SOFTWARE PROJECT MANAGEMENT

Lesson 2

PROJECT MANAGEMENT IN DETAILS

CONTENTS

1. PROJECT

Project Management Components

Project management can be presented as a set of actions that the project manager performs to make the project successful.

When talking about the success of a project, it usually means that a successful project is the one that has achieved the goals, met the initial approved deadlines and budget.

The PMI (American Project Management Institute) research of 2018 gives the following statistics on the success of projects:

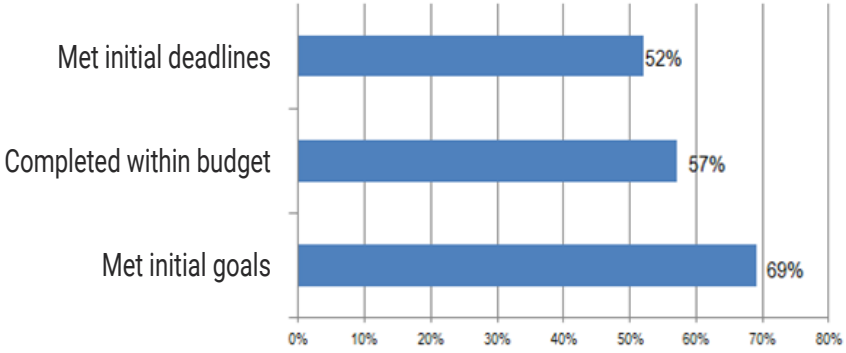

Figure 1

In order to implement a successful project, the project manager needs to know and be able to do a lot, but first of all, he/she needs to understand how the Triple Constraint works.

Project Parameters

In order to describe the project parameters, project management uses the term **Triple Constraint**, also known as the Project Management Triangle or the Iron Triangle.

Any project should be constrained by the following parameters:

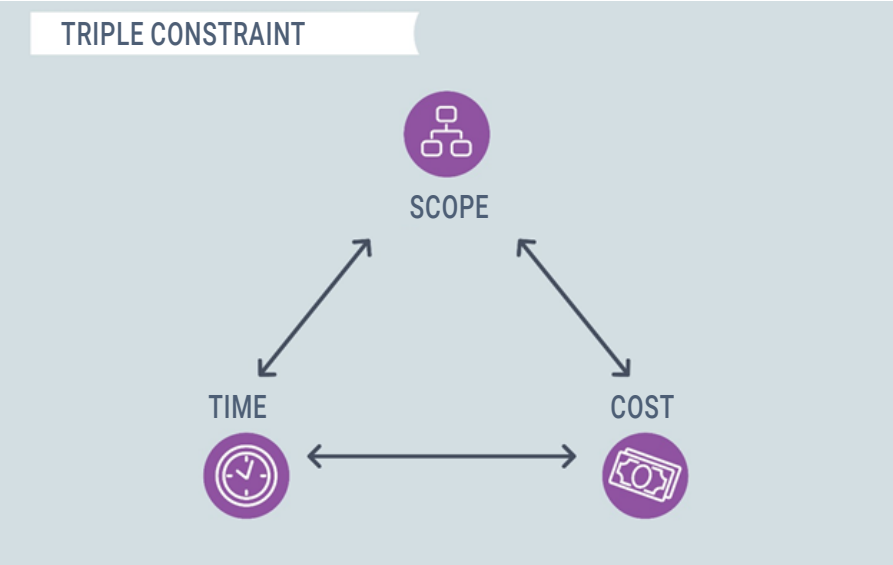

Figure 2

1. **Project Scope (functionality)**

   The scope of an IT project is usually formed as follows:

   Project objective > Project outcomes > Requirements for project outcomes.

Since most projects have difficulties with the wording of objectives (*below is a diagram describing the factors of project*

fails), it is recommended to use the **SMART** criteria to formulate the project objectives:

- **S – Specific**. Sometimes S means ***significant***.

Specifics implies the use of such a wording, which allows us to understand what should be the outcome (outcomes) when the objective is achieved. At the same time, the wording of an objective should avoid the "process" description. For example, the objective "continuously improve the testing process" sounds like a process, and the objective of "improve the testing process" sounds like the description of an outcome.

- **M – Measurable**. The quantitative parameters for measuring the degree of objective achievement should be specified.

In the description of an objective we add an indicator to measure the degree of its achievement and get: "reduce the Share of Re-opened Bugs by X Percent".

- **A – Achievable (Ac), Ambitious (Am)**. On the one hand achievable, and on the other hand – ambitious.

It is necessary to check whether there are enough resources to achieve the objective and whether the objective is so inspiring that its achievement is a challenge.

- **R – Relevant**. Relevant to other objectives.

Usually, in order to check for relevance, it is necessary to find a strategic goal is affected by this objective in the strategic document of the company.

- **T – Time bound, Trackable**.

We add time restriction to the objective wording and get: reduce the Share of Re-opened Bugs by X Percent within the first six months after the automated tests are automated.

It is believed that for the first time the term **SMART** was introduced by the well-known management guru **Peter Drucker** in 1954 in his book '**The Practice of Management**'. It is not known whether Drucker selected the abbreviation so that it corresponds to the word 'smart' or it turned out by chance, but to date in the scientific literature on management this is the only generally accepted approach to setting objectives (not including approaches from NLP).

Since, after formulating the goal, the project manager and the customer usually formulate project outcomes, and then calculate project time and budget, a part of the SMART criteria can be added only after calculating the planned deadlines and budget of a project.

For example:

The purpose of an IT project can be formulated as follows: Develop a software product allowing the company to increase the average profitability of transactions with customers by 5% within the first year from the time of commissioning.

This objective wording meets two of the five criteria: **S** (Specific) and **M** (Measurable).

To check whether the objective is ambitious and achievable at the same time, the project manager needs to create a project schedule model and check how many resources and for how long a project can be implemented. After forecasting the timing and budget of the project, the objective could meet the criteria **A** (Achievable (Ac), Ambitious (Am) and **T** (Time bound).

To check for the **R** (Relevant) criterion, the project manager needs to make sure that this objective is one of the strategic goals

of the company and is represented in the strategic document of the company, or it allows achieving one of the strategic goals.

The outcomes of this IT project include:

- a functioning software product;
- product documentation (for developers);
- materials of training programs for users;
- trained employees in the software product and new processes;
- data on the average profitability of transactions with customers for a period equal to one year from the time the product was commissioned.

Requirements for the software product will be described as a list of required functionality of the software product and are documented in the Software Requirements Specification.

For the software development project, the scope will be limited to the requirements described in the Software Requirements Specification, which could eventually be transformed into a WBS project and a project task list. Once all requirements have been implemented, the project can be completed and the outcomes can be handed over to the customer of the project.

2. **Project budget (project cost)** is the amount of money that the project customer is willing to spend on achieving the project's objectives and getting the expected outcomes.

The planned budget of an IT project is usually formed of several cost items. The IT project cost items can be as follows:

- project team costs;

- wage taxes;
- purchase of hardware (computers, servers, tablets, etc.);
- purchase of licensed software (DBMS, operating systems, etc.);
- reserve for project risks;
- project planned profit;
- the largest cost item of an IT project team is, as a rule, the "labor costs".

The largest cost item of an IT project team is, as a rule, the "labor costs".

3. **Project implementation term** is the duration of a project in time, which is calculated as the number of days from the official start of the project and to the official finish date of the project.
4. **Quality** is the degree to which the project requirements are met. Changing any of the triangle sides leads to a change in the quality level.

How does the Triple Constraint work:

- To reduce the project time, you can attract more resources (this will increase the cost of a project) or refuse part of requirements (reducing the scope of a project).
- In case of deviation from planned project deadlines, it would be possible to suggest that executors work overtime at higher rates, but this leads to an increase in the project budget.
- To make the project product more attractive to consumers,

it is possible to add previously unplanned functions to it, but this leads to the need to change the project deadline or to attract additional employees to be on time (but this leads to an increase in the budget).

We must understand that there is no universal definition of the term 'quality' for the Triple Constraint. Each project has its "quality" determined by the project's customer. One customer believes the "quality" means "within the budget", and another thinks it is more important to bring a new product to the market on time. It is important for the project manager to learn at the project start from project the customer how he/she treats the term "quality" and what is more important: to be on time, within the budget or to implement all the planned products (outcomes) and their functionality.

The customer of the project should choose one of the strategies shown in the figure 3:

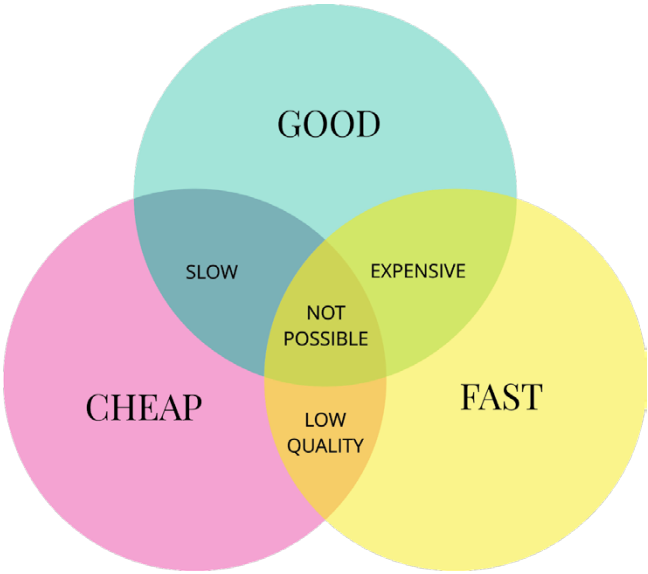

Figure 3

Being a customer, most of us want to make a project *Fast-Cheap-Good*, however, the share of such projects is extremely small, because this strategy is not possible.

To determine the project constraints, we propose the following sequence of actions:

1. Identify the project objective with the customer. Verify the objective wording for compliance with SMART criteria.
2. Discuss with the customer and commit the planned outcomes of the project.
3. Extract (collect) and analyze the requirements for the project outcomes.
4. Based on the requirements for the project outcomes, carry out the design of a WBS project.
5. To forecast the scope for all tasks from WBS and for the project as a whole.
6. Having received forecasts on the scope of the project tasks, predict the project implementation period (for example, using the Critical Path Method).
7. Evaluate the project budget.
8. Arrange the agreements on the scope, timing and budget of a project as a contract or a Project Charter.

Factors Affecting Project Cost

The cost of an IT project largely depends on the amount of work required to implement the planned scope of the project, and the man-hour rates of project participants.

For example, if the project scope is estimated as a project team of 1,000 man-hours, of which 350 hours are the work of coders, 250 hours are the work of testers, 200 hours covers the tasks of business analysts, 100 hours are the work of a project manager and 100 hours are the work of a technical writer, then, knowing the rates of employees, you can calculate the cost of their wages in the project. The Project Team Costs is the largest cost item in the budgets of most IT projects.

Principles of Project Cost Estimation

To estimate the cost of a project, the IT project manager needs to estimate the scope of the project.

In the development of software there are many approaches to estimate the scope of project, conditionally they can be divided into two groups:

1. **Traditional approaches to estimation.**
2. **Agile Estimation Techniques.**

Traditional approaches include:

- COCOMO 2;
- Functional Point Analysis (FPA);
- Program (Project) Evaluation and Review Technique (PERT).

COCOMO 2

Project effort estimation is based on the analysis using a study of 63 software development projects carried out by **Barry Boehm** and published in 1981.

After 10 years, a new version of **COCOMO II** appeared, taking into account the new life cycles of software development projects that have appeared since that time and using a larger set of data.

The scope of the project with the use of COCOMO II depends on such an indicator as the number of estimated kilo lines of code (**KLOC**) and the correction factors derived by **B. Boehm** based on the analysis of 63 completed projects.

There are three levels of estimation used in COCOMO II:

1. **Basic estimation** level does not take into account the impact on the project scope of a range of factors difficult to take into account in the early development stages, such as the team's experience in software development.
2. **Intermediate estimation** level implies that the size of a project depends on the size of a software product, the assessment of product characteristics, project characteristics, team's characteristics and hardware characteristics.
3. **Detailed estimation** level takes into account the impact of individual stages of a project on its labor efforts and, accordingly, the cost.

Functional Point Analysis (FPA)

To use the FPA, the project manager needs to have functional requirements for a software product.

All functional requirements are divided into five categories: outputs, queries, inputs, internal files and external interfaces. Each function is assigned an estimated number of functional scores, depending on its complexity.

The estimation of function complexity is calculated by the following formula:

$$FP = UAF \times VAF$$

where:

FP – Function Point;

UAF – Unadjusted Function Point;

VAF – Value Adjustment Factor.

The estimation of the whole project is obtained by summing up the estimates of all functional points.

PERT: Program/Project Evaluation and Review Technique

Three estimates are used to estimate the complexity of a project task (see Figure 4):

O – optimistic estimate of task complexity (if everything goes well);

P – pessimistic estimate of task complexity (if everything goes wrong and all possible problems happen);

M – most likely estimate.

The formula used to calculate the PERT estimate:

$$E = (O + 4*M + P) / 6$$

The optimistic complexity estimate can be obtained from the task performer, which the project manager considers to

be an optimist: the performer most often does not fit into the planned time of accomplishing the tasks.

The pessimistic estimate is made by the potential performer of a task, which most often gives a predictive estimate higher than his counterparts

And the most likely estimate can be obtained by studying the statistics on actual efforts for similar tasks in previously completed projects.

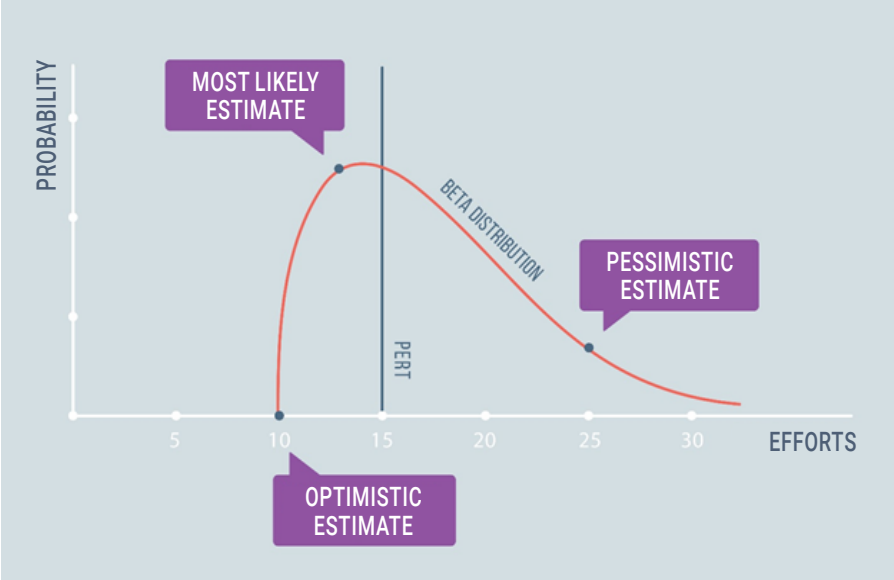

Figure 4

Having calculated the PERT estimates for all project tasks, the project manager can get a predictive estimate of the entire project efforts.

To do this, you need to sum the efforts obtained by the PERT formula for all project tasks and add a reserve for unforeseen

circumstances. This reserve can be predicted by calculating the root-mean-square deviation of a project: calculate the **standard deviation** (**SD**) for each project task, get the obtained value squared, and then extract the square root of the sum of the SD squares for all tasks.

In the event that the project manager wants to get the forecast of the project effort with an accuracy of 95%, the following formulas should be used (where *i* is task number):

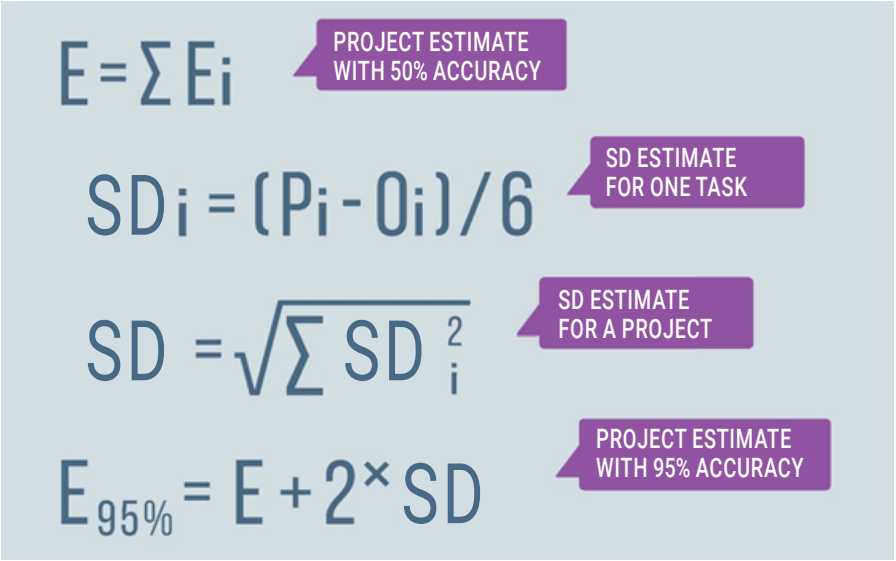

Figure 5

Agile Estimation Techniques

Planning Poker

Planning Poker is a modification of the Delphi method. In the Delphi method, the estimation is based on the opinion of an expert group, and it is very important to get rid of the so-

called "anchoring" effect. **D. Kahneman** describes the anchoring effect as follows: *"The anchoring effect manifests itself when people consider a particular value for an unknown quantity before estimating that quantity. This experiment provides some of the most reliable and stable results in experimental psychology: estimates do not deviate from the quantity considered, hence the image of the anchoring to a certain point."*

In order to obtain a group independent estimate, none of the experts should say their estimation until everyone makes a choice, and only after that results are announced.

How does the process poker planning take place?

Participants in the estimation (potential task executors) and moderator of the meeting are gathered in the same room. Each participant who carries out the estimation of efforts of project tasks has a deck of cards, for example, this one:

Figure 6

The values on the cards of this deck correspond to the Fibonacci series, where the following rule is used to determine the next value of the series: the sum of the two previous numbers should give the next number. There are several cards that are used rather as “entertaining”: for example, a card with a "?" sign, an expert pulls it out in case it does not fully understand the requirements for the task outcomes, or a card with a “cup” image, if the expert is tired of the estimation and is wants to have a break.

There are several cards with numbers not corresponding to the Fibonacci series: 20, 40 and 100. If a participant takes such cards, then he/she demonstrates his/her opinion of that the task is too large-scale. In this case, the moderator of the meeting is recommended to decompose the task into smaller sub-tasks and estimate them.

The procedure for using cards with estimates is as follows. The moderator reads a wish (or a task wording), the estimators ask questions about the requirements for the wish, and the project customer answers their questions.

After all the answers, the moderator asks each participant to make an estimate of efforts. After considering the estimate, the expert should draw a card with a figure corresponding to this estimate and put it face down, so that no one saw his estimate. That is, if the expert estimates the implementation of a task as 8 hours, he will draw out a card with the number 8 and put it face down.

After the experts pulled out the cards, they turn over them and the moderator announces the results. As a result, the group gets a range of estimates, which can be very broad.

To approach the estimates of experts, the moderator asks the expert who got the lowest score to explain his/her point of view. The expert explains his/her point of view and it often turns out that he/she misunderstood the requirements. After that, the moderator asks to speak out to the expert who made the highest estimate, and it often turns out that he/she chose not the most optimal approach to implementation. After listening to the opinions of two experts, as a rule, the requirements become more understandable, and in the course of collective discussion the group chooses a unified approach to implementation. The moderator invites the participants to vote for the second time. After the second round of voting, the range of experts' estimates is reduced. It is possible to conduct the third round of voting, however, the second round is usually enough to average expert estimates and get one estimate of the efforts for implementing this task.

In the end, all the tasks of the project (or the project iteration) get their estimates. Having summed up these estimates, the project manager receives an estimate of the maximum efforts for the entire project (or iteration).

As a rule, the team estimates only those tasks that are related to the development (coding). In the software development industry there is a diagram (see Figure 7) that allows you to make an overall estimate of the project activities related to software development.

This diagram shows that in the total scope of the software development project, coding occupies about 25% of the effort. So, in order to correctly calculate the project budget, you need to increase the forecast effort for developing the required

software functionality by 4, which in the end will allow you to take into account the remaining types of work.

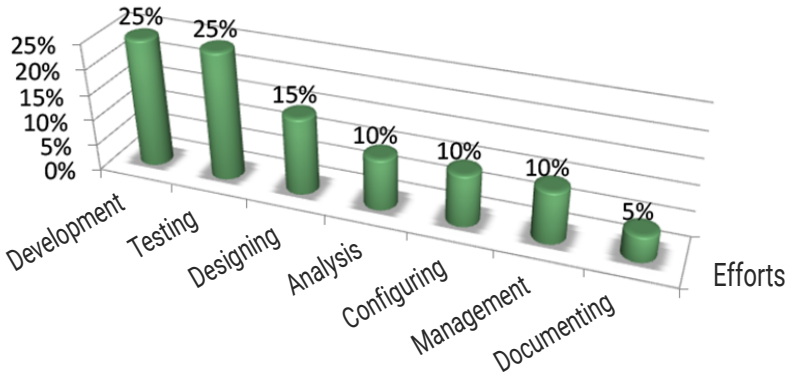

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Figure 7

After we have estimated the scope, it remains to multiply the estimated hours of developers, testers, business analysts and project managers by their hour rates, and we will get the main cost item in the project budget – the wages of the project participants. Next, the project manager needs to calculate the planned value for other cost items:

- Wage taxes – as a rule, the share of wage taxes is a known figure, which remains to be multiplied by the received value under the item "wages".
- Purchase of hardware (computers, servers, tablets, etc.) – this budget item must be agreed with the customer after collecting and analyzing the requirements for the hardware, choosing hardware options.

- Acquisition of licensed software (DBMS, operating systems, project management software, etc.) – for some projects, this item may have no costs, because all the necessary software is already available for the customer.
- Reserve for project risks – usually, this reserve can be calculated after a project risk analysis, or calculated using a percentage of project team's wages.
- Overhead costs for office maintenance.
- The planned profit of the project is determined by the management of a company, which is the project executor.

Example of Cost Estimations

The software product development project team received the terms of reference for software product development from the project customer, and it contains the description of the processes, the description of the usage scenarios and the requirements for the software product. The task of the project team is to estimate the project budget.

The first thing to do is to develop a list of works on the project. As a rule, the project manager does not have enough competencies to make a detailed list of works, so he/she invites competent experts in the subject area and asks them to make a transition from functional requirements to a detailed list of tasks.

You can give the requirements to the system architect for study, so that he/she drafts the product design, and then the team will determine the list of works. Next, the team makes an estimate of efforts through the planning poker method

and gets an estimate of the efforts for the tasks on developing the necessary functions.

Suppose, the planning poker results in the estimate of the development work showing that the coding requires 1000 man-hours.

Based on the received data, we calculate the planned value of the "Project team wages":

Type of works	Efforts, man-hours	Rate per man-hour for this type of work, $	Cost, $
Coding of the functions described in the ToR	1000	15	15 000
Testing	1000	12	12 000
Software design	600	20	12 000
Requirements analysis	400	14	5 600
Configuring	400	15	6 000
Project management	400	20	8 000
Documenting	200	10	2 000
Total	4000	–	60 600

Calculate the remaining costs of the project:

Cost Item	Calculation Formula	Cost, $	Comment
Wages of the project team		60 600	

Cost Item	Calculation Formula	Cost, $	Comment
Wage taxes	45% of the wages item	27 270	
Purchase of hardware	As per the cost of an invoice for the purchase of goods	10 000	As per the invoice from the server vendor
Purchase of licensed equipment		0	This project does not require this purchase
Reserve for project risks	10% of the team wages	6 060	
Planned project income		15 150	
Overhead costs of office maintenance	5% of the team wages	3 030	
Total project budget		**116 050**	

Based on the above calculations, the project manager can form a 1 man-hour rate of a project team member for the project's customer:

The 1 man-hour rate = 116 050 / 4000 = $ 29

So, the project budget is calculated, it remains to coordinate it with the project's customer.

Planning of Project Terms. Critical Path Method

To schedule an IT project, you can use the critical path method, which involves the use of the project's activity-on-node diagram and some calculations.

The project team makes a forecast on the efforts for tasks, and the project manager gets information about how much time each project participant can devote to the tasks of the project. After that, the project manager calculates the timing of each task using the formula:

Term of task = Efforts for the task * 100% /
% of the performer availability

where

% of the performer availability is the share of the working day that the performer c an devote to work on the task.

Next, the project team determines the dependencies in the implementation of tasks and develops an activity-on-node diagram.

When filling out the data in the **Predecessor** field, the command specifies the name of the task, which must be completed before the start of this task:

Task	Duration, days	Predecessor
A	2	–
B	15	A
C	10	A

Task	Duration, days	Predecessor
D	13	A
E	18	A
F	15	C, D
G	10	F, B
H	5	E, G

In order to determine the critical path, the team creates an activity-on-node diagram:

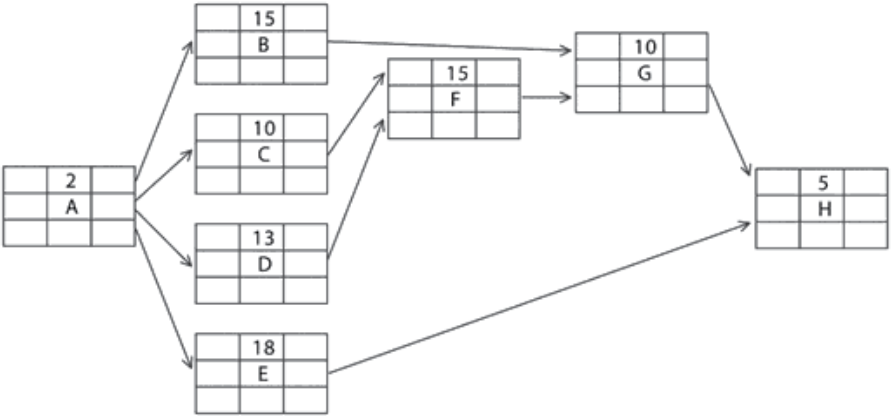


Figure 8

The task parameters on the chart are arranged in a rectangle. The legend for describing the values of rectangle cells is presented below:

EARLY START	DURATION	EARLY FINISH
TASK CODE		
LATE START	RESERVE	LATE FINISH

The order of project tasks is indicated by arrows, for example, task C can begin only when task A is completed, and task H starts when tasks E and G are completed.

To simplify the calculation of the diagram parameters, let's agree to use not the calendar dates, but the days' numbers. Also, to simplify the calculations, let's assume that task A can start right now, and today has number 0 (zero).

For task A, we calculate the parameters of the early start and finish dates:

Early start of task A is a day with number 0.

The early finish of task A is calculated as "early start" plus "duration", i. e. 0 +2 = 2 days.

Let's make one more assumption: the following task can be started on the same day when the previous task ends.

We perform the calculations for task B:

Early start: day number 2.

Early finish: 2 + 15 = 17th day.

The early start and early finish dates are calculated in the same way for all tasks specified in the activity-on-node diagram. In the case when a task has several predecessor tasks (for example, task H), the largest value is selected when calculating the day of early start.

To determine the longest chain of tasks in the project, it is necessary to calculate the dates of late start and late finish on the task.

The following rules are used for their calculation:

1. The late date of the finish of this task is equal to the late start date of the follower task.
2. If there are several follower tasks, as for task A, the lowest available value is selected to determine the late finish date.
3. The late start date of a task is defined as the difference between its late finish and duration.

It remains to determine the critical tasks in the diagram. To do this, you should calculate the reserves for task. The reserve value for a task is calculated as the difference between the late start value of a task and the early start value of a task. Those tasks which have zero-time reserve are called critical and determine the critical path of the project. Tasks which have reserve value different from zero are not critical. This means that for these tasks the implementation period can be extended for the time of their reserve or the task start can be shifted to the late start date.

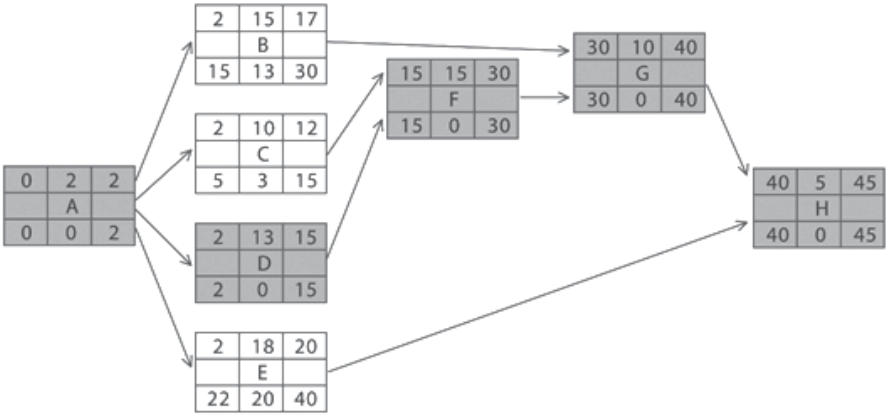


Figure 9

Why is it useful for the project manager to know the list and parameters of tasks that lie on the critical path?

- He/she gets an idea about the optimistic value of project duration.
- He/she understands which tasks require enhanced control, because the tasks of the critical path determine the duration of the whole project.
- The project manager can assign performers to the tasks of the project, see if there are overloads for some performers, align the overloads, and find out the real value of the critical path and project timing.
- If the deadline for the finish of the critical path tasks fails, the project manager can quickly predict how the project's time will change and consider how to adjust the project plan to meet the deadline.

The critical path method will soon be 60 years old, but for projects based on eth waterfall life cycle model, it is still relevant for planning the timing of projects.

For today in the world there is a huge quantity of computer programs which automate the calculations of parameters of the activity-on-node diagram.

Participants and staff of the project

In order to increase the probability of IT project success, the compulsory roles must be fulfilled within the structure of the project participants.

More often than not, IT projects have two sides of the project: the customer company and the executing company, but

sometimes, the IT project is done by the internal IT department of a company. Consider how the roles in the IT project are distributed in the first case.

Project participants from the customer side

There are many approaches to project management in the world and each of them describes its vision of what roles should be fulfilled in the project.

For example, in PMBOK, the following role model for the project is described:

Role	Responsibility	Powers
Project Manager	Responsible for all the parameters of the triple constraints: the achievement of objectives within the planned period and in budget	In the project organizational structure: the choice of executors for a team, the formation of a team, planning and monitoring the execution of tasks
Project Customer	Approval of the document on the requirements for the IT project (for example, SRS). Arrangement and execution of works on acceptance of the received project outcomes	Change of requirements for project outcomes, determination of priorities in the implementation of requirements
Project Sponsor	Approval of project objectives, target dates and budget. Ensuring that the agreed project executors allocate the time planned for the project tasks	Solving the issues which are not within the powers of the project manager and the project customer
Project Team	Execution of the project objectives within the agreed timeframe and planned efforts	To inform as soon as possible the project manager about problems in solving the tasks

For example, consider a project for the implementation of the **Enterprise Resource Planning** (**ERP**) system in a certain company, whose management decided to attract a company specializing in the implementation of ERP-systems.

Obviously, the role of the project customer should be performed by someone from the company's employees, wherein ERP is being implemented.

Can the role of the project customer be performed by several people, for example, all the heads of departments who will use ERP? Have you heard the saying "everybody's business is nobody's business"? This proverb is about the project, wherein the role of the customer is performed by several people, among which there is no chief. The customer of the project should be one person, although it does not prevent him/her from arranging a working group (or team) to consult with about taking important decisions on the project, but he/she must bear responsibility for the decisions made.

In order to decide on the appointment of a specific employee for the role of a customer in the ERP implementation project, the following questions should be answered:

1. Which employees of the company will use ERP?
2. Who of the leaders of these departments is most interested in the ERP-system helping him/her improve the indicators which he/she is responsible for?
3. Can the candidate for the project customer spend at least 4-6 hours a week on it?

To calculate the time required for the customer of the project to perform his/her functions one can use the data of the Standish Group company, that every $1000 of such a cost item as "man-hour cost" in an IT project requires taking 1.5 decisions. Suppose the ERP-system implementation project is estimated at $250,000, $100,000 of which is the cost of software licenses for the boxed ERP-system, and $150,000 is the cost of modifications and implementation of ERP (which is the cost of people's time). If the Standish Group calculations are to be believed, then in this project about 225 important decisions are to be taken, and the Standish Group indicates that the customer must take part in at least 20% of these decisions. As a result, it turns out that the customer will make a decision in 45 cases. Suppose that, on average, the customer spends 4 hours to make one decision, 4 hours per each of 45 important decisions result in 180 hours.

If the duration of the project is approximately 1 year, 180 hours divided by 48 weeks, gives the result of 3.75 hours per week the customer should spend on decision-making in the project.

At the same time, it is obvious that the customer will spend time not only on making important decisions, since he/she still needs to:

1. Ensure the availability of a project vision describing how the product will meet the expectations of different stakeholders.
2. Agree the project's constraints on the timing, budget and scope (these constraints should be spelled out in the project agreement or in the Project Charter).

3. Select a method for measuring the progress of the project, which should be on the one hand not requiring much time for measurement, and on the other hand – providing the correct data on the progress of the project.
4. Agree documents on requirements.
5. Arrange work on acceptance of the developed functional.
6. Arrange training activities for users.
7. Analyze the progress reports of the project manager.
8. Participate in the creation and adjustment of the project plan – the owner of the product should understand the project completion forecasts (whether the budget will be enough, whether we will meet the deadline) and make decisions on the priorities for the implementation of project product requirements.

So it turns out that 4 hours a week is the minimum time that is needed to adequately fulfill the role of the ERP project customer. Note that in some IT projects, the customer can take all his/her working time to fulfill the role of the project customer.

In some approaches to project management (for example, in Scrum), the project customer is called the "project product owner" and this name reflects the essence of his/her activity: create a product that will be valuable to its consumers. The owner of the product should be interested in obtaining an outstanding product within the planned terms and the approved budget.

Does an ERP implementation project need a sponsor?

In our opinion, this is one of the key roles for the project success. According to PMI statistics, the weak support of the

project sponsor fell to the ninth place in the list of project fail factors.

Figure 10

Project sponsor (curator) is the top manager of an organization, which will use the project outcomes. The project sponsor (curator) is responsible for the achievement of the final project objectives and realization of benefits for the organization.

What is the difference between the role of the project sponsor and customer?

1. The **Project Sponsor** should have more power than the customer of the project otherwise there will be no sense in him/her.
2. The **Sponsor** should be responsible for creating value in

the project and transferring this value to business units for operation.

The sponsor of the ERP implementation project, in our opinion, should be the CEO of a company or one of his/her deputies. The ERP implementation is an expensive project, the outcomes of which will be the change of many business processes of the company and if this project is not given the desired status, then it may prove to be a fail. Therefore, if the role of the project sponsor is assumed by the CEO of the company, the project will only benefit from such a decision.

Does the company ordering the project need to appoint a **Project Manager** from among its employees? The answer depends on what share of works from the total project scope will be performed by employees of the company-customer. If it is less than 20-25%, in our opinion, the project manager from the customer is not needed, with a larger share – it should be assigned, because someone will have to plan, organize and monitor the performance of tasks that will be entrusted to the employee of the company-customer.

Project staff from the developer company

On the part of the developer company, there is always a team that usually participates in an IT project to solve the project tasks that are facing it. This team must have a project manager. Other participants depend heavily on the work that needs to be done in the project. But usually the team consists of:

- Developers;
- Testers;

- Business Analysts;
- In some cases, the project team also needs interface designers, a system architect, a technical writer.

Should the IT project manager have experience as a programmer, analyst, or tester to lead the team?

This question has the following answer: the larger the project is, the less the project manager needs to be topic-oriented and the more skills he/she needs in project management:

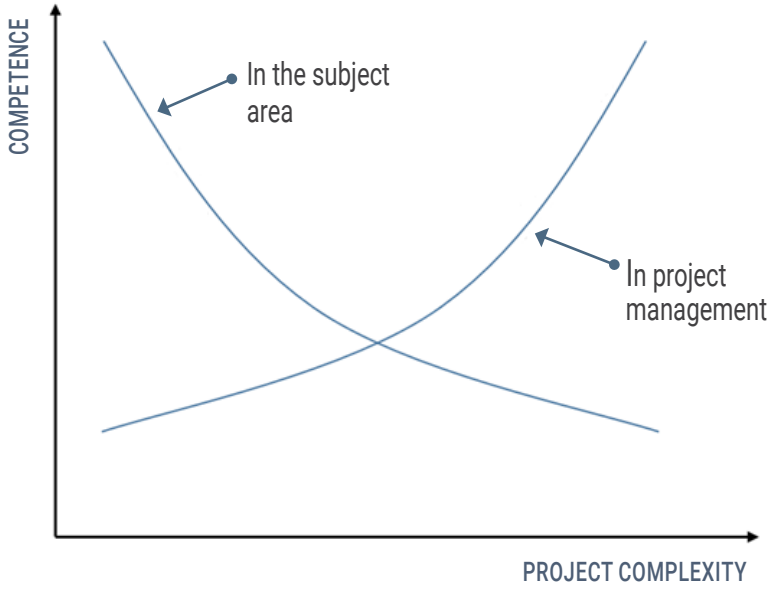


Figure 11

Let's consider the role of the project manager in detail.

The role of the project manager and his responsibility for the project is treated differently in different approaches to project management. So, the **MSF (Microsoft Solutions Framework)** approach assumes that the entire team, consisting

of the following role clusters, is responsible for the success of the project:

- **program manager** is responsible for the development of the solution architecture, planning and monitoring of project terms;
- **developer** is responsible for product development;
- **QAE** is responsible for planning, developing tests and reporting on tests;
- **release manager** is responsible for creating an infrastructure, producing a finished product;
- **user experience** means responsibility for training, ergonomics, graphic design, technical support;
- **product manager** is responsible for prioritization, product marketing, fulfillment of customer interests.

It turns out that in MSF the responsibility for the project success is collective, but the role of Program Manager is responsible for the implementation of the project on time and within the budget.

In the PMBOK approach, the project manager is responsible for the project success, and success is measured by whether the project team was able to fulfill it within the planned time, to keep within the planned budget and to achieve the objectives set for the project.

What competencies should the IT Project Manager have?

In our opinion, in the first place, he/she must have soft skills, such as:

- the ability to select the right people for the project and create a team of;

- negotiating skills;
- the ability to motivate team members;
- the ability to choose the most appropriate approach (or hybrid approaches) for project management and implement it in a project;
- skills of implementing automation tools for project work.

The ability to select the right people and create a team of them is the most difficult skill that a project manager needs to acquire. Below we will consider approaches that can help the project manager when selecting people for the team.

Principles of selecting employees for the project team

How does the team differ from the group of people working together on the project?

In our opinion, the team must have the following characteristics:

1. Constructive disputes about the case. If within the team people do not dispute about the care – they do not care, and this leads to the adoption of not the most optimal solutions.
2. Awareness of the overall responsibility for the outcome. Each participant strives not only to fulfill his/her tasks, but also to help colleagues.
3. Analysis of team performance. The team determines the metrics with which it analyzes its performance.
4. Continuous improvement of teamwork. Team members

periodically meet and determine what else can and should be improved, set tasks and implement changes in the teamwork processes.

When selecting employees for the team, it is important to take into account not only their professional skills, but also personal qualities.

In many companies, the **MBTI approach** is used to assess the personal qualities of employees, which has several practical aspects:

1. Knowledge of the employee's psychotype allows the manager to select the right communication channels, to predict the employee's behavior style in work and conflicts.
2. Knowledge of MBTI helps the manager understand the characteristics of his/her team and develop training plans for team members in soft skills.
3. MBTI helps to understand which tasks an employee can decide showing him/her best, and which decisions will be difficult for him/her.

The MBTI methodology allows you to determine the preferences of each person on four aspects, and then promote the best application of these preferences in life and work (see Figure 12).

- **Source of energy: extroverts and introverts**

An extrovert gets energy in communication with other people, and the introvert takes it in solitude.

- **The function of collecting information: sensing and intuitive members**

Sensing members trust their experience when collecting information. The intuitive ones collect information based on the assumption that any information can have a certain degree of reliability, even if they do not experience this. Intuitive person is a strategist, and sensing one is a tactician.

- **The decision-making function: thinking and feeling**

Thinking people in making decisions do not think about how those who are affected by this decision will feel. Feeling ones, on the other hand, make a decision, taking into account the impact that it will have on other people.

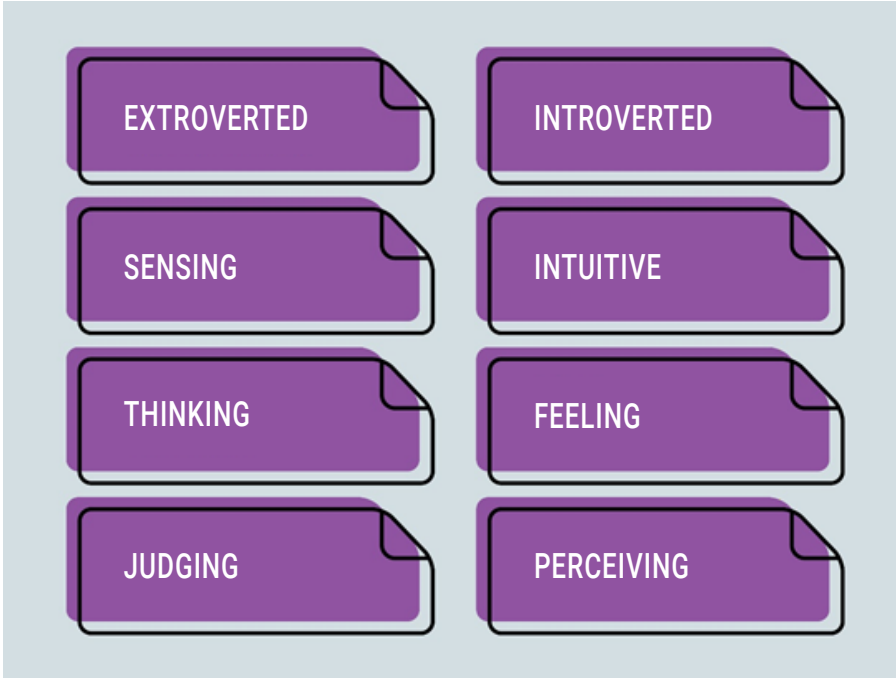


Figure 12

- **Lifestyle: judging and perceiving**

Judging people like to make decisions, the presence of open questions, which have no answers, make them stress. Perceiving ones prefer to collect information for decision-making and delay the moment the decision is made until the last.

Each of us has a predisposition to this or that pole on the scale extraversion-introversion, sensory-intuition, thinking-feeling, judgement-perceive. Each person can manifest himself as an extrovert in some situations and as an introvert in others, while a tendency to one of these qualities will be higher.

There are 16 types in MBTI:

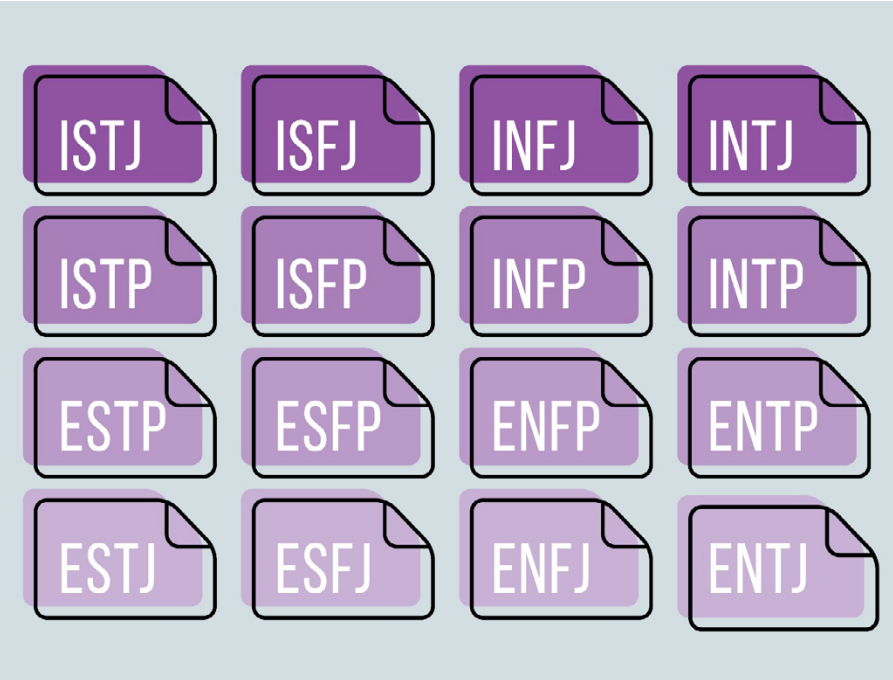


Figure 13

Interestingly, about 70% of Fortune 500 companies successfully use MBTI®, this indicates the popularity of the MBTI approach (https://mbtitraininginstitute.myersbriggs.org/home.htm?bhcp=1).

Another important point in the selection of employees for the project team is to study what motivates each potential participant to work in this project.

Ideal case is when the key motivator for a candidate is not money, but internal motives, such as: the desire to create a world-class product, the desire to gain new experience of successful work in a team, etc.

The project manager must have the skills to determine the dominant motivators of potential project participants.

Project Team Management

What is "team management"? From our point of view, management is to measure the performance indicators of the team and adjust the behavior of the team so that these indicators reach their maximum.

When using the Scrum framework, the team can measure two key indicators: **Focus Factor** and **Velocity**.

Example of Focus Factor calculation:

*The team took the responsibility to implement for one sprint 20 tasks with the effort of 400 man-hours. At the end of the sprint the team was able to demonstrate the result of 14 tasks out of 20 planned. According to the planned effort estimates, these 14 tasks were estimated at 200 man-hours. The **focus factor** of this sprint was 200/400 = 0.5 and team **velocity** was 200 man-hours.*

If you measure this figure after each sprint and track its trend, you can judge what stage of the life cycle the project team is at. The theory of the team life cycle was developed by **B. Tuckman**. He singled out the following stages of group dynamics in the team:

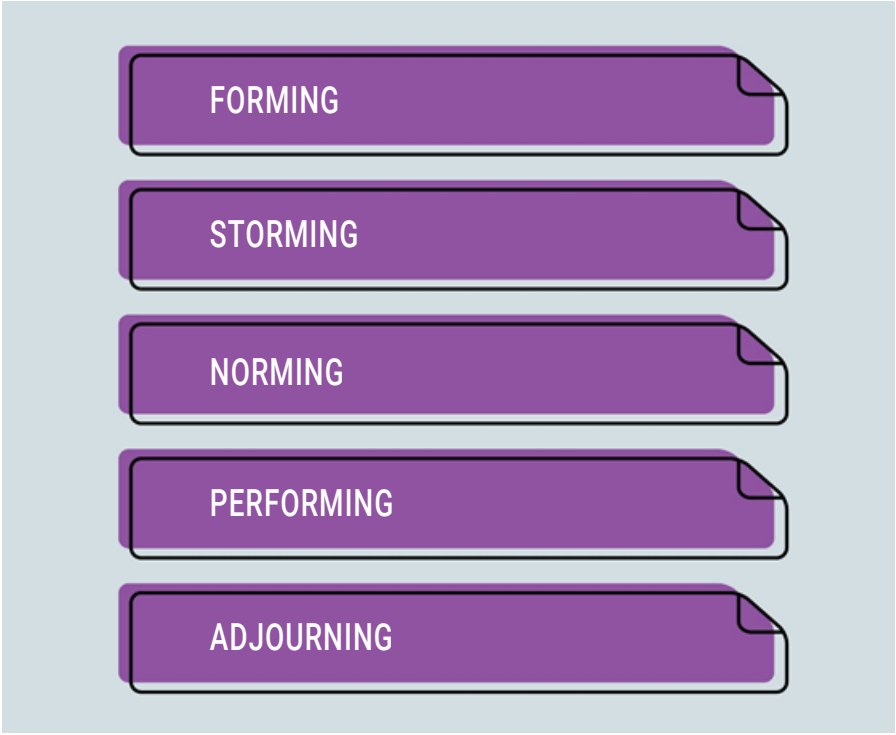


Figure 14

The team performance usually changes as it is shown in Figure 15.

If the team's focus-factor fluctuates in the first sprints from 0.3 to 0.5 and then growing and falling, which means that the team is at the stage of storming and cannot overcome it in any way. If the focus factor during 2-3 sprints grows steadily, then the team most likely moved to the norming stage. And if the focus factor continues to grow steadily over 3-6 sprints, at the same time it reaches level 1 and is at this level for a few sprints, then we can state that the team has reached the stage performing.

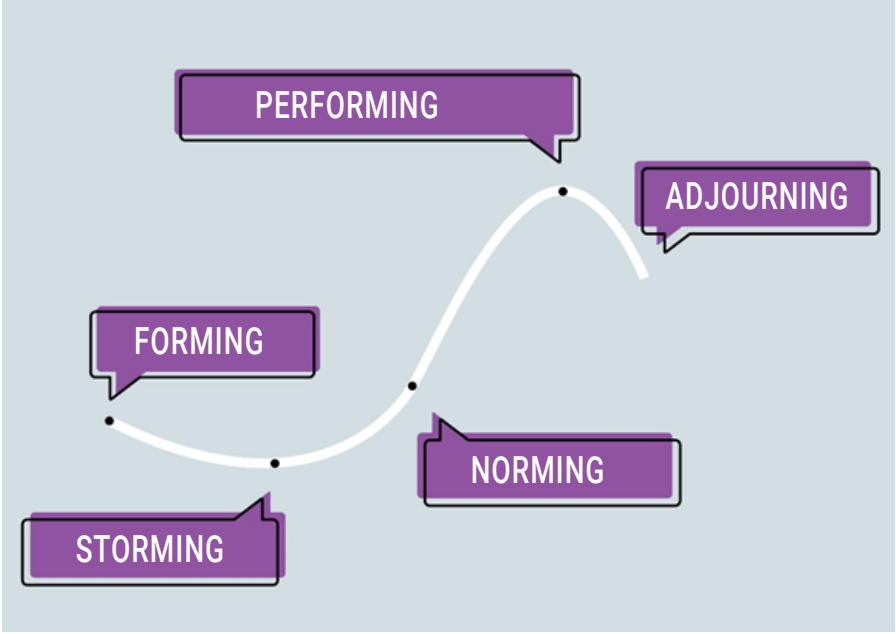


Figure 15

Roles within the project

There are quite a lot of professions appeared in the industry of development and implementation of software products for decades of its development. These professions also influenced the appearance of new roles in the IT project:

1. **Project Manager** is responsible for the project implementation on time and within budget and the achievement of the project objectives
2. **Business Analyst** extracts and analyzes requirements for the software product, searches for and analyzes problems, develops solutions for identified problems, documents requirements
3. **Product Architect** is responsible for product design and architecture description
4. **Developers** code requirements so that they correspond to the description and created functionality of the product passed test cases
5. **Testers** develop scenarios for testing requirements, conduct testing and record the deviations from requirements (including errors) detected during testing,
6. **Team Leader:** in some projects the number of participants exceeds 9 people and the project manager decides to split them into several teams. A team leader is selected to plan and monitor the results of the teams, and sometimes they are also responsible for the development of the competencies necessary for the project among the members of their team.

2. PROJECT RISKS

What are project risks?

In any IT project, despite how much time the project manager spent planning, something will go wrong. In order not to struggle with the consequences, but to foresee and prevent problems in the project, you need to learn how to manage the project risks.

There are several definitions of the term "risk":

> ***Risk** is an uncertain event or condition, the onset of which adversely or positively affects the project objectives.*
>
> © PMBOK

> ***Risk** is the impact of uncertainty on the achievement of objectives.*
>
> © GOST R 56275-2014

In fact, the project risk is something that will create a problem in the future, so we are impressed by the definition: risk is a potential project problem that may arise in the future.

That is, at the current moment this problem has not yet arisen, but if it does arise, it will have an impact on the implementation of the project on time and within the planned budget, and, possibly, will lead even to that the goal of the project will be non-implementable in full.

The essence of IT project risk management is to manage "proactively"without allowing problems to arise, and not to engage in endless "extinguishing of fires".

In our opinion, most project managers rely too much on their intuition and experience in planning the project and do not want to look at the project "without rose-colored glasses."

If we go back to the 2017 Pulse of the Profession, then the project uncertain risks fell on the 8th place in the list of reasons for project failure.

In most cases, a risk can be eliminated or its impact on the project can be reduced by making little effort or spending a little money.

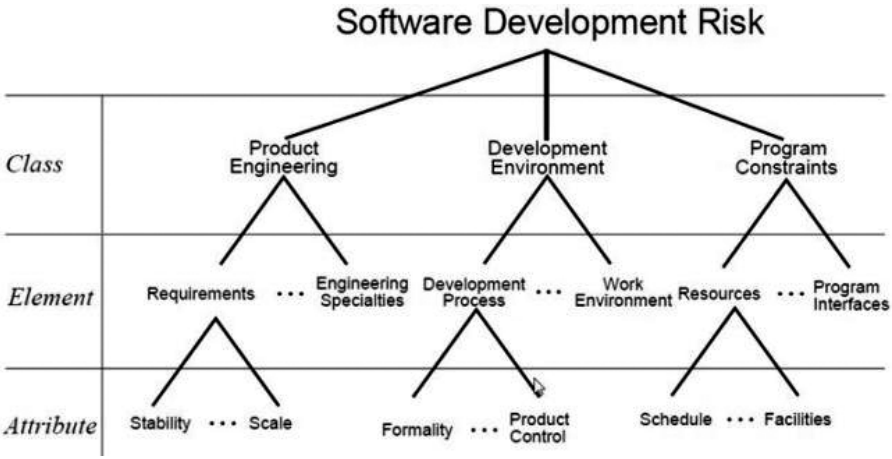
If the benefits of risk management in projects were obvious and proven, then it would be standard practice. But, there are following stereotypes that distract project managers from risk management:

1. If you are engaged in identifying the risks in an IT project, there will be no time to work.
2. A long list of risks will repel any desire to implement a project.
3. Bad thoughts attract bad events. It is better not to think about the bad.
4. Nothing ventured, nothing gained.

In our opinion, the project will only benefit from the fact that we identify at least a couple of dozen risks and take anti-risk measures on them, this will sharply increase the project's resilience to external shocks.

Types of risks

In 1993, the **SEI** (**Software Engineering Institute**) published the IT risk classification – **Taxonomy-Based Risk Identification**. Despite the rather large content, this document is quite simple to use. It describes three classes of risks for **software** projects, each class is decomposed into elements and attributes.



© http://resources.sei.cmu.edu/library/asset-view.cfm?assetid=11847

Figure 16

To identify the risks of an IT project, you can examine all the risk elements described in the document, and leave only those that you think are relevant to your IT project. Then you can plunge into depth and study the attributes and specific risks associated with these attributes. As a result, you will have a dry squeeze – a list of risks that are relevant to your project, which should be included in the document "Risk Register", correctly formulating the risks.

Risk management process

The risk management process consists of the following:

- Identification of risks (risk identification and fixation).
- Qualitative risk analysis (assessment of risk importance).
- Planning of anti-risk measures (adding new tasks to the list of tasks related to reducing, transferring or actively accepting risks).
- Monitoring and control of risks.

Identification of risks

It is conducted in order to detect as much as possible risks of the IT project and record them in the Risk Register.

Risk identification is an iterative process, because as the project develops, new risks can appear in its life cycle. The frequency of iterations and the composition of the iteration participants may be different in each case.

It is important for the project manager to learn how to make the right formulations of risk.

MSF offers the following format for formulating risks (see Figure 17).

Qualitative risk analysis

The list of risks can turn out to be very long, and different risks can have different importance for the project. How to assess the importance of risks?

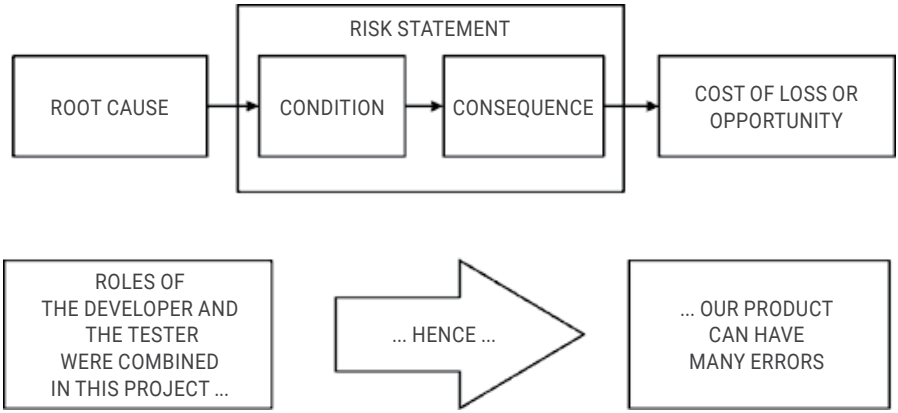


Figure 17

Two characteristics are used to assess the importance of risks: the likelihood of risk occurrence and its impact on the project.

Knowing these two parameters, you can calculate the importance of risk.

How to assess the likelihood of risk?

You can use statistics on cases that lead to the materialization of the risk or expert opinion.

For example, you have found several professionals who are ready to help you with probability evaluation. Ask them to choose the likelihood of the risk:

Probability interval	Wording	Numerical estimation
From 0% to 33%	Low	1
From 34% to 67%	Average	2
From 68% to 100%	High	3

In order to assess the impact of risk on the project, the following impact matrix can be used:

Wording	Numerical estimation
Low	1
Average	2
High	3

And the following formula is used to calculate the impact on the project:

Risk Importance = Probability x Effect

Risk Response Planning

The risks with the highest importance requires the project manager to consider such measures that will allow him/her to remove risks from the project or drastically reduce their likelihood or impact on the project.

Four possible strategies for working with risks are used to develop anti-risk measures. It is necessary to think through specific options for responding through each strategy and choose those that are cheaper than the probabilistic damage from the risk.

The PMBOK describes 4 strategies for dealing with risks:

1. **Avoid.** It presupposes the choice of such measures that

will completely eliminate the occurrence of the problem, and thus rid the project of the risk consequences.

2. **Transfer.** Assumes the search for the possibility to transfer the risk together with the responsibility for responding to the risk on a third party (for example, to the insurance company). The transfer of risk means that in case of risk materialization, the third party will pay the project manager or customer material compensation, but this does not make it possible to be sure that the risk will not happen.
3. **Mitigate.** It involves thinking out and planning activities that will reduce the likelihood and/or consequences of risk occurrence to acceptable limits.
4. **Accept.** There are two options for an acceptance strategy – active and passive acceptance. Active acceptance involves creating a reserve of time and money to eliminate the consequences of risk materialization. Passive acceptance assumes that there is a backup plan in case of risk materialization.

Risk Control

Periodically, the project manager is recommended to assess the status of risks: whether there was a risk or not, review the importance of risks and identify new project risks.

To do this, it is necessary to involve team members in the process of risk management and convince them that working with the project risks greatly increases the probability of meeting the deadline and budget.

3. PROJECT QUALITY MANAGEMENT

What is Quality Management?

The IT industry uses three concepts that are sometimes identified, but in fact are fundamentally different: **quality control (QC)**, **quality assurance (QA)**, and "**product testing**."

Testing is carried out after the product or part of it has been created, and quality control is a set of activities that guarantees the quality of the product at all stages of its creation. Quality Control (QC) is focused on finding defects in the software product and providing actions to correct them. And testing is an integral part of quality control.

Software Quality Assurance (QA) is a set of activities that is responsible for developing and implementing processes to improve the entire product development life cycle.

The relationship between the three concepts is well illustrated in Figure 18.

The functional duties of the QA team include the following functions:

- preparation of quality assurance plans for the project;
- verification of the conformity of project processes to quality plans;
- carrying out regular verifications of project products;

QA, QC and Testing in software development process

Figure 18

- informing the top management that there are deviations from the standards;
- control of availability of procedures for managing project changes;
- control of availability of procedures for managing product configurations;
- preparation of lessons learned in the quality control process and implementation of recommendations based on lessons learned.

In some organizations, the QA is performed by the Company's Project Office. This meets the criteria for independence, however, organizations that follow this model need to ensure that this team consists of trained and/or specialized quality assurance analysts.

Metrics

Quality control of a software product is not possible without the availability of metrics that allow you to assess the achievement of a certain level of software product quality.

> ***Metric** is as a quantitative scale and method which can be used for measurement.*
>
> © ISO 14598

One way to group metrics is grouping by the types of entities involved in quality assurance and software testing:

1. Metrics by test cases.
2. Bug/Deficiency Metrics.

We consider each of the groups of metrics:

Metrics by test cases

Metric Name	Description
Passed/failed test cases	The ratio of the number of successfully passed test cases to failed ones. By the end of the project, the number of failed tests should be zero
Not started test cases	The number of test cases that must be completed for this stage of the project. Having this information, we can analyze and identify the reasons for which the test was not conducted

Bug Metrics

Name	Description
Open/closed bugs	The ratio of open bugs to closed ones

Name	Description
Reopened/closed bugs	The ratio of the number of bugs transferred from the “closed” state to the “open” state to the total number of closed ones
Rejected/opened bugs	The ratio of the number of rejected bugs to open ones

Metrics in Practice

For each metric, it is worth considering the planned value and measuring the actual value.

It's best to keep charts on metrics and track trends. For example, if the share of newly discovered bugs to closed bugs increases, it is necessary to analyze the cause-effect relationships and understand what are the root causes for reopening bugs and how to eliminate these reasons.

Or if the share of open to closed bugs increases, then this is the signal to understand the reasons for the negative trend, which may be as follows:

- inadequate implementation of requirements by programmers (misunderstanding of requirements);
- carelessness of developers and poor testing by the developer himself before transferring the functionality to testing.

Quality control plan

A quality control plan is a document used, in particular, in the RUP methodology. This document contains a project estimate and quality control plan and can refer to a number of other artifacts used in the RUP.

The sections that follow include the template of the Quality Control Plan used in RUP:

- Definitions, Acronyms and Abbreviations;
- Management;
- Documentation;
- Standards and Recommendations;
- Metrics;
- Estimate and Control Plan;
- Evaluation and Testing;
- Troubleshooting and Corrective Actions;
- Tools, Methods and Methodologies;
- Configuration Management;
- Supervision of suppliers and Subcontractors;
- Quality Records;
- Training;
- Risk Management.

4. DOCUMENTATION AND WORKFLOW

Tasks and objectives of the documentation under the project

Documenting the project is performed to achieve the following objectives:

1. Reducing the likelihood that the agreements reached between the project customer and the project manager are forgotten or distorted sometime after the start of the project.
2. Increasing the likelihood that all stakeholders of the project equally understand the content of the project, plans for implementing the tasks of the project, etc.

Types of documentation

All the documentation in the IT project can be conditionally divided into the following types:

1. Project Management Documents:
   - Project Charter;
   - WBS (Work Breakdown Structure);
   - Project Schedule;
   - Risk Register;
   - Progress Report.

2. Documents on the project product:
   - Vision and Scope;
   - Software Requirements Specification (SRS);
   - Product Backlog;
   - User Documentation.

Project Charter

Project Charter is a document which the project begins from and by which the project's success is assessed. Project Charter is necessary for the Project Manager to fix in it all important aspects of the project agreed with the customer. Project Charter can become an annex to the contract and allows all project participants to get the same idea about the project.

In our projects we use the template of the Project Charter, the structure of which contains the following sections:

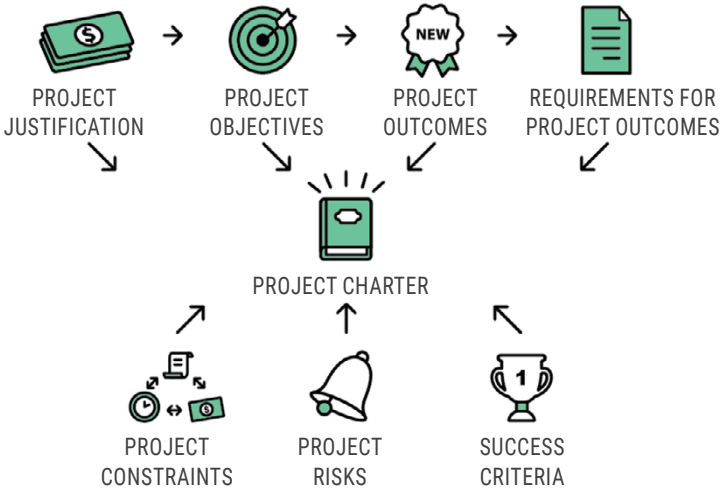


Figure 19

We believe that the project in most cases will be drafted by the Project Manager, and the Project Sponsor and Manager will coordinate it.

Project Charter is not a legally valuable document, but it can perfectly complement the contract or serve as an internal document that will be used by the project team and the project customer in case of deviation from the originally agreed project parameters.

WBS (Work Breakdown Structure)

In order to move from the project outcomes to the work list, to limit the project scope and to ensure that important project activities will not be missed, some project management methodologies (eg PMBOK, MSF) suggest using the **Work Breakdown Structure (WBS)**. WBS allows you to divide the project into parts (work packages):

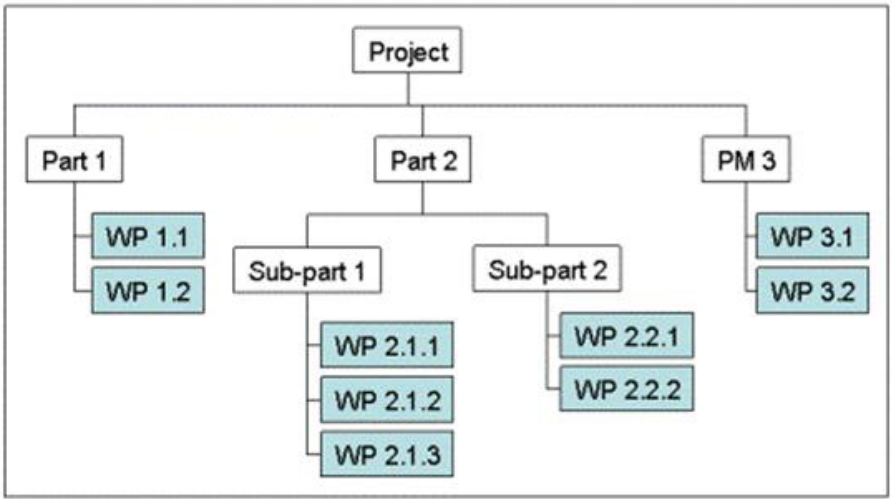


Figure 20

In MSF they write that WBS links the functional specifications and solutions that need to be created, with the tasks that must be done for this.

There are 3 approaches to the decomposition of the project:

1. **By project outcomes**.
2. **By function (specialization of labor)**.
3. **By life cycle**.

MSF gives the following recommendation for choosing the decomposition method: *"The first level of the WBS can correspond to the phases of the project life cycle."*

Here is one of the options for splitting the CRM implementation project using the project results approach:

CRM IMPLEMENTATION PROJECT			
Requirements for the software product	CRM software product that meets the requirements	Regulatory documents on CRM processes	CRM training for users

The project outcomes described in the WBS are necessary to achieve the ultimate goal of the project – CRM in the company should have an effect for the business.

Let's consider the second option of the project decomposition – by the stages of the life cycle:

CRM IMPLEMENTATION PROJECT			
Development of requirements for the software product	Selection of a software product and vendor	Completion of the software product to meet the requirements	Software implementation

The same CRM implementation project can be decomposed by function:

CRM IMPLEMENTATION PROJECT				
Collection and analysis of requirements	Development of architecture and technical design	Completion of the software product	Software implementation	Project management

Obviously, all three approaches used to decompose the project at the top level should lead to approximately the same task list at the lower levels of the WBS. In this case, no important tasks of the project should not be missed.

When creating a WBS, it is recommended that you follow these rules:

1. After decomposition of the parent task, you need to make sure that the achievement of the results by child tasks will result in the achievement of the result by the parent task.
2. Child tasks that decompose the parent task must be the same in terms of scope or timing.
3. When moving from one level of WBS to another, you can change the approach to decomposition (for example, at the second level, the "by outcomes" approach was used, and on the third one you can use the "by functions" approach).
4. Different approaches to the decomposition of works should be used so that the maximum proportion of the links between tasks falls on the lower levels of the WBS.

Now answer the question about the depth of the WBS decomposition. First, different packages of WBS work can have different depth of detail.

Secondly, decomposition can be stopped when the lower-level tasks of WBS meet the following conditions:

- The requirements for the task are clear to the potential executor and the employees participating in the decomposition of works.
- You can assign one executor to one task.
- The scope of the task does not exceed a certain threshold value.

For example, if the effort of the task does not exceed 40 man-hours, the decomposition should be stopped.

In MSF, there is the following recommendation for IT projects regarding the size of tasks in WBS: the assessment of the execution time of each task should not be less than one or more than 40 days.

Project Schedule

Project Schedule is needed by the Project Manager and the Project Customer in order to detect deviations from the approved base schedule at the earliest possible moment and make important decisions on corrective actions.

A good project schedule allows you to:

1. Understand what is the need for performers for any period of time, for example, next month, week or day.

2. Make changes in the amount of available time for the executors assigned to the tasks of the project, changes in the start dates of tasks, changes in the task list.
3. Get a forecast of whether the team has time to implement the project on schedule.

The Project Manager uses the following approaches to create a good project schedule:

1. Development of the WBS project to obtain a complete list of project activities.
2. Evaluation of the scope and the appointment of executors to the tasks of the project to determine the timing of tasks.
3. Critical path method for determining the overall duration of a project.

The development of Project Schedule is usually performed in several iterations, and in order to edit it quickly it is necessary to create a project model. The **project model** is a list of project activities with specific links in the task sequence, with an estimate of the effort required for tasks, assigned resources and estimates of the duration for each task.

The project model allows the project manager to determine the need for performers for any project planning horizon, without any special effort to make changes and get the forecast completion date of the project, to play scenarios such as "what will happen to the project term if you take another programmer to the project team?", to forecast the completion terms of the project.

To create and work with the project model, there is special software, such as MS Project, Oracle Primavera, Easy Projects, Clarizen, etc.

Usually the following types of project schedule are used:

1. Project Activity-On-Node Diagram.
2. Gantt Chart.
3. Milestone Plan.
4. Project Time Schedule.

Below is one of the forms of the Project Time Schedule:

Project Time Schedule

_____

_____

project name

Planned start date of the project:

Planned completion date of the project:

No.	Task Name	Task Start Date	Task Finish Date	Executor	Outcome Acceptance Criteria

Risk Register

The risk register does not have a single, universally recognized structure. On the web, you can find different templates for this document. We give one of them:

Example Project Risk Register:

Risk Description	Risk Response Task	Executor	Deadline	Risk Status
Insufficiently developed requirements will lead to a large amount of refinement and the failure to meet the deadlines	Select only the cases critical for launching the system and concentrate on their implementation	Yakubovich	21.04.17	Actual

Progress Report

The project manager should inform the Customer about the progress of the project. How to make a progress report on the project in such a way that the customer takes 10-15 minutes to receive information about the project?

There is a simple report form, consisting of 3 sections:

1. Project Results Received:

Result Description	Result State	Actual Costs

2. Implementation Tasks:

Task	% of implementation	Cost Forecast

3. Problems (risks):

Problem (risk) description	Response Plan

In some IT projects, the customer is offered to use the one sheet report form, which includes up to 7-10 areas of attention. See report example on the next page (Figure 21).

Project Objectives Section. Here it is necessary to formulate one or several objectives of the project.

Project Tasks Section. Here you need to add 20-25 tasks from the project schedule. If there are more tasks in the project, you need to list tasks of the second or third level of WBS.

At the intersection of the Objective column and rows with the project tasks, you need to specify which tasks will lead to the achievement of this project objective. When all the circles in the column with the Objective name are filled with color – the objective is considered achieved.

Project Manager: M. Yakubovich | **Project: ERP Implementation** | **Date: 20.08.2018**

Project Objective: Effort reduction for routine operations, improve accounting accuracy

Objectives					Main Tasks	Complete Project by 20.12.2018 Responsible/Role															
				1	Train users in Minks			●						R	E		C				
			R	2	Train users in Berlin				●	R				R			E	C			
			R	3	Train users in Warsaw				◎	R				R		E			C		
			R	4	Train users in Moscow						R			R		E		C			
			R	5	Train users in Prague				◎	R				R	E		C				
	●			6	Issue missing reports				●						R			E	C		
	R			7	Verify data in reports					R					R	E		C			
R				8	Improve program interface				◎	R					R			C	E		
R				9	Set timing for main processes				●	R					R		C		E		
R				10	Analyze time release						R				R		C		E		
R				11	Calculate implementation ROI						R			C		R	E				
R				12	Start the document flow block					R	R			E	R				C		
		R		13	Develop procedures and instruction for new WB			◎	◎	R						R	E	C			
R				14	Test new role model					R					R	E	C				
R				15	Develop role model				●	R	R				E		R		C		
R				16	Architecture description of the Production module				●	R	R				R		C		E		
R				17	Architecture description of the Finance module				◎	R	R				E		R		C		
				18	Close period in the new WB				●	R	R			C		E	E	E	R		
R				19	Collect remarks upon the period close				●	R	R				E	R			C		
R				20	Improve the procedure of the period close				●	R	R			R	C		E				
		R		21	Improve procedures and instructions for the new WB				●					R	C		E				
		R		22	Approve procedures and instruction for new WB					R				R		E			C		
			R	23	Train employees of all branches						R				R		C		C		

Implement ERP Modules	Get Accurate Report	Approve New Procedures	Train Users	Main Tasks / Objectives / Terms / Costs / Conclusions and Forecasts	July	August	September	October	November	December	January	February	March	Yakubovich	Nikolaiev	Karpin	Shalimov	Susko	Patrikeev
				Expenses on the Analyst								17000					25000		
				Bonus Budget								0					20000		
				Expenses on Improvement								33000						50000	
				Introduce weekly meeting to control procedure development															
				Warsaw and Prague lack training budget, request for Budget Committee is drawn up															
				Outsourcing team was invited to speed up interface improvement															

Figure 21

Terms Section. This section allows you to visualize in the diagram the periods in which task works are scheduled. If the task is planned to be performed in several periods, circles are drawn opposite these periods.

Responsible/Role Section. The names of key project participants are listed below, and the responsibility matrix is filled above the names. The following values are used in this form:

- Responsible (letter **R**) – he/she is responsible for the result of the task.
- Executor (**E**) – directly performs the task.
- Controller (**C**) – takes the results of the task and formulates a list of errors.

Costs Section. Planned project budget items and the planned amount of costs for them are listed. The larger the planned budget, the longer the segment.

Conclusions and Forecasts Section. The project manager needs to convince the customer that he/she knows how to manage the project.

How to fill out the report in the part of the tasks:

If the volume of the work actually performed was not less than the planned one, then the circle in the report in the task line is green if the actual volume was less than the planned one, but there is a chance to make up the schedule – the yellow color is used, and if the task has not been done, the red color is used.

The same system of "traffic lights" is also used for painting the segments for budget items. If the budget is executed according

to the plan – green, in the reporting period there was an overspending – yellow is used, the planned amount is exceeded for the budget item – we paint in red.

This form of the report is very convenient and is pleasant to customers of projects.

Product Backlog

This document is used in the Scrum approach to collect and manage the order of all requirements for the software product. The Product Owner is usually responsible for what requirements fall into the Product Backlog and for the availability of priorities for the requirements (*for more details on the role of PO, see the lesson on Scrum*).

The Product Backlog structure is not strict and is not described in the Scrum Guide. Below is one of the options for the structure of this document:

Requirement	Importance	Testing scenario	Assessment

Requirement is a description of Epic or User story (*see the Scrum lesson*).

Importance is the value filled by the Product owner, he/she also determines the scale by which the importance of the requirement is measured. In the literature there is a recommendation regarding the length of the list of requirements, which is adequate for efficient work with the list – about 100 pieces. Based on this, PO can choose a scale from 100 (maximum importance) to 1 (minimum importance).

Test scenario is the field that describes a script, during implementation of which the requirement will work as expected by the Product owner.

Assessment contains values for the assessment of the efforts for the implementation of requirements. Assessments are usually made by one of the project team members and they are preliminary, which means that they can be refined when planning a sprint.

Vision and Scope

This document allows you to understand the answers to the questions:

- What problems or opportunities does the product solve?
- What are the key business requirements for the product?
- Who will be the users of the product?
- What business requirements will fall into which release of the product?

The structure of this document can be borrowed in the book by **K. Wiegers 'Software Requirements'**:

1. Business Requirements
1.1. Background, business opportunities, customer needs
1.2. Business objectives and success criteria
1.3. Factors of business risks
2. Solution Vision
2.1. Provision on the project vision
2.2. Main functions (characteristics)

2.3. Assumptions and dependencies
3. Scope and constraints
3.1. Volume of the first and subsequent releases
3.2. Limitations and Exclusions
4. Business Context
4.1. Profiles of project stakeholders (participants)
4.2. Priorities of the project

Note that some sections of this document overlap with the Project Charter, so the project manager should adapt one of the documents to avoid duplication of information.

Software Requirements Specification SRS

This document must contain all requirements for the software product. Classification of requirements for the software product will be discussed in the next lesson.

There is no single version of the SRS document structure, but there are 2 templates that are used quite often.

The structure of this document can be borrowed in the book by **K. Wiegers 'Software Requirements'**:

1. Introduction
1.1 Purpose
1.2 Project scope
1.3 References
2. Overall description
2.1 Product perspective
2.2 User classes and characteristics

2.3 Operating environment
2.4 Design and implementation constraints
2.5 User documentation
2.6 Assumptions and dependencies
3. System features
3.1 Function 1
3.2 Function 2
3.3 Function 3
3.4 ... ..
3.5 Function N
4. External interface requirements
4.1 User Interfaces
4.2 Hardware Interfaces
4.3 Software Interfaces
4.4 Communications interfaces
5. Other non-functional requirements
5.1 Performance
5.2. Safety
5.3 Security
5.4 Software Quality Attributes
Annex A: Glossary and Data Model
Annex B: Analysis models

The second SRS template was proposed in the once popular for IT projects approach – RUP and has the following structure:

1. Introduction
1.1. Purpose
1.2. Scope
1.3. Definitions, Acronyms, and Abbreviations
1.4. References
1.5. Overview
2. Overall Description
3. Specific Requirements
3.1. Functionality
3.1.1. <Functional Requirement One>
3.2. Usability
3.2.1. <Usability Requirement One>
3.3. Reliability
3.3.1. <Reliability Requirement One>
3.4. Performance
3.4.1. <Performance Requirement One>
3.5. Supportability
3.5.1. <Supportability Requirement One>
3.6. Design Constraints
3.6.1. <Design Constraint One>
3.7. On-line User Documentation and Help System Requirements
3.8. Purchased Components
3.9. Interfaces

3.9.1. User Interfaces
3.9.2. Hardware Interfaces
3.9.3. Software Interfaces
3.9.4. Communications Interfaces
3.10. Licensing Requirements
3.11. Legal, Copyright, and Other Notices
3.12. Applicable Standards
4. Supporting Information

And here is the SRS structure recommended in IEEE 830 standard:

- Introduction
  - Purpose
  - Definitions, acronyms, and abbreviations
  - Intended audience and consistency of perception
  - Scope
  - References
- Overall description
  - Product Vision
  - Product functionality
  - User classes and characteristics
  - Operating environment of the product
  - Frameworks, limitations, rules and standards
  - User documentation
  - Assumptions and dependencies

- System functionality
  - Function block X (there may be several such blocks)
    - Description and priority
    - Causal relationships, algorithms (process flow, workflows)
    - Functional requirements
- External interface requirements
  - User experience (UX)
  - Software interfaces
  - Hardware Interfaces
  - Communications interfaces
- Non-functional requirements
  - Performance requirements
  - Requirements for safety (data)
  - Software quality criteria
  - System security requirements

User documentation

In most cases, the users of the software product require the following types of documentation to work with the program:

- built-in help for work with the program;
- materials describing the cases of using the product (most often they are created in the format of video lessons, but there are also descriptions in the form of documents).

Lesson 2

PROJECT MANAGEMENT IN DETAILS