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PLANNING AND MANAGEMENT OF IT PROJECT

PLÁNOVÁNÍ A ŘÍZENÍ IT PROJEKTU

MASTER'S THESIS

DIPLOMOVÁ PRÁCE

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Theoretical Background
Problem Analysis and Current Situation
Proposals and Contribution of Suggested Solutions
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Abstrakt

Diplomová práce je zaměřena na zpracování návrhu realizaci vybraného projektu ve zvolené firmě s využitím vhodných metod, technik a nástrojů projektového řízení. V první části práci bude proveden průzkum teoretické informací ohledně problematiky projektového řízení IT projektů. V druhé části bude popsán současný stav ve vybrané společnosti a na základě tohoto stavu budou aplikované vhodné metodiky a nástroje pro realizaci projektu v návrhové části práci.

Klíčová slova

IT projekt, projektové řízení, plánování, WBS, MS Project, risk management, RIPRAN

Abstract

The master's thesis is focused on the design of the implementation of the selected project in the chosen company using appropriate methods, techniques and tools of project management. The first part of the thesis contains theoretical basis of IT projects management. At the second part will be described current situation inside of the company and based on this situation will be applied appropriate methodologies and tools for IT project realization.

Key words

IT project, project management, planning, WBS, MS Project, risk management, RIPRAN

Rozšířený abstrakt

Informační technologie (IT) jsou v dnešní době vysoce cenným aktivem pro jakýkoliv podnik. Tyto technologie existují jako prostředek výměny informací, automatizace a služeb, zaměřených na uspokojení konkrétních potřeb zákazníků. Jednou z nejdůležitějších součástí vývoje nového produktu, služby nebo prostředí je nepochybně činnost projektového řízení, která sestává z určitých cílů, stanovených termínů a většinou omezených zdrojů.

Řízení IT projektů je primárně komplikováno skutečností, že trendy a tržní požadavky se rychle mění. Proto je třeba zabránit situacím, kdy se výsledek projektu ukáže jako nevyžádaný a irelevantní. Metody projektového řízení, samozřejmě, nejsou univerzálním řešením k zabránění těchto situací, ale přispívají však k minimalizaci pravděpodobnosti jejich výskytu.

Hlavním cílem diplomové práce je zpracování návrhu vybraného IT projektu ve zvolené firmě s využitím vhodných metod, technik a nástrojů projektového řízení. Práce se konkrétně zaměřuje na návrh realizace interního IT projektu ve společnosti XYZ, která podporuje a vyvíjí software pro bankovní sektor.

Diplomová práce je rozdělena do tří základních částí. První část je zaměřena na teoretická východiska práce, která uvádí informaci ohledně řízení IT projektu včetně různých přístupů, nejčastěji používaných nástrojů, fází projektu a plánování projektu z hlediska času, zdrojů, rozpočtu a nákladů. V teoretické části práce je také popsána metodika řízení rizik RIPRAN, která pomáhá včas identifikovat možná rizika a navrhnout vhodná opatření k zamezení nebo zmírnění jejich dopadu na celkovou realizaci projektu.

Druhá část diplomové práce se zabývá představením společnosti XYZ, její organizační strukturou a analýzou současného stavu. K tomu přispívá analýza PEST, která zkoumá sociální, ekonomické, politické a technologické faktory ovlivňující společnost. Kromě toho, je Porterův model pěti konkurenčních sil využíván pro identifikování ovlivňující síly vnějšího prostředí společnosti v oblasti zákazníků, konkurentů, dodavatelů, substitutů a nových účastníků trhu. Pro účely zkoumání vnitřního prostředí společnosti

je aplikovaná analýza 7S. Výsledky předcházejících průzkumů se pak projevují ve SWOT analýze, která definuje slabé a silné stránky analyzované společnosti, a také její příležitosti a hrozby.

Poslední část diplomové práce se zabývá návrhem realizace projektu, který vychází z analýz a průzkumu, provedených v předchozích kapitolách. Samotný projekt spočívá ve vývoje nového analytického portálu pro datové analytiku, pracující v programovacím jazyce Python. Nejprve se uvádí identifikační listina a logický rámec projektu, kde je stručně popsán celý projekt. Cíl projektu je definován pomocí metody SMART, což přispívá k její dosažitelnosti. Následně je definovaná hierarchická struktura činnosti (WBS), která rozděluje jednotlivé práce projektu na menší a lépe zvládnutelné celky, a tímto poskytuje srozumitelný popis celého projektového rámce. Díky tomu dochází ke zvýšení efektivity a jednodušší kontrole jednotlivých částí projektu. Dále je stanovený časový harmonogram pro jednotlivé činnosti a výsledky jsou graficky znázorněny pomocí Ganttova diagramu.

Pro úspěšnou realizaci projektu je také nutné provést zdrojovou analýzu, která spočívá v definování potřebných zdrojů, popisu organizační struktury projektu (OBS) a přiřazování odpovědnosti podle RACI matice. Během přípravy návrhu projektu se také řešil problém přetížení zdrojů a způsoby jejich narovnání.

Další nedílnou součástí návrhu realizace projektu je analýza plánovaných nákladů a rozpočtu. Součástí plánovaného rozpočtu by také měly tvořit finanční rezervy, plynoucí z navržených preventivních opatření v aplikované analýze rizik. Závěrem bude zhodnocená celková realizace projektu a jeho přínosy pro společnost.

K dosažení hlavního cíle jsou také definované následující dílčí cíle:

- realizace průzkumu nezbytných teoretických základů problematiky projektového řízení v oblasti IT;
- provedení komplexní analýzy současné situace ve společnosti;
- analýza projektové specifikace a návržení plánu realizace projektu;
- realizace zdrojové a nákladové analýzy projektu;

- identifikace projektových rizik a navržení preventivních opatření, která umožní rizikům zabránit;
- zhodnocení přínosů navrženého planu realizace projektu.

Při psaní práce byly využity metody pozorování, komunikace s interními zaměstnanci, analýzy dat, dedukce, aplikování znalosti zjištěných během studia a práce s odbornými zdroji.

Vzhledem k charakteristikám projektu a omezenému množství zdrojů, je návrh realizace projektu řízen tradičním přístupem. Doba trvání projektu je stanovena na 154 dní a konečný rozpočet včetně nezbytných rezerv na zaklade rizikové analýzy tvoří 819 400 Kč.

Tento konkrétní projekt lze považovat za investici, která společnosti přinese v budoucnu další výhody, mezi které patří:

- uspokojení potřeb zákazníků v souladu s měnící se strategií datové analytiky na grupové úrovni;
- budování dlouhodobých vztahů se zákazníkem na základě podpory unikátního řešení na míru (a následující finančních výhody);
- nove řešení umožní snazší spolupráci mezi zákazníky (bankovní oddělení v různých zemích), což šetří jejich čas a peníze, a v důsledku budou více investovat do podpůrných služeb společnosti XYZ.
- vytvořený projektový tým získá zkušenosti s metodami řízení projektů, které budou použity pro budoucí interní projekty.

Jeden z klíčových přínosů diplomové práce je skutečnost, že celková předprojektová fáze a plán projektu je zpracován s využitím aplikace MS Project, ve které je projekt nachystán pro jeho realizaci a řízení. Plán projektu může dále sloužit jako šablona a souhrnná znalostní báze pro další interní projekty řešené ve firmě. Tím pádem, ve společnosti bude zavedena metodika interního projektového řízení, která do této doby chyběla. Návrh realizace projektu plně reprezentuje systémové řízení projektu ze všech klíčových aspektů projektového managementu jako čas, zdroje, náklady, rizika, a proto, dovoluje plánovat a řídit další projekty ve společnosti. Tato metodika byla reprezentovaná formou case study na vybraném projektu.

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Čestné prohlášení

Prohlašuji, že předložená diplomová práce je původní a zpracovala jsem ji samostatně. Prohlašuji, že citace použitých pramenů je úplná, že jsem ve své práci neporušila autorská práva (ve smyslu Zákona č. 121/2000 Sb., o právu autorském a o právech souvisejících s právem autorským).

V Brně dne xx. května 2020

podpis studenta

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INTRODUCTION

Information technologies are highly valuable in today's realities. These technologies exist as means of information exchange, automation and services aimed to satisfy particular consumer needs. Unarguably, one of the most important parts of development of a new product, service or environment is a project management activity, which consists of goals, deadlines and resource restrictions.

However, approaches of IT project management differ significantly from other ones that are applied to projects in more traditional areas as an example civil engineering or production works with material objects. Management of IT projects is primarily complicated by the fact that trends and market requirements are changing rapidly, hence everything must be considered in fast mode in order to avoid situations where result of a project turns out to be unclaimed and irrelevant.

Of course, methods of project management are not a universal approach to succeed. These methods are not applicable to all management tasks, however, are appropriate in the case of this work.

The diploma thesis is focusing on proposal of realization of internal project in the company XYZ, that support and develop their own products for the bank aria.

The master's thesis is divided into three basic parts. The first one is focused on theoretical bases, which consists of information about the project management including different approaches, most commonly used tools, project phases and project planning in terms of time, resources, budget and costs. A risk management methodology is also described in the theoretical part of the thesis.

The second part of the diploma thesis deals with an introduction of the company, its organizational structure, and an analysis of the current state. The analysis consists of conduction of PEST analysis, which investigates social, economic, political and technological factors influencing the company. In addition, Porter's model of five competing forces is utilized for analysis, it helps to identify influencing power of the company surroundings in the field of competitors, suppliers, customers, substitutes and new entrants to the market. The company is also subjected to 7S analysis, which

investigates an internal environment. Based on the above-mentioned researches, SWOT analysis is applied to defines a company's weaknesses, strengths, opportunities and threats.

The last part of the diploma thesis deals with project's realization proposal, which is based on theoretical bases and analysis of the current state. It consists of building project logical framework and project charter, which briefly summarizes the entire project. Subsequently, will be assembled hierarchical structure of activities (WBS), which determines individual work on the project and serves as the basis for creating a project timetable divided into several steps, including graphic representation as a Gantt's diagram.

In order to successfully implement the project, it is required to allocate necessary material and human resources, which are specified by means of source analysis. Budget and planned cost is another part of the project, which addresses the financial side of the whole project. The last important part of the project is a risk analysis, which contains identification of risks, including proposed precautions to eliminate them. In conclusion, the whole project realization and its benefits will be evaluated.

1 AIM OF THE THESIS, METHODOLOGY

The main Master's Thesis goal is design of realization of chosen IT project in selected company. The goal will be achieved by using appropriate methods, techniques and tools of project management.

In order to propose the realization plan of the whole project, it is necessary to perform internal and external analyses of the XYZ company, which will help to determine its current state, external and internal factors that may affect both the functioning of the company and an overall course of the project. The project realization plan is proposed based on these analyzes, for the implementation of which it is necessary to use project management tools such as logical framework, project charter, hierarchical structure of activities (WBS), organizational structure of the project, Gantt's chart etc. It is also required to define project activities scheduling, resources, allocate budget, calculate costs, identify and manage risks and, at last, evaluate the entire project.

The partial goals were determined to achieve the main goal. These goals are provided below:

- provide the research of all necessary theoretical foundations of problematic of project management in IT area;
- perform a complex analysis of current situation within the company;
- analyze project specifications and propose project realization plan;
- identify projects risks and propose precautions to avoid them.

The problem is examined comprehensively through external and internal connections. Methods of interviews with employees, observation, data analysis, deduction and work with professional theoretical sources were utilized during the writing of the thesis.

Microsoft Project software, which has sufficient project management tools, was applied for the project planning as well. It utilizes such methods as PERT, network and Gantt's diagram. The program helps to set the project timetable aligned with the project resource plan, which displays material and human resources required for the successful realization of the project. The software also allows to optimize management of overloaded resources.

The diploma thesis is supplemented by an analysis of external and internal environments, including Porter's model of five competitive forces, PEST analysis, SWOT and 7S analysis.

2 THE THEORETICAL BACKGROUND

The theoretical part of master's thesis summarizes and explains individual concepts related to project management and planning of IT projects. The resources for this part are mainly used professional literature and verified internet resources.

2.1 Project management

Project management is the field of activity in which clear project goals are defined and achieved by balancing between the scope of work, resources (such as money, labor, materials, energy, space, and others), time, quality and risk (2, p. 37).

A key factor in the success of project management is the presence of a clear pre-defined plan, minimizing risks and deviations from the plan, effective change management (as opposed to process, functional management, service level management). The products of the project can be the products of an enterprise or organization (the results of scientific and marketing research, design and technological documentation for a new product developed for the customer) and the solution of various internal production tasks (for example, improving the quality of products and efficiency of labor organization, optimization of financial flows) (2, p. 38 -39).

2.1.1 Methods of project management

Each project is unique and requires special type of approach for successful realization. We can identify 2 main approaches that are most often applied for IT project: traditional approach resp. Waterfall and Agile approach (26).

Traditional approach

The most obvious way to make the project more manageable is to break the process of its execution into successive stages (pic. 1). The traditional project management is based on this linear structure. In this sense, it resembles a computer game - you cannot go to the next level without completing the previous one (21).

Waterfall Model

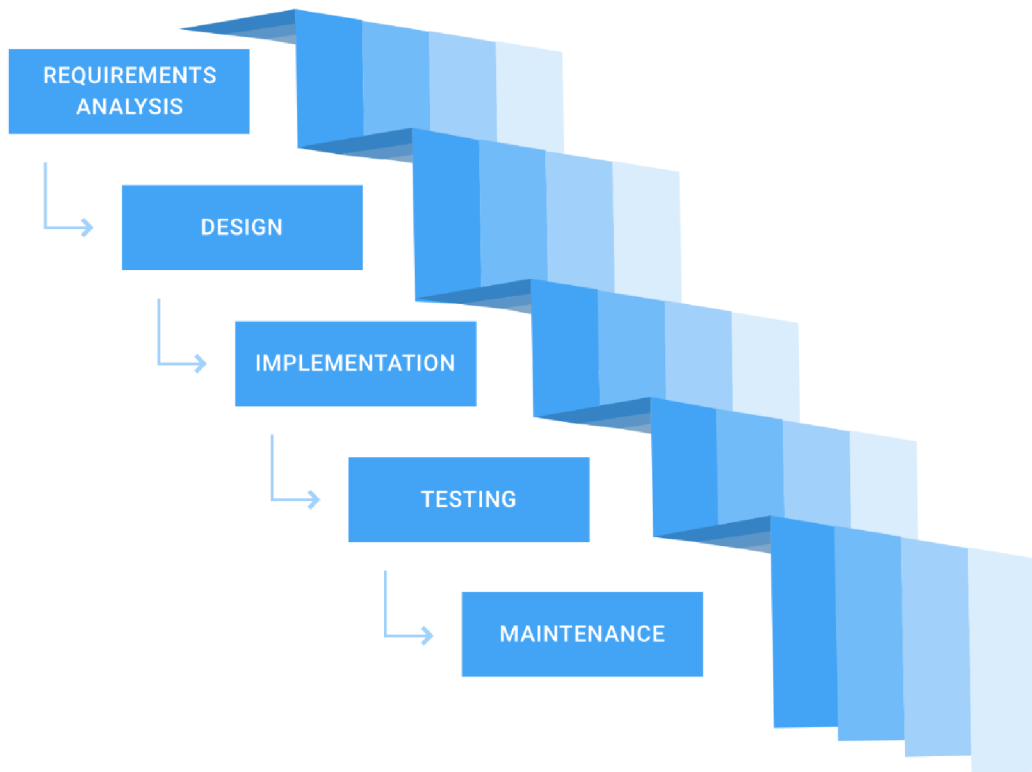


Figure 1: Waterfall model

(Source: 12)

The project plan consists of five essential stages:

1. Initialization and requirement analysis

At this stage all input documentation is created. According to the documentation the development will be carried out. First of all, the requirements and wishes of the customer are analyzed, then it is projected on the company's capabilities and market conditions. The result is a document describing what software should do, but not how (26).

2. Planning and design

At this stage, team decides how exactly assigned goals will be achieved. The team clarifies and details the goals and results of the project, as well as the scope of work. Based on this information, team generates a calendar plan and budget, assesses risks and identifies interested sides (1).

3. Implementation

During of this stage the actual implementation of tasks and activities is provided. The extremely important part of this stage is a communication between all who are involved into the project, checking the providing of tasks, monitoring of time schedule and a budget (1).

4. Monitoring and testing

This stage of the project is linked to the previous one. The product is being monitored and tested. The product is checked for compliance with the requirements of a customer and stakeholders. The testing part identifies and corrects the shortcomings of the product (1).

5. Project ending

Depending on the project, this stage may consist of a simple transfer to the customer of the project results or of a long process of interaction with customers to improve the project, increase their satisfaction and support the project results (1).

Agile approach

Unlike the traditional approach, agile approach is based on a continuous coordination and clarification of the project objectives (1, p. 190).

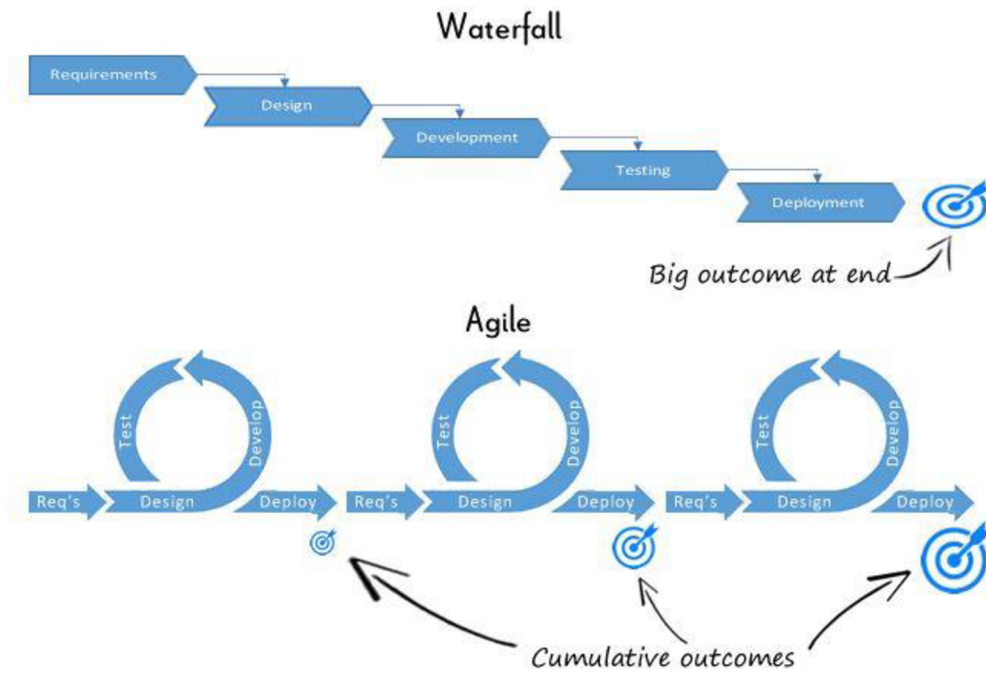


Figure 2: Agile versus Waterfall

(Source: 13)

Important aspects of the project, which is managed by flexible agile methodology are:

- people and interaction is more important than processes and tools;
- a functional product is more important than comprehensive documentation;
- cooperation with the customer is more important than negotiating the terms of the contract;
- readiness for change is more important than following the original plan (26).

Agile became the basis for a number of flexible methods, the most famous are Scrum, Lean, and Extreme Programming (26).

Scrum - Agile-based development methodology, which is based on a “sprint” - a segment from 1 to 4 weeks, after which functional version of the product must be obtained (14).

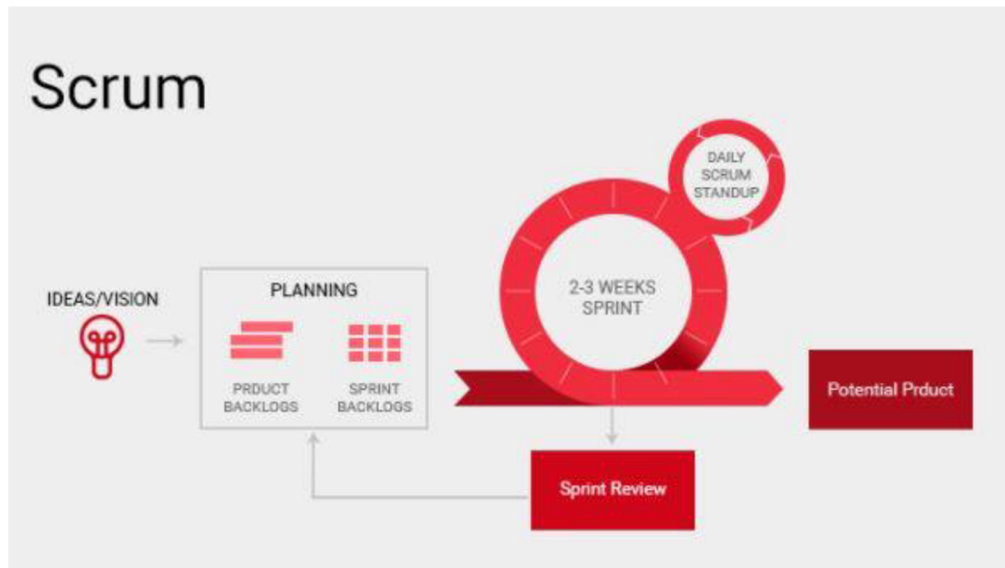


Figure 3: Scrum methodology

(Source: 14)

Lean is a method that has grown on the basis of the production management system of the Toyota Production System. It is based on the philosophy of continuous improvement at all levels of the organization, where one of the key concepts is value (something the customer is willing to pay for) (26).

Extreme programming is one of the Agile methods, where an important role is played by the periodic planning game involving the customer. It allows to identify the shortcomings of previous iteration, priority of tasks, desired functionality of the product, taking into account wishes of the customer (26).

2.1.2 Project management triangle

Project management triangle (called also the Triple Constraint, Iron Triangle and "Project Triangle") describes the balance between project content (scope), cost, time, and quality (1, p. 66).

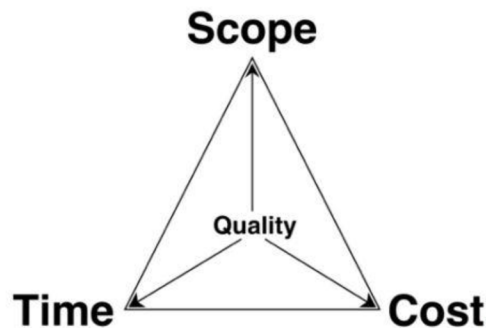


Figure 4: Project management triangle

(Source: 16, p. 339)

As a rule, each project has certain restrictions. Classically, those restrictions are defined as project scope, time and cost. They also relate to the Project Management Triangle, where each side represents a restriction. Changing of one side of the triangle affects the other side (16, p. 338).

Time restriction is determined by the amount of available time to complete a project. The limited cost is determined by the budget allocated for the project. Restriction of the scope is determined by the set of actions necessary to achieve the final result of the project (16, p. 339).

These three restrictions often compete with each other. Changing the scope of the project usually leads to a change in the timing (time) and cost. Deadlines (time) can cause an increase of cost and a decrease in scope. A small budget (cost) can cause an increase in time (time) and a decrease in scope (16, p. 340).

A different approach to project management considers the following three restrictions: finance, time, and human resources. If it is necessary, by reduction of the time (time), the number of people employed can be increased to solve the problem, which will certainly lead to an increase in the budget (cost). Due to the fact that the task will be solved faster, the growth of the budget can be avoided, reducing costs by an equal amount in any other segment of the project (16, p. 340).

2.2 Project

“Project is a piece of planned work or an activity that is finished over a period of time and intended to achieve a particular purpose”. (29)

The project has a number of inherent characteristics, defining which, it is possible to say for sure whether the analyzed type of activity is related to project.

- Temporality - any project has a clear time frame (this does not apply to its results); if such a framework is not available, the activity is called an operation and can last indefinitely (28).
- Unique products, services, results - the project must generate unique results, achievements, products; otherwise, such an enterprise becomes mass production.
- Sequential development - any project develops in time, passing through previously defined phases or steps, but the drafting of project specifications is strictly limited to the content established at the start stage (28).

Despite the fact that the final result of the project should be unique, it has several characteristics in common with the production:

- performed by people;
- limited availability of resources;
- planned, executed and managed (1).

Each project develops in a specific environment. And no matter what subject area it belongs to, this environment directly affects the project. All impacts are divided into several categories (2)

Project environment:

- socio-cultural environment (customs and customs of the area, ethical considerations of project activities, etc.);
- international political environment (political situation in the territory, economic impact, resource intensity of the area, etc.);
- environment (environmental parameters, availability of natural resources, etc.) (29).

2.2.1 IT project specification

The term "IT project" is usually used to refer to activities related to the use or creation of some information technology. This leads to the fact that IT projects cover very

diverse areas of activity: the development of software applications, the creation of information systems, the deployment of IT infrastructure, etc. (2, p. 60).

2.3 Project life cycle

Each project has a several phases that describes the time period and special goal or even more goals (1, p. 169).

The following phases are used as the basic structure of the project:

1. pre-project phase;
2. project phase;
3. post- project phase (3, p. 39).

2.3.1 Pre-Project phase

This phase takes place before the project is launched and designed in purpose to analyze all important aspects of the project and decide if it is possible to implement the project (1, p. 169).

This is achieved by two actions: study of opportunities and feasibility studies (1).

After the completion of the pre-project phase, the project team should be able to answer on the following questions.

- Can the project be implemented (1)?
- What is the right direction for implementation of the project (1)?
- How much time it is needed to realize the project (1)?

Study of opportunities

This study is provided for the purpose of estimation of expected benefits and also expected costs of the project together with the decision whether it is a good opportunity to realize the project. Also is very important to take into account the current market situation and the current status of the organization in which the project is located including the estimated evolution of these two aspects (28).

The result of the study is the decision whether to implement the project or not. In case the study recommends realization of the project, when framework of the entire project characteristic should be created. The framework is based on several analyses such as:

- analysis of customer suggestions;
- SWOT analysis;
- analysis of competition behavior;
- analysis of company management (26).

Feasibility studies

Feasibility study defines all the necessary requirements for the successful implementation of the project, including the timeframe of the project bounded by the beginning and the end of the project, expected costs and resources required (1).

Several types of analyses are generally used for creation of feasibility study:

- analysis of project implementation;
- financial Analysis;
- economic Analysis;
- definition of social impacts of the project;
- analysis of the current situation of the organization;
- analysis of conditions for realization of the project;
- technical description (27).

2.3.2 Project phase

This is the most essential and time-consuming phase of the project which is separated into four phases:

1. initiation;
2. planning;
3. execution;
4. completion (1, p. 172).

Initiation

First of all, the so-called initiation phase must be conducted. Generally speaking, this is an analysis conducted by the project team, which proposes all possible solutions, specifies goals, members of the team, all competencies including authorities and responsibilities. All these points are recorded using the foundation project documents (1).

A fundamental problem at this stage is uncertainty, which is mainly caused by the lack of information about the project, so it is necessary to analyze the requirements of all parties involved, thus eliminating the possibility of discrepancy at the beginning of the project phase (1).

If individual parties are not able to clarify all details of the project, the so-called start-up workshop is arranged. The main goal of this workshop is to clarify any discrepancies during personal meetings of all parties involved, so the next phase of the project can be proceeded (1).

Planning

This is a detailed inventory of all individual tasks, which together make up the overall project plan. These tasks are created by decomposing the problem into individual activities, having certain binding with each other (1).

The hierarchical structure of activities is used for detailed project layout and the following aspects are defined:

- time estimates;
- resource requirements;
- budget;
- cash flows;
- risk factors;
- suppliers and contracts (27).

For even better project layout over time, tools such as the Gantt Chart or the Critical Path Method can be used (28, p. 138).

In this part of the project, the time-based analysis using the CPM and the CPM methods, the cost analysis using the CPM / COST tools and the analysis of resources, which is

formed by a heuristic procedure, are utilized for the planning of three essential project attributes that are part of the project triangle (28).

Realization

The project realization is defined by its management and control. The important part is to compare the course of the project with the project plan, to monitor any deviations and to respond to them on time in the form of complete elimination. In case of requested changes by any of the parties involved in the project or new findings, it is necessary to respond and to apply appropriate precautions: to modify the plan or to create a completely new one (for example, when a larger change is made) (1).

Completion

It ends the project phase, analyses it and then physically passes the outputs of the project, followed by subsequent protocol handover. Handover is followed by billing and confirmation of acceptance documents, which is done by signing them by the involved parties (1).

On the side of the project implementer, the project will continue to be analyzed in case of documentation and comparison with the intended goals, after its submission (3).

Other important actions connected to the completion of the project are the transfer of responsibility to the project's owner (the sponsor of the project), the beginning of the warranty period and the training of the future users of the resulting project (1).

From the point of view of the project team, its members' responsibilities are transferred to another project (1).

2.3.3 Post-Project phase

The post-project phase is continuously linked to the project phase by the analysis of the conducted project, which brings both positive and negative knowledge and experience that can serve as an inspiration or edification for future projects. Which in practice means that after identifying an error, an identical error in another project should be eliminated, and positive effects, discovered during the conduction of the project, should appear again in other projects (1).

In the case of projects for which the result should appear for some time, it is necessary to determine the date when the result is to be displayed, and after that to evaluate the project (1).

2.4 Project Planning

One of the most crucial processes regarding the project implementation is a project planning, because it describes the complete process of activities related to the project that attempt to fulfill parameters: project triangle, planning of time, resources and costs (28, p. 113).

The plan of the project serves primarily for:

- structuring the general goal to partial points and specific outputs;
- preparation of methodologies;
- validation of the skills and knowledge of the project team members;
- division of products and work topics into sub-sections;
- definition of subsystem interfaces;
- determination of risks;
- identification of needed resources (28, p. 113-114).

2.4.1 Time

Time planning serves as a springboard for the planning of additional points, which are costs and resources (27, p. 63).

At first, individual activities of the project are determined as specific sections without any connection between them. Following the definition of activities (using different diagrams), the search for the links between them and the sorting to a certain order in which the activities will be progressively implemented according to the setup project timetable is conducted (27, p. 63-66).

Such timetable defined by diagrams is an integral part of time project planning and it displays a huge amount of information, including:

- estimates of the expected duration of the individual work segments;

- links between activities;
- milestones and project dates;
- the hierarchical structure of activities;
- any other information that allows you to maintain a schedule (27, p. 63-66).

The most basic tools for time planning within the project are unambiguously diagrams that provide complete project management support and serve as a tool that a manager uses on a daily basis. Diagrams are often used for their flexibility as they respond very quickly to potential changes in the project. The most commonly used charts for planning are Gantt chart, PERT / CPM charts (4, p. 45).

Gantt Chart

The Gantt chart is a popular type of bar charts (histograms) that is used to illustrate a plan, a schedule of work on a project. It is one of the project planning methods (28, p. 138)

The first chart format was developed by Henry L. Gantt in 1910 (26).

In essence, a Gantt chart consists of bars oriented along the time axis. Each bar on the diagram represents a separate task in the project (a type of work), its ends are the moments of the beginning and completion of work, its length is the duration of the work. The vertical axis of the chart is a list of tasks. In addition, aggregate tasks, completion percentages, work sequence and dependency indicators, key points (milestones), the current time mark “Today”, etc. can be marked on the diagram (28, p. 138-139).

The key concept of a Gantt chart is a “mark” of a significant moment in the course of work, a common border of two or more tasks. Milestones allow to visually show the need for synchronization in the conduction of various works. Milestones, like the other borders in the diagram, are not calendar dates. A milestone shift will shift the entire project. Therefore, the Gantt chart is not, strictly speaking, the schedule of work. In addition, the Gantt chart does not reflect the significance or resource intensity of the work, the essence of the work (scope). For large projects, the Gantt chart becomes overly heavy and loses all visibility (26).

These mentioned disadvantages and limitations seriously limit the scope of the chart. However, nowadays, the Gantt chart is de facto standard in the theory and practice of project management, at least to display the structure of the list of project activities (26).

PERT

Program (Project) Evaluation and Review Technique (abbr. PERT) is a project evaluation and analysis method that is used in project management (2, p. 331).

PERT is designed for very large-scale, one-time, complex, non-routine projects. The method implies the presence of uncertainty, making it possible to develop a project work schedule without precise knowledge of the details and the required time for all its components (3, p. 110).

PERT was implemented primarily to simplify paper planning and scheduling of large and complex projects. The method specifically focuses on analyzing the time needed to complete each individual task, as well as determining the minimum time needed to complete the entire project (8).

The most commonly used part of PERT is the critical path method, based on the construction of a network graph (PERT diagram) (3, p.111).

2.4.2 Resources

Resource management involves identification of resources, their subsequent allocation, and optimization due to the timetable of the project along with monitoring. Under the concept of resources, you can imagine the workers, equipment, and infrastructure to which belong equipment, finance, information technology, knowledge, tools, provision services and more. The purpose of resource planning is to define human resources, equipment, machines etc. (28, p. 153).

As main processes of such planning can be considered:

- identification of resources needed - resources are highlighted within the timetable required to carry out activities that relate to a particular job position, and skills;

- detection of limits – it means an exploration of all resources needed within the project to determine whether they are available or whether they have any limitations in availability;
- comparison - the aim is to compare defined needs with constraints and occurrence of conflict between resources. Such situations occur, because there are often needed more resources than available;
- conflict resolution - after the comparison, the problems have to be resolved (1, p. 194-198).

2.4.3 Costs and budget

Cost management, together with the financial management of the project, is based on cost estimates in the early stages of the project, planning, monitoring and controlling of the costs involved in all activities of the project (3, p. 18).

They are determined in two levels at the level of each activity (for example, using the WBS output) and project-level, and thus complete budget of the entire project can be evaluated. In order for the cost plan to develop according to the initial ideas, it is necessary to control the actual costs and compare them with those planned and to update a plan respectively to the changes, whereas each expense must be measurable, approved, documented and determined in given units (e.g. USD and so on). Among others in terms of a properly designed cost plan, there is also the fact that each budget should have a so-called reserve to cover any additional costs (3, p. 40 – 43).

The budget of a project can be defined as the volume of all funds allocated to the project, which, in a similar manner as the cost plan, is determined by two planes - the total budget and the partial budgets by category or by time (28, p. 160).

There are several methods to determine costs depending on size and type project. The most common ones are described below.

- Bottom-up estimate - based on the hierarchical activity structure (WBS) when the initial cost status is at zero and the cost of the individual activities gradually add to each other. The result is the cost of the entire project (3, p.42).

- Analogue estimation - cost estimation is based on the realized projects that were of the same type as the project being implemented (27, p. 50).
- Expert estimation - this is an estimate based on knowledge and experience of members of the project team (27, p. 50).
- Parametric modeling - in this case, two types of modeling, which are the regression analysis and the curve of knowledge acquisition, are utilized (27, p. 50).

The regression analysis is based on previous project values and determines future costs with the help of statistical approach (3, p. 394).

The learning curve holds the idea: when repeated activities are given, a worker improves and works faster and more precisely and reduces the total cost (27, p. 49).

2.4.4 Microsoft Project

Microsoft Project (or MSP) - program for project management, developed and distributed by Microsoft Corporation (28, p. 52).

Microsoft Project is designed to help the manager of the project in planning, resource distribution for tasks, progress tracking, and analysis of workflow. Microsoft Project creates critical path schedules. Schedules can be made based on the resources used. The chain is visualized in a Gantt chart (28, p. 52).

There are other software solutions for project management:

- Primavera – a main competitor in the corporate segment;
- GanttProject – open-source Java program, designed for project management, based on built-in Gantt and PERT type charts;
- OpenProj — cross-platform clone of desktop MS Project without the support of formulas and indicators. Product development is conducted by open source community under the name ProjectLibre;
- Basecamp — a main competitor in the segment of ultra-light project management solutions (26).

2.5 Tools of project management

Among the most crucial tools of project management are the logical framework, WBS (Work breakdown structure) and OBS (Organization Breakdown Structure) (3, p. 43).

2.5.1 Work breakdown structure (WBS)

It is a hierarchical structure of activities that logically breaks down the entire project into levels through decomposition. In other words, it is a decomposition of more complex activities to smaller, better-defined ones and the representation of specific links between them, which leads to the creation of so-called tree structure. The entire process of creation of WBS is based on the top-down philosophy, which moves away from the main outputs and the results through the partial components and outputs to work packages. The lowest element of the whole structure is called a work package that no longer needs to degrade to a lower level, as it is clearly defined and understandable (3, p. 40 - 42).

Due to such decomposition, it is possible to determine the overall scope of the project, which then serves as an entry point for scheduling timetable, costs, and resources. Reasons for building a hierarchical structure of activities are mainly:

- identification of activities and their interdependence for better clarity;
- decomposition of activities to the smallest tasks in order to increase the accuracy of time estimation;
- creation of clear workflow documentation to make it easier to assign responsibilities;
- acquirement of a document that will become a support for other tools of project management (3, 42 - 44).

2.5.2 Logical Framework Approach (LFA)

The basic tool used during the conduction of any project is the logical framework, which determines what the project should achieve. The whole logic framework is based on the interconnection of four essential parts:

- Goal,

- Purpose,
- Output,
- Activities (1, p. 68)

These four points are basic pillars of a logical framework, which is of a form of a 4x4 matrix. Each row and column of a matrix has its own meaning, and together they form a complete one definition of project's scope (15).

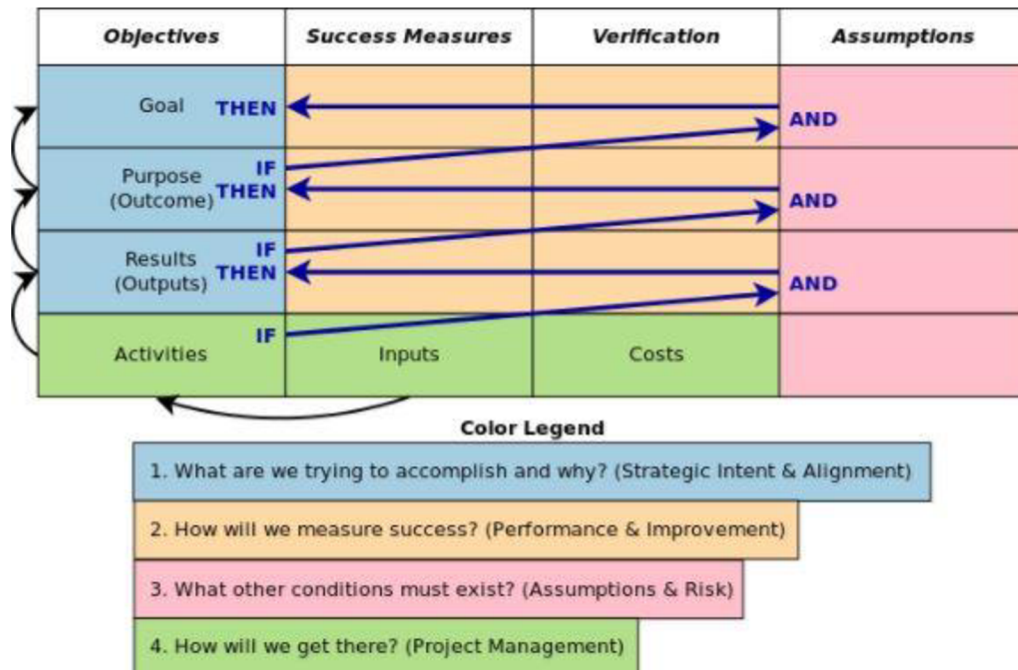


Figure 5: Logical Framework Approach work principles

(Source: 15)

2.5.3 Organization Breakdown Structure

OBS, or the organizational structure of the project, consists of hierarchically ordered elements: companies, institutions, organizations, individuals (for example, employees participating in the project) etc. This type of structure is very closely related to the WBS tool as the above-mentioned elements are assigned with specific activities from the hierarchical structure of activities (3, p. 43).

The purpose of creating the organizational structure of the project is to establish responsibilities and powers to each element involved in the implementation of the

project. The whole process of creation is conditioned by some basic recommendations that should be followed (3, p. 43).

The first fundamental rule is the so-called unambiguous assignment, which determines that given competency must be assigned to just one element of the hierarchical structure. Another recommendation concerns the delegation of competencies where it is appropriate to determine the competencies of individual elements according to expected results due to available resources, time, knowledge, and risks (3. p. 42).

2.5.4 RACI matrix

Within the OBS, a so-called matrix of responsibilities is often used to clarify individual responsibilities. The RACI matrix is the most well-known one (27, p. 94).

The individual responsibilities of RACI matrix are divided into the following table:

Process Step/ Description	Role 1	Role 2	Role 3	Role 4
	R			
		C		
	A			
				I

R	Responsible	A	Accountable	C	Consulted	I	Informed
----------	-------------	----------	-------------	----------	-----------	----------	----------

Figure 6: RACI matrix format

(Source: 17)

R - Responsible - indicates who is responsible for the entrusted activity;

A - Accountable - shows who is responsible for completing the task;

C - Consulted - determines who is able to provide a consultation for the task;

I - Informed - Indicates who needs to be informed about events related to the task (26, p. 95).

2.6 Company analysis

In this part of Master's Thesis, methods of internal and external company analysis will be described.

2.6.1 SWOT analysis

SWOT analysis combines all the factors, that influence the organization in a single matrix, consisting of four components, namely:

S - strength,

W - weakness,

O – opportunities,

T – threats (1, p.61).

The matrix of SWOT analysis is illustrated in figure below:



Figure 7: SWOT analysis matrix

(Source 18)

Accordingly, strengths and weaknesses are internal factors influencing the company, and opportunities and threats are external ones. The matrix of the SWOT analysis is convenient because all the necessary indicators and criteria are collected in one place,

which allows evaluating the situation completely, taking into account all the factors of influence (1, p.61).

Using a SWOT analysis matrix, it is possible to evaluate all strengths and weaknesses, identify opportunities and threats, and, based on the data obtained; determine the strategy for further actions (1, p. 62).

2.6.3. PEST analysis

PEST analysis serves for company's macroenvironment investigation (external environment of the company). It includes the collection of business-relevant information from the following areas (3, p. 12).

P - political and legal environment: tax policy, labor law, trade restrictions, tariffs, etc. (3, p. 12).

E – economic: unemployment, interest rates, inflation rates, exchange rates, GDP, economic growth, etc. (3, p 13).

S - social - demographic data, cultural aspects, career attitudes, safety emphasis, etc. (3, p. 14).

T - technical and technological - technical level, automation, quality of services, innovations, etc. (3, p. 15)

2.6.2 Porter's five forces analysis

A strategic model for analysis of five competitive forces was described by Michael Porter in 1979. Michael Porter, using the five structural units inherent to each industry, described ways of building a competitive advantage and long-term product profitability, as well as ways by which a company can maintain its profitability and remain competitive in the long run.

The theory of competition by Michael Porter says that there are five driving forces in the market that determine the possible level of profit in the market. Each force in the model of Michael Porter represents a separate level of product competitiveness:

- bargaining power of buyers,
- bargaining power of suppliers,
- the threat of invasion of new members,
- the danger of the appearance of goods – substitutes,
- level of competition or intra-industry competition (26).

Michael Porter believed that these elements of the market are the driving forces of market competition, which was the name of the model - the model of the five forces of competition according to Porter (26).

2.6.3 7S analysis

McKinsey 7s model is a tool that analyzes 7 key internal elements of the company: strategy, structure, systems, shared values, style, staff and skills (21).

As shown in the Figure 1, there is an intense interrelation between the elements of the model. The shared values is the central element that creates foundation to the development of other critical elements (19).

“A change in any of the elements affects all other elements. Therefore, all operations related to the creation and management of elements should be carried out by competent and skilled managers who possess the necessary knowledge and skills to understand the scope and properties of the elements”. (19)

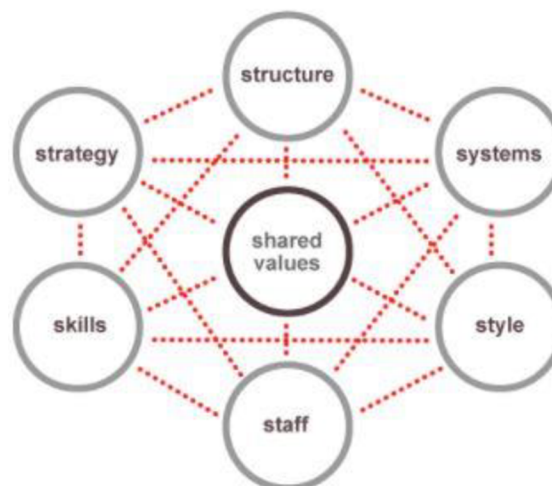


Figure 8: 7S analysis structure

(Source: 19)

Strategy

Strategy means a long-term development plan for a company that helps to improve business competitiveness and create sustainable competitive advantages. The criteria for a correct strategy are simple: it must be clearly defined, have long-term goals, be aimed at achieving competitive advantages, correlates with the company's common values and mission (19).

Structure of the company

The structure in the model is understood as a way of organizing interaction between different departments in a company, indicating the principles of subordination, priority, and area of responsibility of each department. This element of the model is the most mobile and easy to change (19).

System

The management system describes the day-to-day procedures of the company. This element of the McKinsey 7S model is responsible for how management decisions are made, how the day-to-day work in the company is conducted in general, and in what ways and methods the business develops (19).

Skills

Skills in the model are understood as the entire amount of abilities, capabilities, and competencies owned by the staff working in the company now (21).

Staff

This element of the 7S model is responsible for: how many employees work in the company, who they are in the specialty, how the company organizes the principles of working with staff: recruitment, training, motivation, and remuneration (19).

Style of relationship within the company

This element characterizes the management style adopted in the company. The value of senior executives in the company and their role in making important business development decisions (19).

System of values

The main central element of the McKinsey 7S model. It describes norms and standards of interaction, work in the company, principles of corporate culture and key aspects of the enterprise's mission (21).

2.7 Risk management of the project

Any project is associated with uncertainty and risk. Therefore, one of the main processes in project management is project risk management, which is present at all stages of its life cycle (2, p. 38).

A project risk is an uncertain event or condition that, if it occurs, has a positive or negative impact on at least one of the objectives of the project, for example, time, cost, content or quality (2, p. 43).

Risk in a project can have not only a negative, but also a positive effect, that is, lead to an improvement in the qualitative and quantitative characteristics of the final goals of the project (2, p. 43 - 44).

There are negative risks, positive risks, and unforeseen circumstances (2, p. 43).

Negative risks

Negative risks are events leading to a deterioration in the quality of project execution. They require additional resources and time or reduce the quality characteristics of the result (2, p. 43 - 44).

Positive risks

Positive risks are events that provide an opportunity to improve the quality of project implementation and achieve goals with fewer resources and time, or with higher quality (2, p. 43 - 44).

Unforeseen circumstances

Unforeseen circumstances are events that were impossible or could not be foreseen at the stage of identification of risks (2, p. 43 - 44).

Risk management

Risk management is a systematic process of reducing uncertainty and managing the likelihood of events in a project (2, p. 43).

The purpose of the project's risk management is to increase the probability of occurrence and impact of favorable events and reduce the probability of occurrence and impact of unfavorable events for the project (2, p. 34).

The entire process of the project's risk management is divided into separate sub-processes that arise in each project, and some of them are implemented at several stages of the project (2, p. 43).

Thus, at the project planning phase, an integrating process of selecting an approach, planning and performing project risk management operations takes place. Also, at the project planning phase, a process of identifying risks occurs, i.e. determining which risks may affect the project, and documenting their characteristics (2, p 45-46).

Subsequently, a qualitative risk analysis takes place, which identifies their location according to the degree of priority for further analysis or processing by estimating and summing up the probability of their occurrence and impact on the project. Quantitative risk analysis implies a quantitative analysis of the potential impact of the identified risks on the overall objectives of the project (1, p. 87).

2.7.1 RIPRAN (Risk Project Analysis)

RIPRAN (RIsk PRoject ANalysis) is an empirical method for risk analysis of projects. It arises from the procedural concept of risk analysis. The method accepts the philosophy of quality and therefore contains activities that ensure the quality of the risk analysis process, which is ensured by standard ISO 10006 Quality Management Systems (1, p. 89).

The whole risk analysis process according to the RIPRAN method consists of the following phases:

1. preparation of risk analysis;
2. risk identification;
3. quantification of risk;
4. response to risk;
5. overall risk evaluation (22).

In practice this method is mainly focused on processing the risk analysis of a project that needs to be done before its own realization. It can be utilized during all phases of the project. The method does not deal with the risk monitoring process in the project. However, whenever any new hazards are identified or a situation requiring a reassessment of a certain risk is changed, the RIPRAN methods can be re-used as well as the project risk monitoring process (22).

3 PROBLEM ANALYSIS AND CURRENT SITUATION

At this part will be provided information about chosen company, its history and current situation from the project management point of view. As reviewed company preferred to stay anonymous, the name is replaced by “XYZ”.

3.1. Company Introduction

The Company XYZ is a Czech IT company that insure complex technical support and continuous maintenance to the group of well-known bank branches all over the world. Internally designed and developed applications serve more than 45 million customers in 10 countries:

- Czech Republic,
- Slovakia,
- Russia,
- USA,
- Kazakhstan,
- China,
- Vietnam,
- India,
- Indonesia,
- Philippines (23).

At this moment, the common company strategy is more focused on Asian targets as there is a big potential of local financial sector growth and, as a result, bigger demand for a technical support (23).

Partially different versions of same systems are being developed for each specific country by dedicated teams. The company's goal is to create a unified, universal and configurable core of the information economic system so that way all countries can use this common core, despite their specificity. Dedicated teams focus only on the implementation of specific adaptation of the basic system for a given country and the development of micro-applications specific to a given destination (23).

Currently the company has more than 900 employees that are located 3 cities in Czech Republic:

- Brno (the main development center);
- Prague;
- Ostrava (3).

The company mission is divided into several parts based on the subject.

- 1) **Support:** to support businesses by delivering innovations and keeping promises (23).
- 2) **Technology:** people focused on technology enabling the best customer experience for every single client using company products (23).
- 3) **Culture:** the culture is based on trust and leading by example (23).
- 4) **Knowledge:** every single employee knows the purpose of their work (23).

3.1.1. Transformation

Since the beginning of the year 2019, the company go through the transformation process, based on which the company structure was changed significantly: amount of manager's positions was reduced reorganization of teams was conducted. From that time, 40+ small "functional teams" were organized based on a specific product development and support, so each team is being unique and has their own unique responsibilities. Aimed to be more agile, each team have a freedom in development process and organize their daily work process by themselves (23).

3.1.2. Teams

Facts about the teams created based on the company transformation strategy are described below.

- *"Each team varies in size and looks after a specific component of our system.*
- *End-to-end responsibility often requires team members to extend their skills beyond their primary specialization.*

- *Teams can mostly use a **technology stack of their choice**.*
- ***Agile style of work is a must but each team chooses its own methodology.***”
(23).

From the facts above follows that each team should have all professionals that are needed for support and development of specific component they care for. As the transformation is still ongoing progress, the composition of teams is not ideal, but it involves people to be more versatile and to learn new technologies.

3.1.3. Project management in a company

Company XYZ is using two approaches of project management methodology depending on a country group (23).

For the projects of countries like a China, Czech Republic and Slovakia is used more traditional approach. The reason has historical roots: the bank branches in these countries are the oldest and this approach has been used there since the branches have been created. Below is the example of traditional waterfall model of development in China (Figure 8). The whole process is broken into the several parts:

- initialization: creation of business requirement;
- requirement and impact analysis;
- planning and design of solution on development environment;
- deployment on test environment;
- UAT tests and bug fixing;
- deployment on production environment based on pre-defined release plan (23).

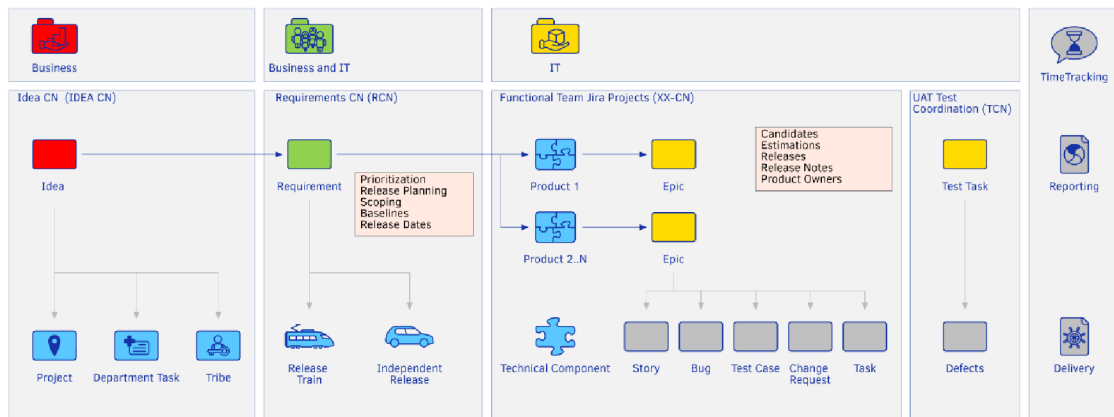


Figure 9: Waterfall model of development in China

(Source: 20)

For the rest of the countries, agile methodology of project management was introduced. The whole software development process is composed of sprints. First of all, the requirement is discussed on prioritization meetings, where XYZ effort estimations, capacity and benefit for the business (whether the requirement is really needed or is just “nice-to-have”) are considered. Based on prioritization results, will be decided whether the requirement:

- will be implemented in upcoming sprints;
- will be postponed;
- or even cancelled (23).

However, in case of internal company projects these approaches are not applied yet and it depend on a functional team how to manage assigned internal project (23).

3.2. PEST analysis

PEST analysis is focused to 'scan' the external environment of the company. It helps to analyze the Political, Economic, Social, and Technological influences on a business (1, p.62).

Social factors

Factors that are usually mentioned in the literature, such as population rate, geographical distribution, age structure, etc., are not so relevant for the IT sector. In the case of XYZ, more important is quality of people at the labor market and the

relationship between the attractiveness of the employer and the chance to catch a valuable employee who will add value to the company. Another important factor, which is related to the previous one, is the level of salaries in the given region or the unemployment rate in general. Based on ČSU statistics, unemployment rate in Czech Republic on March 2020 is about 3.1%, which is one of the lowest rates in Europe (7).

Technological factors

Technological factors play an important role for the IT sector, such factors can be, for example, the speed of implementation of new technologies, technological quality, the speed of technology obsolescence. The company XYZ tries to follow the modern trends in IT world and provide employees with education courses for new technologies, that were recently implemented (1).

Economic factors

As reviewed IT company provide support for the bank branches, economic factors also have a huge impact on them.

There can be included such macroeconomic indicators as interest rate, economic cycles, unemployment, purchasing power, etc. When economic of country growth, the purchasing power of the people increases as well. In other way, when economic is in recession stage, population will reduce consumption of bank product, with is going negatively effect as bank corporations as well as the company XYZ (8).

The changes of interest rates in different countries, reflect the level of banking products and the consequent reduction in the availability of financial resources for companies. Such interest rate movements can cause difficulties, for example, in calculating product returns, etc. (3).

Political factors

As political factors can be considered: evaluation of political stability, political attitude (towards a banking segment), political influence of various groups (3). Political decisions can affect the legal aspect of contractual obligations between the company and clients, as an example, obligated GDPR rules. The bank sector is also highly impacted by changes in fiscal and monetary policy of specific country.

3.3. Porter's five forces analysis

The Porter's five forces analysis discovers competitiveness of specific business environment, and identify its strategy's potential profitability. Based on Porter's theory, there are five different external competitive forces environment affecting the business of the company (26).

Bargaining power of customers

The company has regular customers defined on a company group level based on long term support agreement. They are utilizing developed custom products and constantly require an adjustment of their functionality, systems integration or performance improvement. To do this, it is necessary to maintain the high-quality support service to satisfy all customer's needs. For these reasons, it is necessary to constantly improve development technology and bring innovations into the work processes (24).

Bargaining power of suppliers

As the company mostly provide the development and support of their own products by themselves, from the software point of view there is no substantial dependence on suppliers. However, company regularly purchase a hardware from retailers. The company also uses other external suppliers, especially in periods when it needs to increase the capacity of human resources for a short period of time, when it is not financially or timely worth hiring employees internally (24).

The threat of invasion of new members

Based on the reasons described above, in current conditions this risk is minimal.

The danger of the appearance of goods – substitutes

Most of the core systems, that used by bank branches, are fully developed and maintained by XYZ company. For these products and their support service there cannot be substitutes at this moment (24).

The risk of appearance substitute exists only for the support service of the products that were developed and implemented by external vendors. After the implementation of such products is finished, the whole maintenance for related system is handled by XYZ. But, based on the practice, the supplier has a better knowledge of the product and can provide faster bug fixing in case of performance issues. For such cases, customers can buy additional service support from them and partially the XYZ responsibilities will be substituted (24).

Level of competition or intra-industry competition

There are not so many competitive companies in a bank support market, as banks mostly using their own internally developed software and have a permanent IT support partner (24) The level of entrance is also very high and requires big investment at the beginning.

3.4. 7S analysis

The 7S analysis, defined by McKinsey, describes 7 basic areas of internal company environment (21).

Strategy

The primary goal of the company is customer satisfaction, operative problem solving and constant improvement of provided services (24).

The company's strategy consists of several basic areas, which include:

- building of agile company to be able to quickly adapt to market changes;
- increasing the quality of delivered systems and its maintenance;
- overall company growth;
- costs reduction (23).

Style

The company is using democratic style of management. Based on the company transformation strategy, the functional teams have a big freedom regarding to responsibilities assignments and decision making within the team. Communication

between the teams, as well as with higher management, is opened and supported with multiple communication channels. There are also organized meetings with different division's representatives, where some questions can be discussed in real time (24).

Structure

The whole company structure is divided to following divisions:

- Product development Finance;
- Product development Risk;
- Product development Sales;
- Custom development China;
- Service Management;
- IT Infrastructure Services;
- Human Resources (23).

Each division is managed by their own director and have assigned a group of cross-functional teams, based on the supported product type (23).

Systems

The company uses several interdependent systems to organize the daily workflow (24).

For the source code versioning is used GitLab. As a ticketing system is used Jira (new functionality implementation) and Omnitacker (for the production issues and service requests). Internal Wiki system is utilized for the documentation purposes, there is also shared corporate cloud that exists for storing of project documents. For the work evidence and travel requests, the company developed its own HR portal system. As a main communication channel within the whole company group is currently used Microsoft Teams. (23, 24).

Staff

As it was mentioned before, the company has more than 900 employees in different cities. Each employee has a personal budget for his/her education, for these purposes learning portal with a wide list of available courses is organized. There are also free internal courses available, which are provided by experienced internal employees.

The company is also using motivation bonus system, the size of the bonus is calculated each year based on employee's and company's success evaluation (23, 24).

System of values

Based on the company vision, one the main value of the company is a customer satisfaction, which is highly influenced by provided quality of services. Furthermore, the system of values includes employee satisfaction, that help to maintain a friendly corporate culture (24).

Skills

Employees skills create the largest part of the company's success and that is why company support continuous education and improvement of employee's skills. It applies on a technical as well as on personal skills. As a result, it increases quality of services and consequently customer satisfaction (24).

3.5 SWOT analysis

SWOT analysis combines all the influencing factors, following from the previous analyses, in a single matrix of four components. Strengths and weaknesses describe internal aspects of the company, opportunities and threats are characteristics of the external environment (11).

Table 1: SWOT analysis

(Source: own processing)

Strengths	Weaknesses
<p>S1 - Partially integrated agile methodology</p> <p>S2 - Unique products</p> <p>S3 - Experienced and professional employees</p> <p>S4 - Conditions for employees (salaries above average, bonus motivation system, flexible working conditions, professional growth)</p> <p>S5 - Permanent customers based on long term partnership agreement (financial stability)</p>	<p>W1 - Lack of project managers and agile professionals to support company strategy</p> <p>W2 - Employee frustration</p> <p>W3- Management of internal projects</p> <p>W4 - Dependence on customer's prosperity</p> <p>W5 - Dependence on external vendors for 3st level support of some components</p>
Opportunities	Threats
<p>O1 - Human resources growth (number of IT professionals on a labor market)</p> <p>O2 - Knowledge of customer's needs</p> <p>O3 - Growth of banking sector and increase od customer's purchasing power as a result</p> <p>O4 - Technical innovations</p> <p>O5 - Possibility of using EU funds</p>	<p>T1 - Changes and additional requirements during projects realization</p> <p>T2 - Banking legislative changes in customers countries.</p> <p>T3 - Ending of a partnership with a customer</p> <p>T4 - High demand of IT specialists on a labor market (lack of human resources)</p> <p>T5 - Epidemic/pandemic illnesses</p>

The evaluation of each SWOT component is provided by the scoring method in the following chapters. Rating score describes power of specific factor and, based on it, assigns corresponding score from 1 to 5 (where 5 is the highest score) (9). Importance reflects a weight of factor and describing how much value from the whole factors group this specific factor has. Weight score is created by multiplication of rating score and importance. In order to calculate the company's total weighted score, it is needed to add all the weighted scores of each factor (10, p. 9452). The highest weighted scores represent the most powered factors that company need to pay more attention to (9).

3.5.1 Strengths evaluation

Table 2: Strengths evaluation

(Source: own processing based)

Strength	Rating Score (strength efficiency)	Importance (Weight)	Weighed score	Total weighted score
S1	4	0,15	0,6	4,3
S2	4	0,25	1	
S3	5	0,3	1,5	
S4	4	0,2	0,8	
S5	4	0,1	0,4	

The rating scoring describes strength efficiency. Based on a weighted score the most efficient strengths of the company XYZ consist of S2- unique products and S3- experienced employees. The total weight score of strengths in SWOT analysis has the highest value as well. That means, that qualified people resources and unique products brings the company the most value and the company, probably, should constantly improve these strengths to be successful (9).

Table 3: Weaknesses evaluation

(Source: own processing)

Weakness	Rating Score	Importance (Weight)	Weighed Score	Total weighted score
W1	5	0,3	1,5	3,9
W2	4	0,15	0,6	
W3	4	0,25	1	
W4	3	0,2	0,6	
W5	2	0,1	0,2	

Second largest total weight score is represented by weaknesses, what means that the company should takes measure towards the weaknesses, especially with a high weight score, which are W1 - Lack of project managers and agile professionals to support company strategy and W3- Management of internal projects (9).

Table 4: Opportunities evaluation

(Source: own processing)

Opportunity	Rating Score	Importance (Weight)	Weighed Score	Score summary
O1	3	0,1	0,3	3,85
O2	4	0,35	1,4	
O3	3	0,2	0,6	
O4	5	0,25	1,25	
O5	3	0,1	0,3	

Based on a weight score of opportunities, the most attractive and the most possible opportunities for a company can be identified. O2 - Knowledge of customer's needs and O4 - Technical innovations have a biggest value, what means that the company should invest more time and other resources in such activities (9).

Table 5: Threats evaluation

(Source: own processing)

Threat	Rating Score	Importance (Weight)	Weighed Score	Total weighted score
T1	4	0,25	1	3,4
T2	3	0,1	0,3	
T3	2	0,25	0,5	
T4	4	0,25	1	
T5	3	0,2	0,6	

A positive side of threats evaluation is the fact, that the total weighted score value is the lowest within the other SWOT components. However, within the threats group occurred factors with high weight score that company need to deal with. The first one is T1 - Changes and additional requirements during projects realization. The company need to provide more detailed requirement analysis and closer cooperate with a customer to prevent situations like this. The second thread with substantial impact is T4 - High demand of IT specialists on a labor market (lack of human resources). There is still lack of professional and experienced IT specialists on a labor market. As a result, more valuable employees can leave the company for a better opportunity. To prevent it, organization should provide better opportunities inside the company (9).

4 PROPOSALS AND CONTRIBUTIONS OF SUGGESTED SOLUTION

This part of master's thesis is focused on a specific internal project of the company XYZ and propose its realization plan based on selected project management methods.

4.1 Project specifics

Reviewed project is aimed to develop an analytical portal, that will help customer's data scientists to develop different data model in Python programming language. By this time, data scientists in different countries have been using various programming languages to develop their models. It causes the problem that one model created in specific country's branch could not be used in other country, because they could use different methods, tools, connection settings, etc. Now, the whole group strategy is aimed to unify all the processes within the countries, including the development of all data models in one common programming language, which is Python (24).

The XYZ company, as an IT partner, came with the initiative to develop the unique tool that will include all necessary aspects for data scientists work:

- embedded Python console;
- connection to all necessary databases (aligned with internal security rules);
- a server-based solution accessible via web;
- possibility to share the code online;
- possibility to schedule Python scripts;
- included query builder (24).

By this time, development of such tool is fully assigned to corresponding CRM Support team. There should be dedicated people within the team who will be responsible for development and management of the project parts (24).

One of the main specifics of this project is the fact that there is no person on a project manager position within the team, and the project will be mainly managed by the Product Owner. It makes the proposed project implementation plan more valuable and

will provide structured steps with clearly defined responsibilities and deadlines aligned with the planned budget. Provided analyses will also help to avoid possible deviations from the standard project realization plan (24).

4.2 MS Project

The project is partially processed by using MS Project program, which enables effectively manage basic activities, resources and expenses related to the project (28, p. 52).

At the beginning, it is necessary to adjust some basic setting parameters. One of them is the project calendar. Standard calendar does not include public or company holidays, which are not working day and effect project running. To avoid it, the calendar was adjusted and public holydays in Czech Republic are marked as not working days (Figure10).

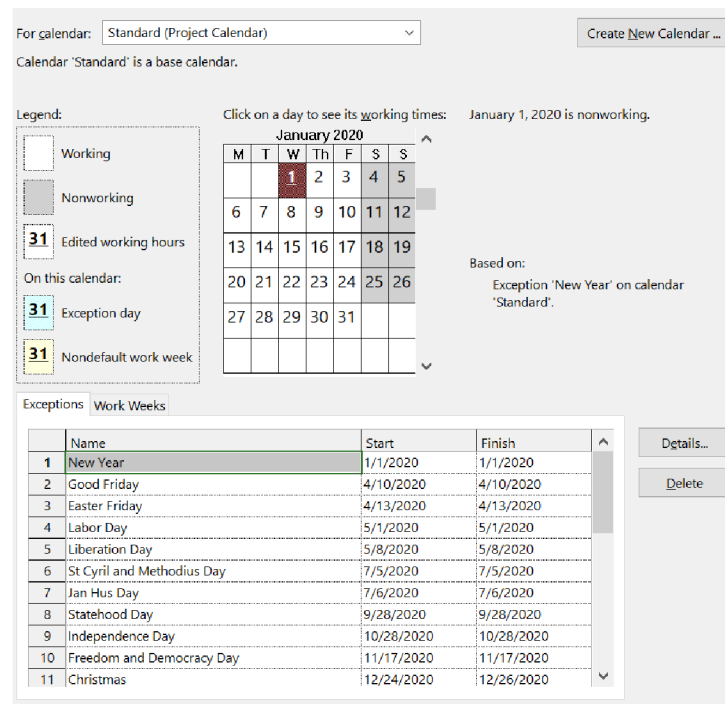


Figure 10: Adjusted project calendar

(Source: own processing in MS Project program)

Other setting that should be adjusted is a payment currency for resources. In case of this project, the currency is changed to CZK. There are also a lot of options for the customization of various project parameters and setting dependencies between the tasks.

The great advantage of the MS Project program is the possibility of editing the project during its realization and the change will be reflected in other depending parameters as well. As an example, prolong of some task will automatically increase the cost of related activity (28, p. 52).

4.3 Project charter

The basic information about the project is represented in a project charter below. The project goal was defined by the SMART method, which means that the goal should be specific, measurable, achievable, realistic, and timely bounded. All of these criteria help to focus on a project effort and increase chances of achieving the goal (1, p. 65).

Table 6: Project charter

(Source: own processing)

Basic Information	
Project name	Implementation of analytical portal for analysts working in Python programming language
Project type	Company internal development
Project goal	Within a scope of 8 months, successfully create a complex CRM Python Framework, that supposed to be a server-based solution accessible via web.
Project intention	To help business users with the Python modeling and allow them to easy implement their codes without having strong technology background
Project main points	<ol style="list-style-type: none"> 1) Creation of final solution design 2) Project approval 3) Product development start 4) Solution is customized

	<ul style="list-style-type: none"> 5) Internal company systems are integrated to customized solution 6) External systems are integrated to customized solution 7) Creation of query builder as a part of the final solution 8) Providing Final version to the requestor 9) Presentation of final solution to countries representatives
Project requestor	Head of Product Development Sales

Table 7: Project team structure

(Source: own processing)

Project team	
Project management	<ul style="list-style-type: none"> Product owner Software analyst Project planning coordinator
Product development	<ul style="list-style-type: none"> Python Developer A Python Developer B Junior Python Developer/Tester

4.4 LFA Framework

The Logical framework determines what exactly the project should achieve, how it can be measured, verified and that are the assumptions for the goal achievement) (1, p.68).

Table 8: LFA framework

(Source: own processing)

LFA Framework		Success measures	Verification	Assumptions
Goal:	Within a scope of 8 months, successfully create a complex CRM Python framework, that supposed to be a server-based solution accessible via web.	Satisfaction of company's needs aligned with a company strategy	Satisfaction questionnaire for the requestor	
Purpose:	To help business users with the Python modeling and allow them to easy implement their codes without having strong technology background	Solution reflects changes in the customer's data analysis strategy. Feedback from data analysts.	Analysis of the company analytics needs based on changed strategy. Business requirement documentation	Close cooperation within the team, with requestor and analysts in countries
Results:	Implementation of Functional CRM Python Analytical portal with all requested functionality. Solution is represented to interested parties	Handover protocol. Presentation of final solution to countries representatives	UAT and smoke tests documentation. Prepared presentation.	Close cooperation within the team and requestor. Compliance with agreed schedule of activities
Activities	-Initiation and requirement analysis	Inputs: - Product owner -Software analyst	Time scheduling: 2.1.-22.1.2020	-Flawless documentation of individual activities

	-Planning and design	-Project planning coordinator	23.1.-17.2.2020	-Following the project realization plan
	-Implementation	-Python Developer A	18.2.-14.5.2020	
	-Testing and corrections	-Python Developer B	15.5.-3.8.2020	-Meeting deadlines
	-Project ending	-Junior Python Developer/Tester	4.8.-11.8.2020	
		-Project budget		-Cooperation with all interested parties
				-Definition of project risks

4.5 WBS Structure

The following diagram illustrates a hierarchical structure of individual project activities created by WBS method.

ID	WBS	Task Name	Duration	Start	Finish
1	PR1	Project Summary	154 days	Thu 1/2/20	Tue 8/11/20
2	PR1/1	Initiation and requirement analysis	15 days	Thu 1/2/20	Wed 1/22/20
3	PR1/1.1	Initial analysis of business requirement	5 days	Thu 1/2/20	Wed 1/8/20
4	PR1/1.2	Clarification of business requirement and project goals with all interested parties	5 days	Thu 1/9/20	Wed 1/15/20
5	PR1/1.3	Brainstorming meeting for discussion of possible solutions	1 day	Thu 1/16/20	Thu 1/16/20
6	PR1/1.4	Creation of documentation	4 days	Fri 1/17/20	Wed 1/22/20
7	PR1/2	Planning and design	18 days	Thu 1/23/20	Mon 2/17/20
8	PR1/2.1	Clarification of final solution design with interested parties	3 days	Thu 1/23/20	Mon 1/27/20
9	PR1/2.2	Determination of risks	3 days	Tue 1/28/20	Thu 1/30/20
10	PR1/2.3	Creation of work scope	5 days	Fri 1/31/20	Thu 2/6/20
11	PR1/2.4	Budget creation	3 days	Fri 2/7/20	Tue 2/11/20
12	PR1/2.5	Creation of project team	3 days	Wed 2/12/20	Fri 2/14/20
13	PR1/2.6	Preparation of functional specification for the final solution	5 days	Fri 2/7/20	Thu 2/13/20
14	PR1/2.7	Project approval	2 days	Fri 2/14/20	Mon 2/17/20
15	PR1/3	Implementation	59 days	Tue 2/18/20	Thu 5/14/20
16	PR1/3.1	Product development start	1 day	Tue 2/18/20	Tue 2/18/20
17	PR1/3.2	Customization of basic solution used before	33 days	Wed 2/19/20	Fri 4/3/20
18	PR1/3.3	Provide integration to internal company systems	15 days	Mon 4/6/20	Tue 4/28/20
19	PR1/3.4	Provide integration to external systems	20 days	Mon 4/6/20	Wed 5/6/20
20	PR1/3.5	Creation of query builder as a part of the final solution	25 days	Mon 4/6/20	Thu 5/14/20
21	PR1/4	Testing and corrections	56 days	Fri 5/15/20	Mon 8/3/20
22	PR1/4.1	UAT and smoke Testing	5 days	Fri 5/15/20	Thu 5/21/20
23	PR1/4.2	Providing the beta version to requestor	1 day	Fri 5/22/20	Fri 5/22/20
24	PR1/4.3	Requestor's overview	3 days	Mon 5/25/20	Wed 5/27/20
25	PR1/4.4	Feedback analysis	5 days	Thu 5/28/20	Wed 6/3/20
26	PR1/4.5	Providing corrections	15 days	Thu 6/4/20	Wed 6/24/20
27	PR1/4.6	UAT and smoke testing	5 days	Thu 6/25/20	Wed 7/1/20
28	PR1/4.7	Providing corrected beta version to requestor	1 day	Thu 7/2/20	Thu 7/2/20
29	PR1/4.8	Requestor's overview	3 days	Fri 7/3/20	Wed 7/8/20
30	PR1/4.9	Feedback analysis	3 days	Thu 7/9/20	Mon 7/13/20
31	PR1/4.10	Providing final corrections	10 days	Tue 7/14/20	Mon 7/27/20
32	PR1/4.11	UAT and smoke tests	5 days	Tue 7/28/20	Mon 8/3/20
33	PR1/5	Project ending	6 days	Tue 8/4/20	Tue 8/11/20
34	PR1/5.1	Providing final solution to requestor	1 day	Tue 8/4/20	Tue 8/4/20
35	PR1/5.2	Prepare presentation that introduces solution to countries branches	2 days	Wed 8/5/20	Thu 8/6/20
36	PR1/5.3	Schedule a meetings with contries representatives	1 day	Wed 8/5/20	Wed 8/5/20
37	PR1/5.4	Presentation of final solution to data analysts in a countries	3 days	Fri 8/7/20	Tue 8/11/20

Figure 11: WBS team structure

(Source: own processing in MS Project 2016)

4.6 Time analysis of the project

As it follows from the WBS structure, the project is divided into the several activities group based on the main product development steps:

- initialization and requirements analysis;
- planning and design;
- implementation;
- testing and corrections;
- project ending.

A complete scheduling of project activities is prepared in MS Project program, that provide us with opportunity of clear and structured tasks planning.

A node-defined network diagram, that shows a big picture of tasks dependencies and durations, can be found in annex I. A part of this diagram is also represented below as an example:

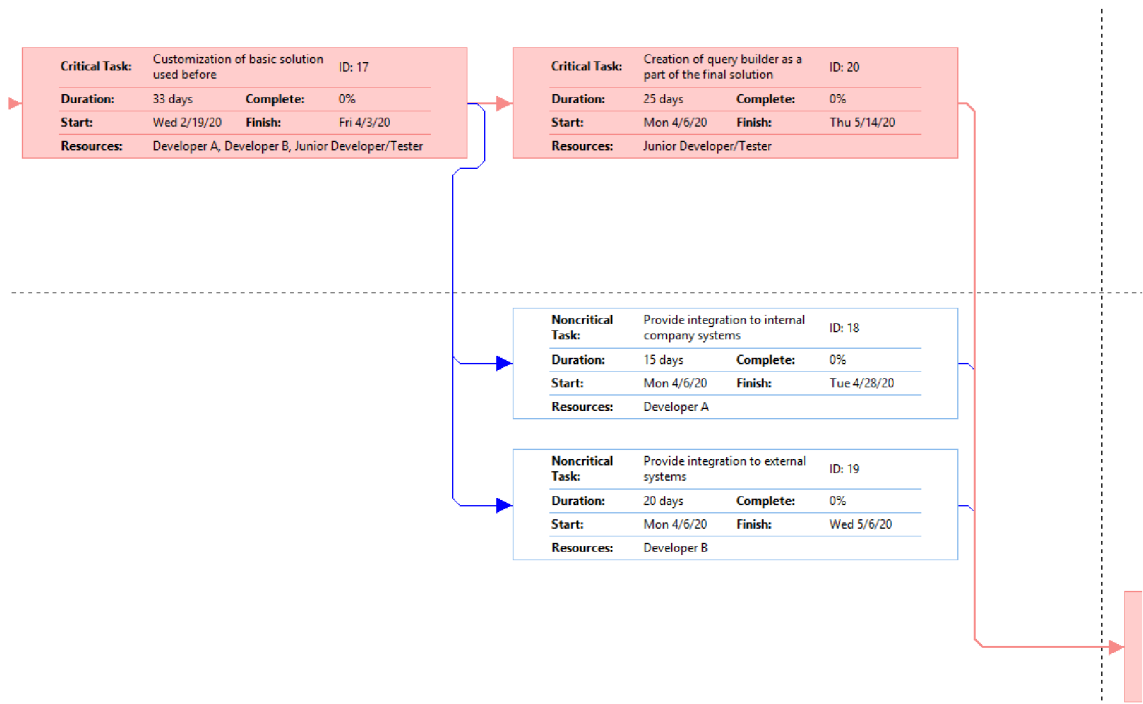


Figure 12: Part of Network Diagram
(Source: own processing in MS Project Program)

A scheduling of project tasks is provided in the table below.

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Project Summary	154 days	Thu 1/2/20	Tue 8/11/20	
2		Initiation and requirement analysis	15 days	Thu 1/2/20	Wed 1/22/20	
3		Initial analysis of business requirement	5 days	Thu 1/2/20	Wed 1/8/20	
4		Clarification of business requirement and project goals with all interested parties	5 days	Thu 1/9/20	Wed 1/15/20	3
5		Brainstorming meeting for discussion of possible solutions	1 day	Thu 1/16/20	Thu 1/16/20	4
6		Creation of documentation	4 days	Fri 1/17/20	Wed 1/22/20	5
7		Planning and design	18 days	Thu 1/23/20	Mon 2/17/20	
8		Clarification of final solution design with interested parties	3 days	Thu 1/23/20	Mon 1/27/20	6
9		Determination of risks	3 days	Tue 1/28/20	Thu 1/30/20	8
10		Creation of work scope	5 days	Fri 1/31/20	Thu 2/6/20	9
11		Budget creation	3 days	Fri 2/7/20	Tue 2/11/20	10
12		Creation of project team	3 days	Wed 2/12/20	Fri 2/14/20	11
13		Preparation of functional specification for the final solution	5 days	Fri 2/7/20	Thu 2/13/20	10
14		Project approval	2 days	Fri 2/14/20	Mon 2/17/20	13
15		Implementation	59 days	Tue 2/18/20	Thu 5/14/20	
16		Product development start	1 day	Tue 2/18/20	Tue 2/18/20	14
17		Customization of basic solution used before	33 days	Wed 2/19/20	Fri 4/3/20	16
18		Provide integration to internal company sys	15 days	Mon 4/6/20	Tue 4/28/20	17
19		Provide integration to external systems	20 days	Mon 4/6/20	Wed 5/6/20	17
20		Creation of query builder as a part of the final solution	25 days	Mon 4/6/20	Thu 5/14/20	17
21		Testing and corrections	56 days	Fri 5/15/20	Mon 8/3/20	
22		UAT and smoke Testing	5 days	Fri 5/15/20	Thu 5/21/20	20,18,19
23		Providing the beta version to requestor	1 day	Fri 5/22/20	Fri 5/22/20	22
24		Requestor's overview	3 days	Mon 5/25/20	Wed 5/27/20	23
25		Feedback analysis	5 days	Thu 5/28/20	Wed 6/3/20	24
26		Providing corrections	15 days	Thu 6/4/20	Wed 6/24/20	25
27		UAT and smoke testing	5 days	Thu 6/25/20	Wed 7/1/20	26
28		Providing corrected beta version to request	1 day	Thu 7/2/20	Thu 7/2/20	27
29		Requestor's overview	3 days	Fri 7/3/20	Wed 7/8/20	28
30		Feedback analysis	3 days	Thu 7/9/20	Mon 7/13/20	29
31		Providing final corrections	10 days	Tue 7/14/20	Mon 7/27/20	30
32		UAT and smoke tests	5 days	Tue 7/28/20	Mon 8/3/20	31
33		Project ending	6 days	Tue 8/4/20	Tue 8/11/20	
34		Providing final solution to requestor	1 day	Tue 8/4/20	Tue 8/4/20	32
35		Prepare presentation that introduces solution to countries branches	2 days	Wed 8/5/20	Thu 8/6/20	34
36		Schedule a meetings with contries representatives	1 day	Wed 8/5/20	Wed 8/5/20	34
37		Presentation of final solution to data analysts in a countries	3 days	Fri 8/7/20	Tue 8/11/20	36,35

Figure 13: Project timetable

(Source: own processing in MS Project program)

4.7 Gantt chart

Gantt chart provide graphical visualization of tasks and their dependencies. Tasks with no time reserve are critical and marked with a red color. That means that these tasks have no time reserve and should be monitored more properly, otherwise the duration of the whole project can be negatively impacted (28).

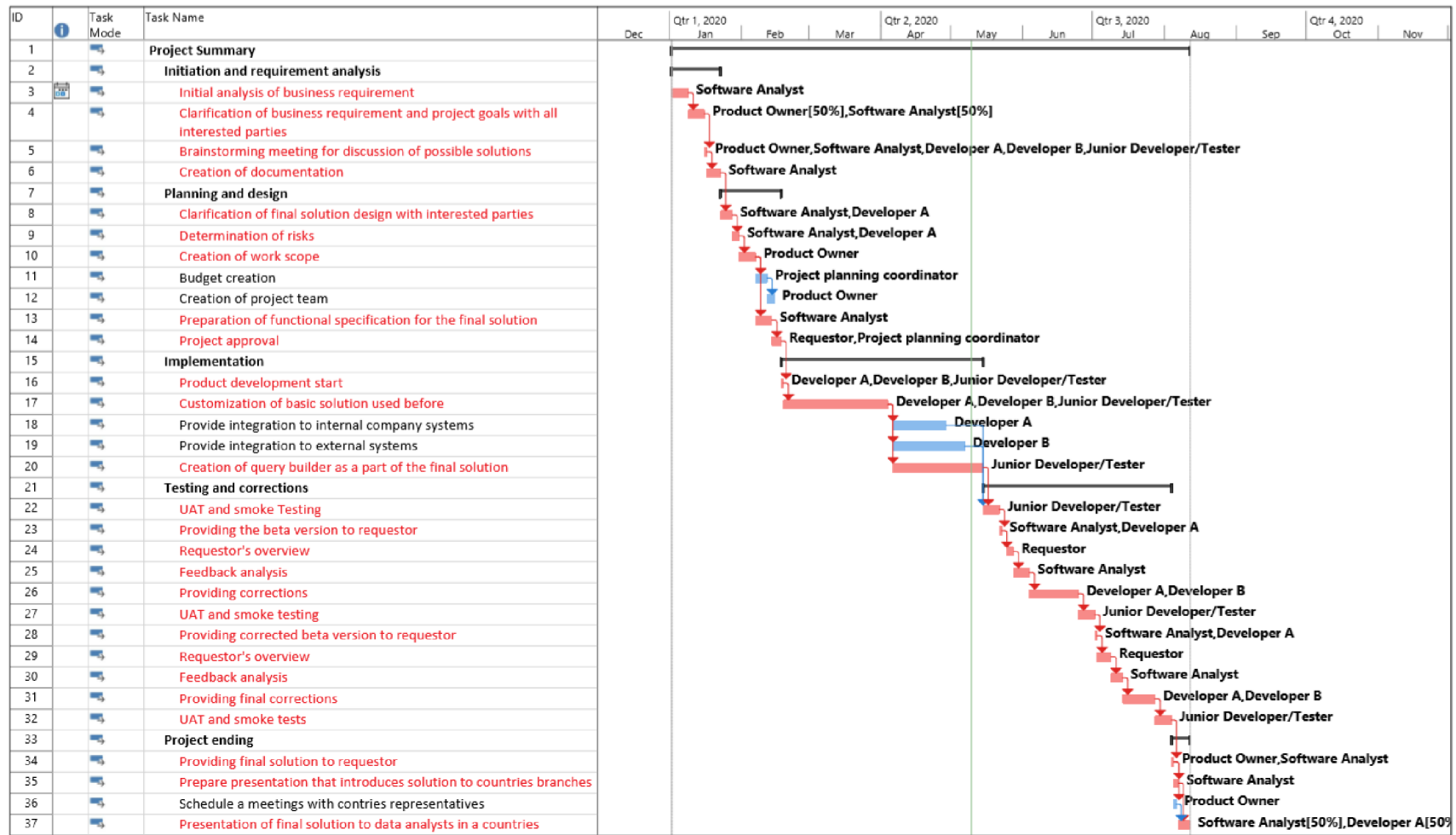


Figure 14: Gantt chart

(Source: own processing in MS Project program)

4.8 Recourses analysis

Necessary recourses, that will participate in the realization of project activities, can be divided into 2 groups: human resources and material resources (4).

For successful completion of the project the sufficient availability of needed resources should be insured.

4.8.1 Material resources

The material resources of the project mainly consist of:

- office equipment as chairs, tables, etc.;
- computers with appropriate software and internet connection, including all necessary additional PC equipment;
- other office requisites like whiteboard, meeting rooms, printers, etc. (24).

All the necessary material recourses are provided by the company as a standard equipment and there is no requirement for new material recourses for this specific project. Based on this fact, the material resources will not be calculated for this specific project.

4.8.2 Human resources

The most important recourses for this project are people, who are actively involved to participate in project activities.

In terms of human resources, the project is mainly managed by assigned CRM team's members: product owner, software analyst, 2 senior developers, junior developer/tester and project planning coordinator (24).

As it is internal company project, there is no project manager assigned directly for this project and the main project management responsibilities are divided between product owner, software analyst and project planning coordinator (24).

For the development of product itself are dedicated 2 senior developers, who implement the main functionalities, and junior developer/tester, who performs less demanding development tasks and provide software tests (24).

4.8.3 OBS project structure

The following OBS project structure is created based on existing project team structure (3). Originally the project is assigned to the CRM support team, which is led by the Product Owner. The project planning coordinator is not assigned directly to this project but he takes part in a multiple project's administration activities such as, for example, a budget approval (24). As it shown in the figure n. 15, the project team do not include a Project Manager, because of this, project management responsibilities are divided between the Product Owner, Project planning coordinator and Software Analyst.

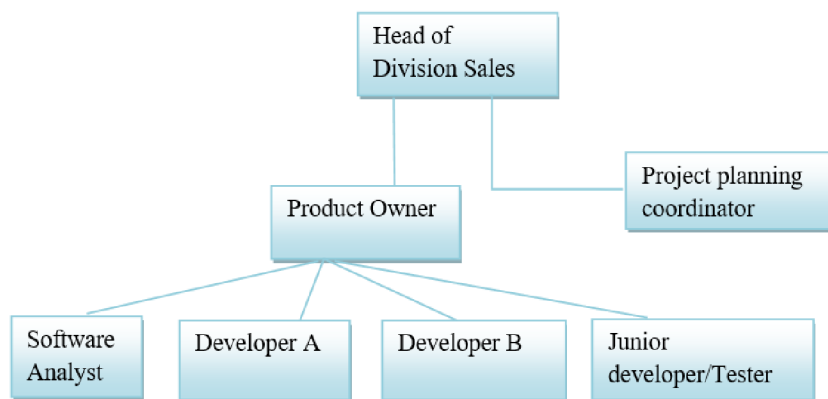


Figure 15: OBS structure

(Source: own processing)

4.8.4 Responsibility matrix

RACI matrix divided responsibilities according to the following context:

R – Responsible: indicates who is responsible for entrusted activity and complete the task;

A – Accountable: shows who is responsible for completing the task;

C – Consulted: determines who is able to provide a consultation for the task;

I – Informed: indicates who needs to be informed about events related to the task (27, p. 94).

In the following table, the matrix shows the responsibilities of individual employees and their participation in partial outputs of the project.

Table 9: RACI matrix of project

(Source: own processing)

Task Name	Product Owner	Software Analyst	Developer A	Developer B	Junior Developer/Tester	Project planning coordinator	Requestor
Initial analysis of business requirement	A	R	C	C			I
Clarification of business requirement and project goals with all interested parties	A, R	R	C	C		C	I
Brainstorming meeting for discussion of possible solutions	A, R	R	R	R	R		I
Creation of documentation	A	R	C	C			I
Clarification of final solution design with interested parties	A	R	R	C	I		R
Determination of risks	A	R	R	C	C		I
Creation of work scope	R, A	C	C	C	I		
Budget creation	A					R	I
Creation of project team	R, A	C	I	I	I		
Preparation of functional specification for the final solution	A	R	C	C	C		I
Project approval	C	I	I	I	I	R	R, A
Product development start	A		R	R	R		I
Customization of basic solution used	A	I	R	R	R		

before							
Provide intergation to internal company systems	A	I	R	C	C		
Provide integration to external systems	A	I	C	R	C		
Creation of query builder as a part of the final solution	A	I	C	C	R		
UAT and Smoke Testing	A	I	C	C	R		
Providing beta ersion to requestor	A	R	R				C, I
Requestor's overview	A	C	I	I	I		R
Feedback analysis	A	R	C	C	C		I
Providing corrections	A	I	R	R	I		I
UAT and Smoke testing	A	I	C	C	R		
Providing corrected beta version to requestor	A	R	R				C, I
Requestor's overview	A	C	I	I	I		R
Feedback analsis	A	R	C	C	C		I
Providing Final corrections	A	I	R	R	I		I
UAT and smoke tests	A	I	C	C	R		
Providing final solution to requestor	A, R	C	R				C, I
Prepare presentation that introduces solution to countries branches	A	R	C	C			I
Schedule a meetings with contries representatives	A, R	C					I
Presentation of final solution to data analysts in a countries	A	R	R	C	C		I

4.8.5 Resources allocation

The responsibility matrix is aligned with assigned resources for each task in MS project 2016 (Figure 16).

ID	Task Mode	Task Name	Duration	Resource Names
1		Project Summary	154 days	
2		Initiation and requirement analysis	15 days	
3		Initial analysis of business requirement	5 days	Software Analyst
4		Clarification of business requirement and project goals with all interested parties	5 days	Product Owner[50%],Software Analyst[50%]
5		Brainstorming meeting for discussion of possible solutions	1 day	Product Owner,Software Analyst,Developer A,Developer B,Junior Developer/Tester
6		Creation of documentation	4 days	Software Analyst
7		Planning and design	18 days	
8		Clarification of final solution design with interested parties	3 days	Software Analyst,Developer A
9		Determination of risks	3 days	Software Analyst,Developer A
10		Creation of work scope	5 days	Product Owner
11		Budget creation	3 days	Project planning coordinator
12		Creation of project team	3 days	Product Owner
13		Preparation of functional specification for the final solution	5 days	Software Analyst
14		Project approval	2 days	Requestor,Project planning coordinator
15		Implementation	59 days	
16		Product development start	1 day	Developer A,Developer B,Junior Developer/Tester
17		Customization of basic solution used before	33 days	Developer A,Developer B,Junior Developer/Tester
18		Provide integration to internal company systems	15 days	Developer A
19		Provide integration to external systems	20 days	Developer B
20		Creation of query builder as a part of the final solution	25 days	Junior Developer/Tester
21		Testing and corrections	56 days	
22		UAT and smoke Testing	5 days	Junior Developer/Tester
23		Providing the beta version to requestor	1 day	Software Analyst,Developer A
24		Requestor's overview	3 days	Requestor
25		Feedback analysis	5 days	Software Analyst
26		Providing corrections	15 days	Developer A,Developer B
27		UAT and smoke testing	5 days	Junior Developer/Tester
28		Providing corrected beta version to requestor	1 day	Software Analyst,Developer A
29		Requestor's overview	3 days	Requestor
30		Feedback analysis	3 days	Software Analyst
31		Providing final corrections	10 days	Developer A,Developer B
32		UAT and smoke tests	5 days	Junior Developer/Tester
33		Project ending	6 days	
34		Providing final solution to requestor	1 day	Product Owner,Software Analyst
35		Prepare presentation that introduces solution to countries branches	2 days	Software Analyst
36		Schedule a meetings with contries representatives	1 day	Product Owner
37		Presentation of final solution to data analysts in a countries	3 days	Software Analyst[50%],Developer A[50%]

Figure 16: Resources allocation

(Source: own processing in MS Project 2016)

On the graph below the summary of working hours for each employee can be seen, based on assigned project tasks. As it is a software development project, most of the

project activities are performed by developers (more than 600 hours are dedicated for each resource).

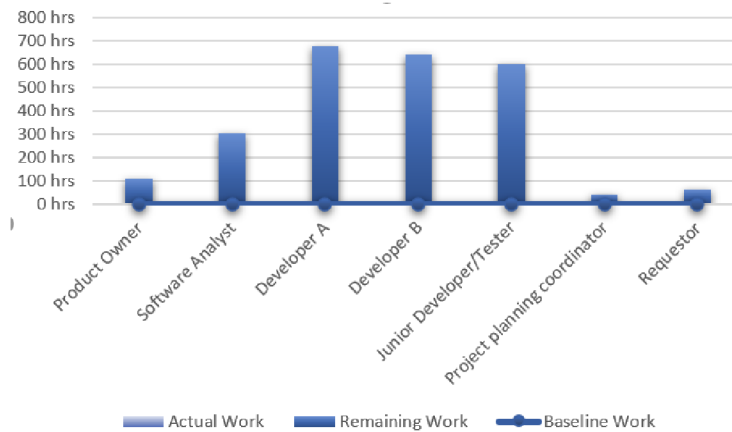


Figure 17: Project work hours summary
(Source: own processing in MS Project 2016)

4.8.6 Resources overallocation

During the project work division, the issue of resource overallocation have been solved as well. A resource is overallocated when it is assigned too much work to complete within the resource's available time capacity. The advantage of MS Project program is indicator that always notifies about that issue, as it showed in figure below (30).

15		Implementation	59 days
16		Product development start	1 day
17		Customization of basic solution used before	33 days
18		Provide integration to internal company systems	15 days
19		Provide integration to external systems	20 days
20		Creation of query builder as a part of the final solution	25 days
21		Testing and corrections	56 days
22		UAT and smoke Testing	5 days
23		Providing the beta version to requestor	1 day

Figure 18: Notification about the resources overallocation
(Source: own processing in MS Program 2016)

The task of creation of query builder was supposed to be done by the Developer A, but at the same time, he had been assigned to other task with his 100% capacity.

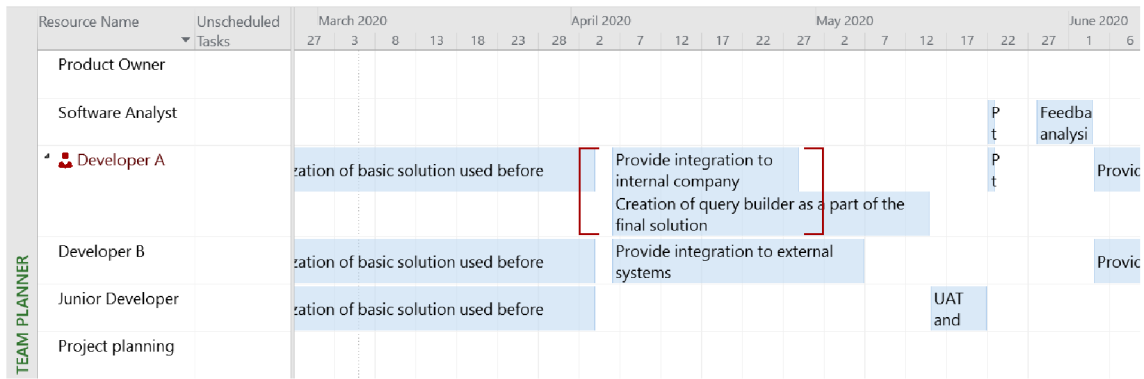


Figure 19: Resources overallocation notification in the Team planner

(Source: own processing in MS Program 2016)

As it follows from resource's histogram below, expected summary units of Developer A in April is 200%, which is 100% more than resource's available time. In this case it is necessary to solve a problem overallocation to prevent the project running complications.

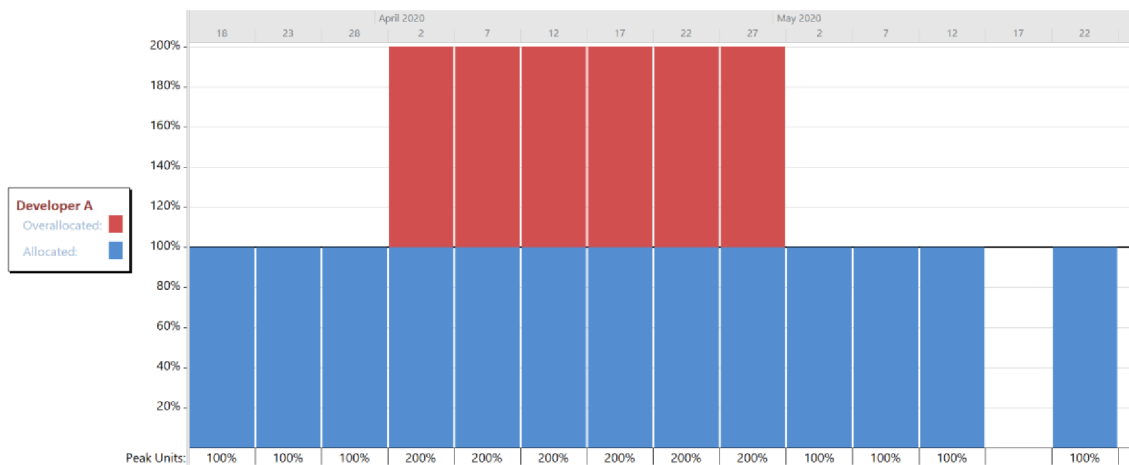


Figure 20: Resource histogram (Developer A)

(Source: own processing in MS Program 2016)

Resolution of resource overallocation

A few options exist to resolve the issue of resource overallocation. The following paragraphs describe each solution (10).

Automatic settlement in MS Project

The first option is an automatic settlement using the MS Project software. In this case, the project task will be postponed for dedicator resource to available time (Figure 21),

and, according to the three imperatives rule, the program will automatically extend duration of the project. In such case, the total duration of the project would be extended from 154 days to 169 days (10).

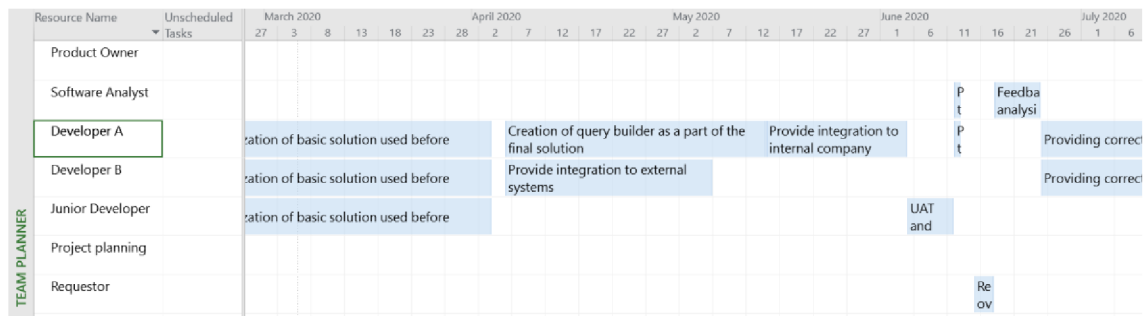


Figure 21: Resolution of resource overallocation (automatic settlement in MS Project)

(Source: own processing in MS Program 2016)

Reallocation of resources

Other option is to find an available resource with enough skills and time capability to complete the task. This solution was finally applied to solve this issue in a project and the task was re-assigned to the Junior Developer (figure 22) (10).

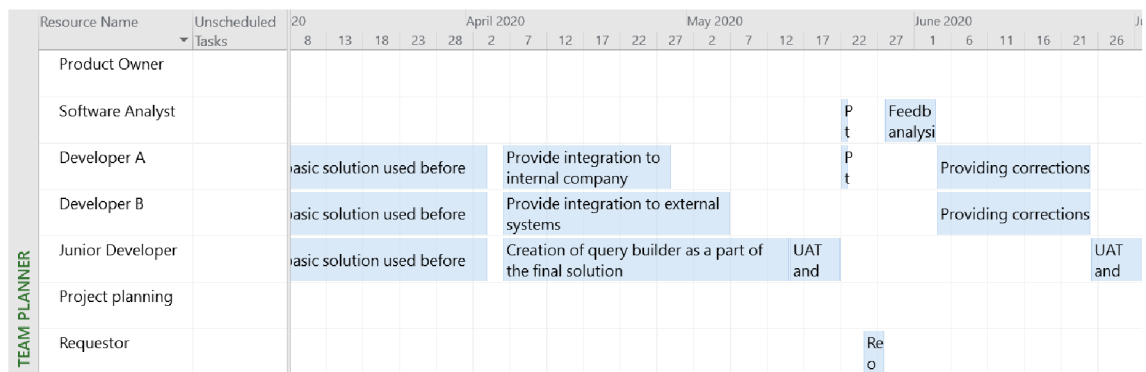


Figure 22: Resolution of resource overallocation (reallocation of resources)

(Source: own processing in MS Program 2016)

Decrease the task duration

The next opportunity is to decrease the task duration to reduce the amount of work for assigned resource, but, as a result, it can have a negative impact on the project in terms of its quality (10).

Additional resources

As a last solution can be extension of project team and assignment of the task to a new recourse. In this specific case, this is not the most optimal solution, because additional developer will significantly increase the project cost (10).

As it was already mentioned, as a final solution was applied option of resource re-allocation and the task was re-assigned to available resource. Other resources are not overloaded and their histograms are represented in the annex III.

4.9 Cost analysis

Planned costs for this specific project mainly consist of the salary of the individual team members working on a project (24).

In the table below the salary of each employee is calculated as an hourly rate, which will help to calculate the whole project cost based on working hours need to be spend by each employee on specific task.

Resource Name	Type	Material	Initials	Max.	Std. Rate	Ovt. Rate	Accrue	Base Calendar
Product Owner	Work		P	100%	285.00 Kč/hr	357.00 Kč/hr	Prorated	Standard
Software Analyst	Work		S	100%	225.00 Kč/hr	382.00 Kč/hr	Prorated	Standard
Developer A	Work		D	100%	285.00 Kč/hr	357.00 Kč/hr	Prorated	Standard
Developer B	Work		D	100%	285.00 Kč/hr	357.00 Kč/hr	Prorated	Standard
Junior Developer/Tester	Work		J	100%	225.00 Kč/hr	382.00 Kč/hr	Prorated	Standard
Project planning coordinator	Work		P	100%	255.00 Kč/hr	319.00 Kč/hr	Prorated	Standard

Figure 23: Calculation of resources hourly rates

(Source: own processing in MS Program 2016)

The most expensive human recourses are product owner and senior developers, as these positions requires essential level of responsibilities and hard skills. Less expensive are Software Analyst and Junior Developer/tester, however the common salary average within the company is quite high comparing to similar companies on a market.

After assignment of dedicated resources to project tasks is done, the cost of each task can be calculated (30).

ID	Task Mode	Task Name	Duration	Cost
1		Project Summary	154 days	619,440.00 Kč
2		Initiation and requirement analysis	15 days	36,840.00 Kč
3		Initial analysis of business requirement	5 days	9,000.00 Kč
4		Clarification of business requirement and project goals with all interested parties	5 days	10,200.00 Kč
5		Brainstorming meeting for discussion of possible solutions	1 day	10,440.00 Kč
6		Creation of documentation	4 days	7,200.00 Kč
7		Planning and design	18 days	61,920.00 Kč
8		Clarification of final solution design with interested parties	3 days	12,240.00 Kč
9		Determination of risks	3 days	12,240.00 Kč
10		Creation of work scope	5 days	11,400.00 Kč
11		Budget creation	3 days	6,120.00 Kč
12		Creation of project team	3 days	6,840.00 Kč
13		Preparation of functional specification for the final solution	5 days	9,000.00 Kč
14		Project approval	2 days	4,080.00 Kč
15		Implementation	59 days	341,040.00 Kč
16		Product development start	1 day	6,360.00 Kč
17		Customization of basic solution used before	33 days	209,880.00 Kč
18		Provide integration to internal company systems	15 days	34,200.00 Kč
19		Provide integration to external systems	20 days	45,600.00 Kč
20		Creation of query builder as a part of the final solution	25 days	45,000.00 Kč
21		Testing and corrections	56 days	163,560.00 Kč
22		UAT and smoke Testing	5 days	9,000.00 Kč
23		Providing the beta version to requestor	1 day	4,080.00 Kč
24		Requestor's overview	3 days	0.00 Kč
25		Feedback analysis	5 days	9,000.00 Kč
26		Providing corrections	15 days	68,400.00 Kč
27		UAT and smoke testing	5 days	9,000.00 Kč
28		Providing corrected beta version to requestor	1 day	4,080.00 Kč
29		Requestor's overview	3 days	0.00 Kč
30		Feedback analysis	3 days	5,400.00 Kč
31		Providing final corrections	10 days	45,600.00 Kč
32		UAT and smoke tests	5 days	9,000.00 Kč
33		Project ending	6 days	16,080.00 Kč
34		Providing final solution to requestor	1 day	4,080.00 Kč
35		Prepare presentation that introduces solution to countries branches	2 days	3,600.00 Kč
36		Schedule a meetings with contries representatives	1 day	2,280.00 Kč
37		Presentation of final solution to data analysts in a countries	3 days	6,120.00 Kč

Figure 24: Project cost analysis

(Source: own processing in MS Program 2016)

Thus, the most expensive part of the whole project is implementation as it requires a longest duration and involvement of the most valuable human resources for this project.

Task Name	Duration	Cost
▸ Project Summary	154 days	619,440.00 Kč
▸ Initiation and requirement analysis	15 days	36,840.00 Kč
▸ Planning and design	18 days	61,920.00 Kč
▸ Implementation	59 days	341,040.00 Kč
▸ Testing and corrections	56 days	163,560.00 Kč
▸ Project ending	6 days	16,080.00 Kč

Figure 25: Project costs summary

(Source: own processing in MS Program 2016)

As it follows from the bottom-up project cost estimation above, planned expenses on this specific project should be approximately 619 400 Kč. Despite of this, the project budget should also include a financial reserve that follows from the possible project risks investigated in the next paragraph (1, p. 206).

4.10 Risk analysis

An essential addition to the project realization proposal is the risk analysis, which helps to identify and manage project risks. For these purposes the RIPRAN method will be applied, because it simply and clearly displays threats of given project (1, p. 90). Early identification of risks and proposal of appropriate precautions to reduce the identified risks can prevent possible consequences of negative impact on the project (2, p. 15).

The whole process of risk analysis based on the RIPRAN method consists of the following phases:

1. preparation of the risk analysis;
2. risks' evaluation;
3. risks' qualification;
4. response to the risk.
5. general risk evaluation (22).

4.10.1 Risk analysis preparation

At the preparation phase, a team should be established for accomplishment of risk analysis. The team should consist of professionals who already have experience with similar projects. In this case, Product Owner and Software Analyst can be dedicated for this task.

After the team is established, team members should agree on scales of probability, impact, and risk level as it shown on the tables 10 – 13 (22).

Table 10: Table of impact evaluation description

(Source: own processing based on 22)

Item description	Scale
High impact – VD	Damage is more than 20% of the value of the project budget
Middle impact – SD	Damage is 0,51 – 19,5 % of the project budget
Low impact – MD	Damage is less than 0,5% of the project budget

Table 11: Table of risk probability evaluation

(Source: own processing based on 22)

Item description	Scale
High probability - VP	66,1 – 100%
Middle probability – SP	33,1 -66%
Low probability – NP	0- 33%

Table 12: Table of risk level

(Source: own processing based on 22)

Item description	
High risk	VHR
Middle risk	SHR
Low risk	NHR

Table 13: Table of risk level evaluation

(Source: own processing based on 22)

	VP	SP	NP
VD	VHR	VHR	SHR
SD	VHR	SHR	NHR
MD	SHR	NHR	NHR

4.10.2 Risk identification

When the risk management context is defined, the possible threats and their scenario should be identified. A scenario is an event that is caused by a threat; hence the threat is the cause of the scenario.

For this phase of risk analysis, the team utilized the brainstorming method (Table 14) (22).

Table 14: Table 14: Identification of risks and their scenarios

(Source: own processing)

ID	Threat	Scenario
1	Insufficient capacity in human resources	Lack of human resources for the project can cause a project delay or even its stoppage. Team members overtime work will also increase the budget cost
2	Insufficient communication	Insufficient communication can have a negative impact to the project objectives, double work and relationship with stakeholders
3	Poorly defined project objectives	Final solution is not reflecting customer's needs
4	Disbalance of project scope, budget and time	Project over -time, over- cost or insufficient final solution design
5	Insufficient input requirement analysis	Developed tool is not usable
6	Missing delivery deadlines	The project is not delivered in time. Project prolong

7	A key employee leaves/sick	In case there is no sufficient replacement opportunity, it will cause project delay
8	Complications with technical realization of planned and approved solution design	Inability to deliver agreed solution design in time
9	Additional requirements after the implementation is started	Design reimplementation
10	Loss of implementation source code due to technical problems	Double work for developers
11	Ending of partnership with customer, for whom the tool is developed	A project may be refused or stopped
12	Epidemic/Pandemic illness	Lack of available human resources or less productivity due to long time work from home

4.10.3 Risk qualification

In this phase, the risk probability and its impact are evaluated based on pre-defined scales, and the risk level is calculated (Table 15) (22).

Table 15: Risk level identification

(Source: own processing)

Risk Identification			Risk qualification		
ID	Threat	Scenario	Probability	Impact	Risk level
1	Insufficient capacity in human resources	Lack of human resources for the project can cause a project delay or even its stoppage. Team members overtime work will also increase the budget cost	NP	VD	SHR

2	Insufficient communication	Insufficient communication can have a negative impact to the project objectives, double work and relationship with stakeholders	NP	SD	SHR
3	Poorly defined project objectives	Final solution is not reflecting customer's needs	NP	SD	SHR
4	Disbalance of project scope, budget and time	Project over - time, over- cost or insufficient final solution design	SP	VD	VHR
5	Insufficient input requirement analysis	Developed tool is not usable	SP	VD	VHR
6	Missing delivery deadlines	The project is not delivered in time. Project prolong	SP	SD	SHR
7	A key employee leaves	In case there is no sufficient replacement opportunity, it will cause project delay	SP	SD	SHR
8	Complications with technical realization of planned and approved solution design	Inability to deliver agreed solution design in time	NP	VD	SHR
9	Additional requirements after the implementation is started	Design reimplementation	SP	VD	VHR
10	Loss of implementation source code due to	Double work for developers	NP	VD	SHR

	technical problems				
11	Ending of partnership with customer, for whom the tool is developed	A project may be refused or stopped	NP	VP	SHR
12	Epidemic/Pandemic illness	Lack of available human resources or less productivity due to long time work from home	NP	VP	SHR

4.10.4 Proposal of risk responses

In this phase, the team proposes possible preventive actions to reduce the impact of identified risks. In addition, the cost of risk reduction is calculated to identify needed financial reserve. After the preventive measurements are proposed, the new level of risk can be recalculated (Table 16).

Table 16: Proposal of risk responses

(Source: own processing)

ID	Threat	Risk level	Response to risk	Cost of risk reduction	New level of risk
1	Insufficient capacity in human resources	SHR	Hire a new employee or external employee from the outsourcing company/Create financial reserve for this	100 000 Kč	NHR
2	Insufficient communication	SHR	Organize daily stand up meeting within the project team and periodic meetings with the requestor side	No	NHR
3	Poorly defined project objectives	SHR	Specify and clearly define the project objectives with all	No	NHR

			interested parties		
4	Disbalance of project scope, budget and time	VHR	Provide qualified analysis of requirements and create the project plan with participation of product owner, software analyst and developers.	No	SHR
5	Insufficient input requirement analysis	VHR	Provide additional requirement analysis with data scientists in a country's branches	No	SHR
6	Missing delivery deadlines	SHR	Regularly control of the project realization plan and checking the deadlines	No	NHR
7	A key employee leaves	SHR	Hire a new employee or external employee from the outsourcing company	50 000 Kč	NHR
8	Complications with technical realization of planned and approved solution design	SHR	Analysis and solution of technical design will be performed with the participation of the development team and the requestor.	No	NHR
9	Additional requirements after the implementation is started	VHR	Provide additional requirement analysis with data scientists in a country's branches before the implementation is started	No	NHR
10	Loss of implementation source code due to technical problems	SHR	Regularly back up/commits and pushes to Git repository	No	NHR

11	Ending of partnership with customer, for whom the tool is developed	SHR	Accept the risk. The project is not ordered directly by the customer, so there is no direct agreement with them.	No	SHR
12	Epidemic/Pandemic illness	SHR	Make possible work from home and improve VPN connection throughput. Use outsource in case of some workers takes sick lives.	50 000 Kč	NHR

4.10.5 Final evaluation of risks

During the risk analysis, the main 12 risks of the project have been identified and analyzed. The RIPRAN method has shown that various threats can lead the project to the same scenarios, but often with different project impacts and different costs to reduce or eliminate the level of individual risks.

In a result, the most of the level risks was decreased by proposed application of preventive measures. Risk analysis also reveal a need for the project budget reserve of 200 000 Kč to successfully prevent possible risks' occurrence.

4.11 Project benefits and evaluation

Project benefits are the advantages and gains that are delivered by a project.

This specific project can be considered as an investment, that will bring the company following benefits in the future.

- Satisfaction of customer needs aligned with their data analysis strategy changes.
- Building of long-term relationship with the customer based on a support of unique custom solution (following financial benefits).
- Helping customers cooperate with each other easier, that will save their time and money and, as a result, invest more in support service.

- Created project team will get experience with project management methods that will be applied for future internal projects.

The whole project is managed by traditional approach based on project specification characteristics and limited resources. The planning duration of the project is set to 154 days and the final budget including necessary reserves is defined as 819 400 Kč.

After the project completion and solution handover, the project will be evaluated by the project team based on success of the following criteria:

- fulfillment of the cost and schedule plan;
- fulfillment of the set goal and purpose of the project;
- handling of changes compared to the plan;
- usage of human resources;
- quality of documentation;
- suitability of used project management methods;
- work cooperation within the team and other participants;
- handling of unexpected risks and events (1).

The goal of project evaluation is to analyze whether the project was successful, that mistakes have been done and what was complete in a best way. Learned mistakes should be avoided in a future and the positive aspects should be strengthened (1, p. 42).

One of the key benefits of this master thesis is the fact, that the project realization proposal can be applied in a practice. The overall pre-project phase and project plan is processed using the application MS Project, in which the project is fully prepared for its implementation and management. Prepared project plan can also serve as a template and a comprehensive knowledge base for other internal projects realized within the company. As a result, the company will introduce a methodology of internal project management, which it has been lacking until that time.

The project implementation proposal fully represents the system project management approach from all key project management aspects such as time, resources, costs, risks, and therefore, allows to plan and manage other projects in the company.

This methodology was represented in the form of a case study on a selected project and its results can be applied on other projects in a future.

CONCLUSION

Nowadays, IT area is one of the most valuable and active developing areas of business. It is common not only in business environment, but also in everyday life. The key point of today's IT project development is the fact that there are high requirements for the product's relevance to the current state of IT market. Quite frequently, there is an excess of deadlines and budget due to low professionalism of development teams to make necessary changes in the course of the project's implementation. That describes, why application of project management methods while the software development is so strategically important.

The main goal of this Master's Thesis was defined as a design of realization of chosen IT project in selected company. The goal was successfully achieved by using appropriate methods, techniques and tools of project management.

As an object of this work was selected a company XYZ, that produce and support software products for a bank sector. For the proposal of internal project realization, was proposed a complex realization plan with using suitable methods and approaches of project management.

At the first part, the theoretical background of reviewed problematic was analyzed. It includes information about different approaches of project management, most commonly used tools, project phases and project planning in terms of time, resources, budget, costs and risks.

The second part of the Master's Thesis introduced the company XYZ, its organizational structure, and provided analysis of the current state. The analysis of external company environment was completed using the PEST analysis and the Porter's model of five competing forces. The company was also subjected to 7S analysis to deeper investigate an internal environment of the company. Based on a SWOT analysis were identified and evaluated company weaknesses, strengths, opportunities and threats.

The project realization proposal itself was prepared in the last part on the Master's Thesis, where the entire project was briefly summarized, hierarchical structure of activities (WBS) was assembled and project's timetable divided into several steps was created, including graphic representation as a Gantt's diagram.

In order to successfully implement the project, necessary resources were identified and allocated during the source analysis. The financial side of the whole project was analyzed and evaluated as well. The duration of the project is set at 154 days and the final budget, including the necessary reserves based on a risk analysis, is 819 400 CZK.

During the risk analysis, possible risks were identified and effective measures were proposed to prevent them.

This specific project can be considered as an investment, that will bring the company following benefits in the future. That is more important, that proposal of project realization can be applied in practice, and utilized methods allow to plan and manage other projects within the company. Prepared project plan can serve as a template and a comprehensive knowledge base for other internal projects implementations.

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LIST OF ABBREVIATIONS

XYZ - anonymized company name

PERT - Program Evaluation and Review Technique

CPM - Critical Path Method

RIPRAN - RIsk PRoject ANalysis

WBS - Work Breakdown Structure

OBS - Organization Breakdown Structure

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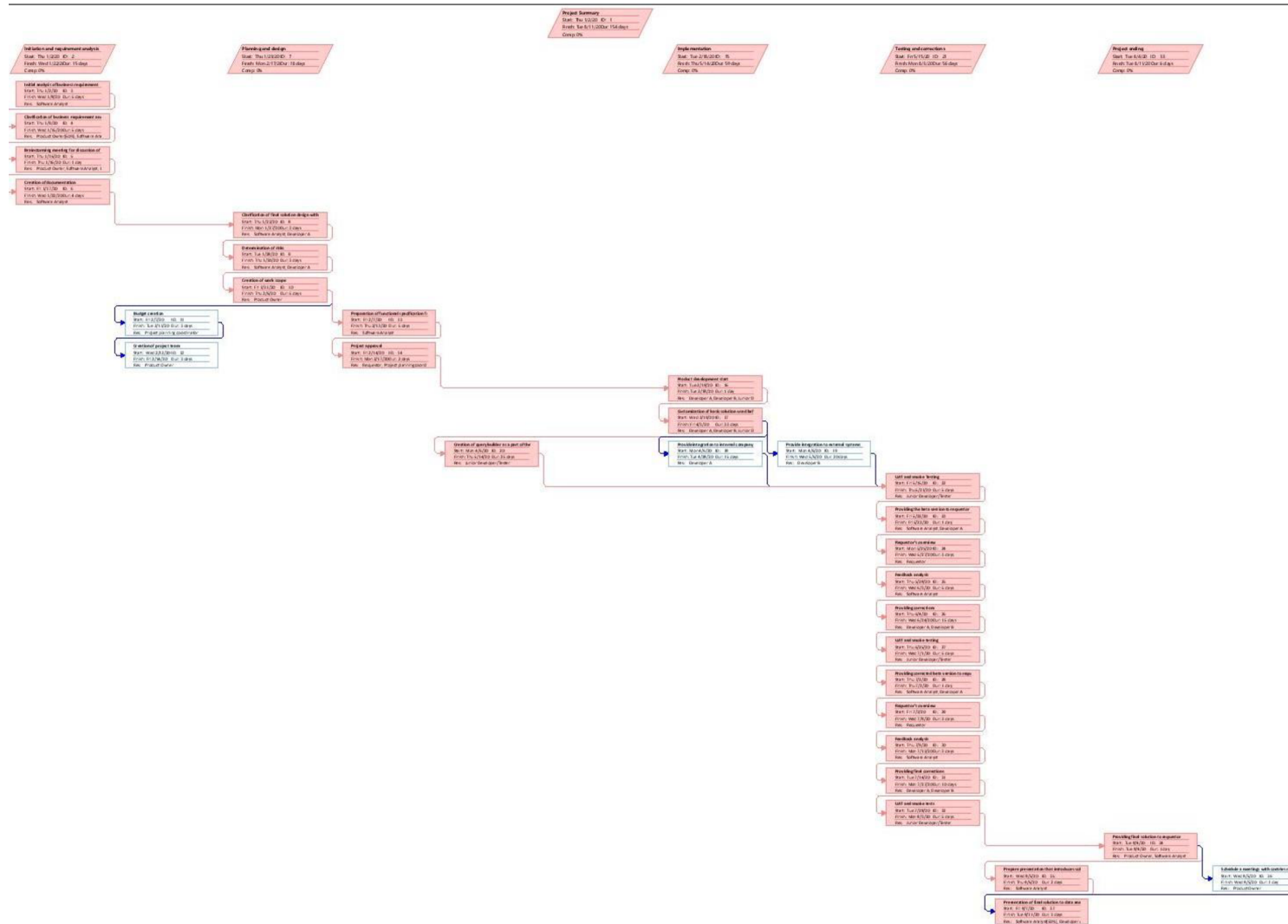
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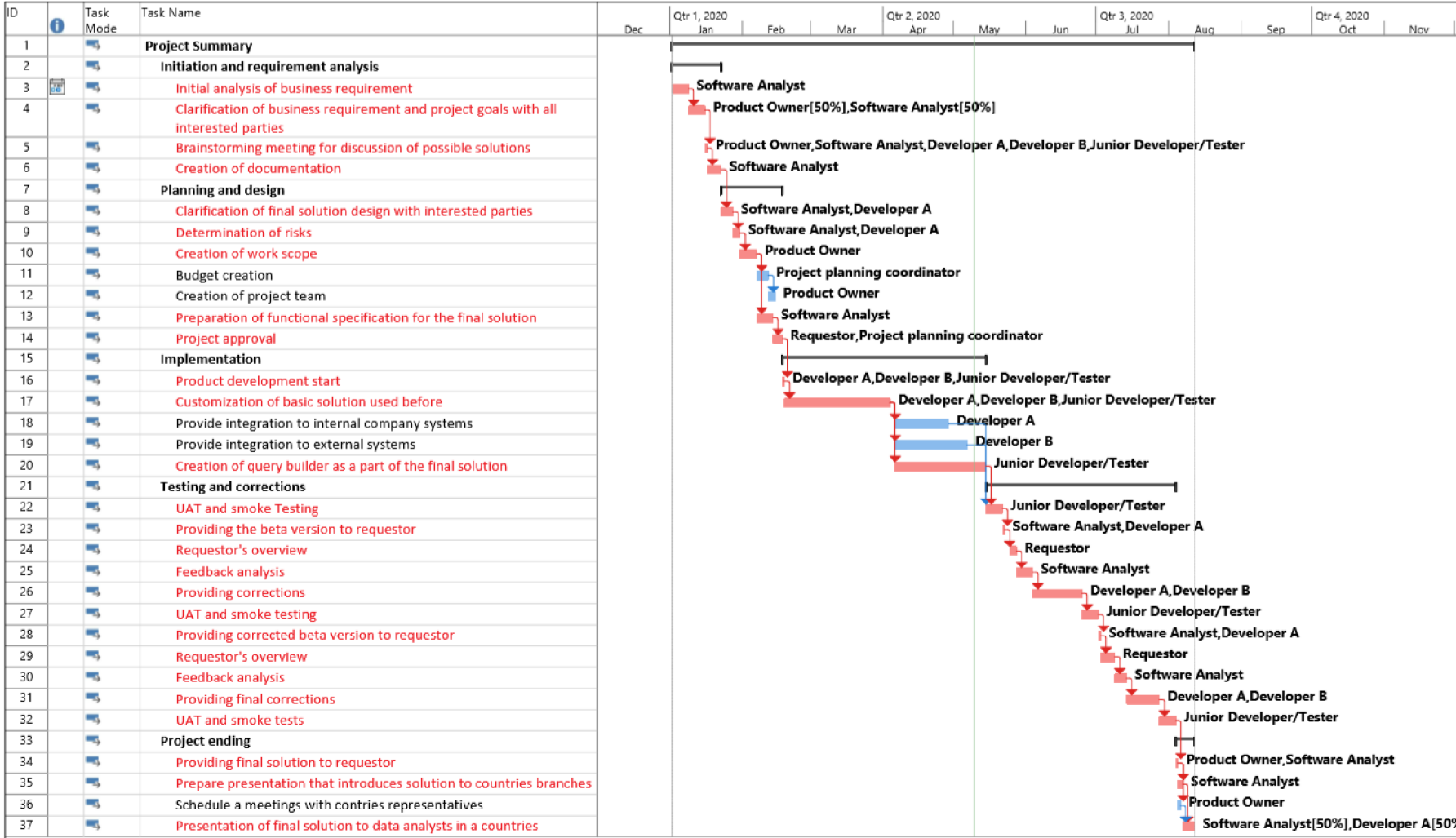
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