-360	-75
> Sub-task	Medium	> IOS app settings	480	0	480	0	0
Story	Low	Android application user can log in by login and password	120	0	120	0	0
> Sub-task	Medium	> Implement authorization and storage of the token for the following requests	240	0	1260	-1020	-425
> Sub-task	Medium	> Screen layout	240	0	510	-270	-112
Total			8520	1200	10770	-3450	-40

Source: PersiLab company

Supplement 4. CardioMarker Time tracking report, 4 iteration

Issue Type	Priority	Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Story	Highest	Manual data capture					
> Sub-task	Highest	> IOS - realize the data capture by the selected parameters	480	480			0
> Sub-task	Highest	> IOS - save the ECG record and put in the queue	240	240			0
> Sub-task	High	> IOS - screen layout of the removal process	240	240			0
> Sub-task	Highest	> IOS - layout of the pickup screen	240	240			0
Story	Highest	Manual data capture					
> Sub-task	Highest	> Android - realize the data retrieval for the selected parameters	480	480			0

> Sub-task	Highest	> Android - save the ECG record and put in the queue	240	240			0
> Sub-task	Highest	> Android - screen layout of the removal process	240	240			0
> Sub-task	Highest	> Android - layout of the pickup screen	240	240			0
Story	Medium	Comments, revisions					
> Sub-task	High	> Fix authorization reset upon exit from the application	480	480			0
> Sub-task	Medium	> Find out the possible cause of a "fall"	480	480			0
> Sub-task	Medium	> Finalize the visible metrics	240	0	240	0	0
> Sub-task	Medium	> Make a transition to the Health Atlas from the lower menu	120	0	120	0	0
> Sub-task	Medium	> Make a scroll bar of atlases and indicators.	120	0	120	0	0
> Sub-task	Medium	> Loading atlases and indicators	240	0	240	0	0
> Sub-task	Medium	> Ranges in the indicator a little curves - the white gap should be a straight line.	120	0	120	0	0
> Sub-task	Medium	> Correct progress bar when loading health atlases	120	0	120	0	0
> Sub-task	Medium	> Uploading a photo in the profile does not work - the camera icon does not react at all	120	0	120	0	0
Story	Highest	A patient in a web application can see health atlases for all of his ECGs		0	1440		
> Sub-task	Medium	> Display a list of ECG records in the form of health satin circles	960	960			0
Story	High	Tab "Analysis of HRV" - ECG screen					
> Sub-task	High	> Implement the display of all labels and dangerous signs	720	720			0
Story	High	Tab "Analysis of HRV" - ECG screen					
> Sub-task	High	> Implement the display of all labels and dangerous signs	720	720			0
Story	Highest	The user can view a complete analysis of each record					
> Sub-task	Highest	> IOS - Getting from the server and processing the XML file analysis of the record	480	480			0
> Sub-task	Highest	> IOS - layout	240	240			0
Story	Highest	The user can view a complete analysis of each record					

> Sub-task	Highest	> Android - Getting from the server and processing the XML file analysis of the record	480	480			0
> Sub-task	Highest	> Android - Layout	240	240			0
Sub-task	Medium	CARD-176> iOS - Implement output of the schedule of indicators by dates and preset intervals	480	480			0
Story	Highest	ECG monitoring - the user can see the ECG in on-line mode	240	240			0
> Sub-task	Highest	> IOS - layout	240	240			0
> Sub-task	Highest	> Implement receiving ECG from the native module.	240	0	480	-240	-100
Story	Highest	ECG monitoring - the user can see the ECG in on-line mode					
> Sub-task	Highest	> Implement receiving ECG from the native module.	240	240			0
> Sub-task	Highest	> Android - Layout	240	240			0
Story	Highest	BLE - Search and Connection					
> Sub-task	Highest	> Android - Connection to the selected device	240	240			0
> Sub-task	Highest	> Android - Search for devices	240	240			0
Sub-task	Medium	CARD-89> iOS - Add a voice comment	480	480			0
Sub-task	Medium	CARD-89> Android - Add a voice comment	480	480			0
Story	Medium	REST-resources for working with coordinates					
> Sub-task	Medium	> Resource for saving coordinates	240	300	240	-300	-125
> Sub-task	Medium	> Resource for requesting the last coordinates	240	0	270	-30	-12
Story	Medium	The doctor can view the complete analysis of the record					
> Sub-task	Medium	> Getting from the server and processing the XML file analysis of the record	240	240			0
> Sub-task	Medium	> Layout - tab "ECG analysis"	240	0	480	-240	-100
Story	Medium	Conclusion - a detailed description of the parameters	240	240			0
> Sub-task	Medium	> Implement the derivation of a complete description of the parameters	240	0	480	-240	-100
Story	Medium	The doctor has all the information about the patient in					

		the form of "Patient's card"					
> Sub-task	Medium	> Implement a patient card	240	240			0
Sub-task	Medium	CARD-176> iOS - screen layout	240	240			0
Story	Medium	Tab "Analysis of HRV" - screen Cardiointervalogram					
> Sub-task	Medium	> Implement the schedule	240	240			0
Story	Medium	Tab "Analysis of HRV" - screen Cardiointervalogram					
> Sub-task	Medium	> Implement the schedule	240	240			0
Story	Highest	The user scans the list of Health Indicators for each entry from Atlas					
> Sub-task	Highest	> IOS - Implement the output of the list of indicators on the screen by the recording date and the time of its creation.	240	240			0
> Sub-task	Highest	> IOS - layout	240	0	780	-540	-225
Story	Medium	A doctor in a web application can see a list of all his patients					
> Sub-task	Medium	> Display a list of patients	240	240	240	-240	-100
Sub-task	Medium	CARD-89> iOS - Adding a text comment	240	240			0
Sub-task	Medium	CARD-89> Android - Add a text comment	240	240			0
Story	Highest	A mobile application can send ECG data to a server					
> Sub-task	Highest	> Android - Implement sending pending	240	240			0
> Sub-task	Medium	> IOS - organize the queue	480	0	840	-360	-75
Story	Lowest	An iOS application user can use the shortcut menu					
> Sub-task	Medium	> Implement the bottom menu	240	240			0
Story	Medium	The doctor looks at the full detailed description of all parameters from the atlas.					
> Sub-task	Medium	> Implement the output of the full description of the parameters (in accordance with the terms of reference of 4.2.2.8.2)	240	0	480	-240	-100
Story	Highest	Detailed description of the Health Indicator					

> Sub-task	Highest	> IOS - Implement a detailed description screen for each metric	480	0	660	-180	-37
Story	Highest	Atlas of health is the foundation					
> Sub-task	Highest	> IOS - output of data according to received XML health atlas	480	0	1140	-660	-137
Story	Highest	BLE - Search and Connection					
> Sub-task	Highest	> IOS - connection to the selected device	240	0	900	-660	-275
> Sub-task	Highest	> IOS - device search	240	0	480	-240	-100
Story	Highest	A mobile application can send ECG data to a server					
> Sub-task	Highest	> IOS - Implement sending pending	240	0	660	-420	-175
Story	Highest	Detailed description of the Health Indicator					
> Sub-task	Highest	> Android - Implement a detailed description screen for each metric	480	0	480	0	0
Story	Highest	The user scans the list of Health Indicators for each entry from Atlas					
> Sub-task	Highest	> Android - Implement the display of the List of Indicators by the recording date and the time of its creation.	240	0	480	-240	-100
> Sub-task	Highest	> Android - Layout	240	0	480	-240	-100
Story	Medium	An administrator can block any account					
> Sub-task	Medium	> Implement a lock	480	0	960	-480	-100
Story	Highest	The doctor can see a list of all patient's ECG records					
> Sub-task	Medium	> Display the ECG list in the form of an atlas	240	0	480	-240	-100
Story	Medium	A patient in the web application can choose his doctor					
> Sub-task	Medium	> Finalize the resource for obtaining the list of accounts	240	0	240	0	0
> Sub-task	Medium	> Display a list of doctors with the option of selecting one of them	240	0	420	-180	-75
Story	Medium	The patient in the web application can delete the ECG record					
> Sub-task	Medium	> Mark Entry as Remote	240	0	240	0	0
Story	Highest	Atlas of health is the foundation					
> Sub-task	Highest	> Android - output of data according to received XML	480	0	840	-360	-75

		health atlas					
> Sub-task	Medium	> IOS - layout	480	0	840	-360	-75
> Sub-task	Highest	> Android - Layout	480	0	720	-240	-50
		Total	21720	13260	16830	-8370	-38

Source: PersiLab company

Supplement 5. CloudPayments Time Tracking Report

Issue Type	Priority	Summary	Original Time Estimated (min)	Estimated Time Remaining (min)	Total Time Spent (min)	Accuracy	Accuracy (%)
Story	Medium	Receiving / removing a list of transactions					
> Sub-task	Medium	> Transaction List Screen Layout	240	720	240	-720	-300
> Sub-task	Medium	> Implement the receipt of transactions from the server	240	240	120	-120	-50
> Sub-task	Medium	> Conversion (inside the chart)	240	60	180	0	0
> Sub-task	Medium	> Implement a diagram (statistics)	240	0	240	0	0
Story	Medium	Return of funds for transaction					
> Sub-task	Medium	> Implement a refund function	480	240	240	0	0
> Sub-task	Medium	> Screen layout "Return completed"	240	210	30	0	0
> Sub-task	Medium	> Implement a confirmation of return	240	120	120	0	0
Story	Medium	Orders - new order	1200				100
> Sub-task	Medium	> Implement destination filtering	240	240			0
> Sub-task	Medium	> Implement saving a new order	240	120	120	0	0
> Sub-task	Medium	> Layout of the screen with a list of values	240	60	180	0	0
> Sub-task	Medium	> Test of the result of creation	0	0			
> Sub-task	Medium	> Confirmation dialog	0	0	240	-240	
> Sub-task	Medium	> Implement a filter (site)	240	0	240	0	0
> Sub-task	Medium	> Layout of the selection screen for company names (Site)	0	0			

> Sub-task	Medium	> Screen layout	240	0	810	-570	-237
Story	High	Remarks 2		240	540		
> Sub-task	Low	> Correct comments	240	150	90	0	0
Story	Medium	The user filters the transactions for the Free period (dates)					
> Sub-task	Medium	> Implement a calendar with a choice of date ranges	480	240	840	-600	-125
> Sub-task	Medium	> Implement filtering	240	120	120	0	0
Story	Medium	User can log in by login and password (implementation)	0	240			
> Sub-task	Medium	> Implement the beginning of the session and the authentication of requests	240	0	240	0	0
> Sub-task	Medium	> Implementing Authorization	240	0	240	0	0
Story	Medium	Application settings are available					
> Sub-task	Medium	> Implement display and automatic (immediately after changing the option)сохранение настроек	240	120	120	0	0
> Sub-task	Medium	> Implement the output of time zones	240	60	180	0	0
Story	Medium	The user filters the list of transactions by parameters and by status					
> Sub-task	Medium	> Screen layout	240	120	120	0	0
> Sub-task	Medium	> Implement filtering by status	240	30	210	0	0
> Sub-task	Medium	> Implement filtering by parameters	240	0	360	-120	-50
Story	Medium	The user can choose to filter the list of transactions by period					
> Sub-task	Medium	> Implement filtering the list of transactions by period	240	60	180	0	0
> Sub-task	Medium	> Screen layout	240	60	180	0	0
Story	Medium	Developer profile					

> Sub-task	Medium	> Understand the developer profile	120	120			0
Story	Medium	User can reset access code					
> Sub-task	Medium	> Show dialog and reset access code in local storage	240	60	180	0	0
Story	Medium	The user is invited to enable TouchId access					
> Sub-task	Medium	> Implement two dialogs	240	60	180	0	0
Story	Medium	The user can view all the data for each transaction					
> Sub-task	Medium	> Screen layout	240	30	210	0	0
> Sub-task	Medium	> Implement the output of transaction data	240	0	360	-120	-50
Task	Low	Time Zones need to be replaced	120	0	160	-40	-33
Task	Low	Transaction filter on the site - you cannot select an empty value if you have already selected some	120	0	30	90	75
Task	Low	The world does not have a red border around the logo	30	0	2	28	93
Task	Low	Transaction canceled, but displayed as rejected	120	0	5	115	95
Task	Low	Transaction screen "return" to change to "Returns"	30	0	15	15	50
Story	Low	Notes, portion 1					
> Sub-task	Low	> After the login in the application, show the "transactions" screen	30	0	10	20	66
> Sub-task	Low	> In the section "Contacts" you cannot make a call or send an email.	120	0	60	60	50
Story	Medium	Filtering transactions by type and currency	240				100
> Sub-task	Medium	> Implement transaction filtering by currency	240	0	120	120	50
> Sub-task	Medium	> Implement filtering by transaction type	240	0	30	210	87
Story	Medium	Finalization of the project as a whole, correction of minor errors, testing of functions, etc.					
> Sub-task	Medium	> You cannot leave the settings screen		0	450		

> Sub-task	Medium	> Transactions. When you select a period, you have to click the title again to end the selection period.	0	0			
> Sub-task	Medium	> Login screen. When entering a login and password, no prompts for fields are saved	60	0	300	-240	-400
> Sub-task	Medium	> Input screen. There is no reference to the terms of connection in the inscription "The terms of connection, see the website."		0	60		
> Sub-task	Medium	> The login screen. "Contacts" is not the font.	0	0	60	-60	
> Sub-task	Medium	> The login screen. On my iPad, the inscription "application for registered ..." crawls on the logos of fb and r +. The cloudmerchant logo is cropped at the top. It seems that you can play on iPhone 4.	60	0	60	0	0
> Sub-task	Medium	> The login screen. For the mail field, put the type "email" - so that the keyboard has @ and.	60	0	2	58	96
> Sub-task	Medium	> The login screen. By clicking on return on the keyboard there is no logging on to the system	120	0	30	90	75
Story	Medium	Go to the list of selected transactions					
> Sub-task	Medium	> Implement display	240	0	240	0	0
> Sub-task	Medium	> Screen layout	240	0	300	-60	-25
Story	Medium	The user can filter the value of the transaction statistics by the currency code.					
> Sub-task	Medium	> Implement filtering by currency code on the transaction statistics screen.	240	0	240	0	0
Story	Medium	Orders - filter by parameters					

> Sub-task	Medium	> Implement filtering	240	0	240	0	0
> Sub-task	Medium	> Screen layout	240	0	270	-30	-12
Story	Medium	Orders - filtering the list by status					
> Sub-task	Medium	> Filter by status	240	0	300	-60	-25
Story	Medium	Orders - getting the list of orders	0	0			
> Sub-task	Medium	> Get the list from the server and output	240	0	540	-300	-125
Story	Medium	Orders - list (layout)					
> Sub-task	Medium	> Screen layout	480	0	720	-240	-50
Story	Medium	The main menu of the application is available to the user					
> Sub-task	Medium	> Implement the menu display	240	0	480	-240	-100
Story	Medium	Require access code entry if it is not possible to enter by TouchID (implementation)					
> Sub-task	Medium	> Access by access code	240	0	240	0	0
Story	Medium	Require access code entry if it is not possible to enter by TouchID (layout)					
> Sub-task	Medium	> Access Code Entry Screen	240	0	480	-240	-100
Story	Medium	Offer to enter by TouchID, if enabled in application and device settings					
> Sub-task	Medium	> Implement TouchID authorization	480	0	240	240	50
Story	Medium	After authorization by login and password, the user must come up with an access code		0	120		
> Sub-task	Medium	> Access Code Entry Screen	480	0	480	0	0
Story	Medium	User can log in through social networks		0	240		
> Sub-task	Medium	> Implement the input via G +	240	0	300	-60	-25
> Sub-task	Medium	> Implement the input via FB	240	0	300	-60	-25

Story	Medium	The user can open the screen with the CloudPaymens contacts while on the login screen		0	240		
> Sub-task	Medium	> Create and display a screen with contacts	240	0	240	0	0
Story	Medium	User can log in by login and password (layout)					
> Sub-task	Medium	> Screen layout	240	0	240	0	0
Story	Medium	When the application starts, the user sees Splash-screen					
> Sub-task	Low	> Screen layout	240	0	240	0	0
Total			15150	3720	15194	-3764	-24

Source: PersiLab company