

Management system for housing cooperative

Computer Project Management

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Chapter 1

Project description

1.1 The Purpose of the Project

1.1.1 The User Business or Background of the Project Effort

Our client - AppartMeans, aim to build housing estate, which needs housing cooperative software system. In order to this new enterprise, AppartMeans sign alignment with housing cooperative which has not used any software up to now. The software which needs to be developed should enable full communication between housing cooperative and new residents to make AppartMeans housing estate more modern and residents friendly. The board of AppartMeans decided to improve customers satisfaction by providing website application for residents. The quality of customers satisfaction should be measure of the time spending every month in our application.

1.1.2 Goals of the Project

The main goal is project and implementation of database application for purpose of account management by housing association. Final product will be consist of two main parts: web application (for residents) and desktop application (for administration). These applications assure of:

- Remove necessity face to face contact between house cooperative and resident
- Automated and error-free calculating of bills
- Provide up-to-date flow of information between sides
- Enable review of all already paid bills, media usage and its price in every month
- Make the billing process paperless

Final applications should allow its users to do as much as possible things related with paying bills and communication, but should do it more friendly and less time-consuming. Residents should use our service because it simplifies managing their bills management, not because they have to. Therefore measure of success should be the time they are spending on functionalities not obligatory to them, like checking the history of bills or media usage instead of checking them manually.

1.2 The Stakeholders

1.2.1 The Client

The client can be either housing cooperatives, house developer or house rental company. Our client is company AppartMeans which sign alignment with housing cooperative.

1.2.2 Other Stakeholders

1. **Customers and users as a stakeholders** - Because housing management system will provide such functionality as gathering bills data, it is necessary to consult project with media suppliers (water, power, gas). The structure of each type of bill is essential for correct accounting. On the other hand, there is a certain need to consult project with future users. For example for establishing requirements for user functionality.
2. **People involved in developing product:**
 - Testers
 - Developers
 - System and database architects
 - Domain specialist (people who knows housing industry)
 - Sponsors

1.2.3 The Hands-On Users of the Product

1. **Tenants** they will have possibilities to improve bills management. First of all browsing bills, according to their date, type (water, power etc.). Moreover there will be functionality allowing to generate charts and figures based on bills. As a result user obtains graphical representation of his bills how much he pays for particular medium in previous months or for example what is the share of gas bills in overall cost in current month. In addition they will manage their own accounts (changing e-mails, password, sending/receiving messages).
2. **Housing administration** apartments owner (not only person, but also company), who manages the system. He has privileges to add/remove users(tenants) and buildings he owns. For improving communications, he will send messages and notifications to tenants (for example about formal meeting, some reminders etc.). An administrator will be a person, who inputs the data about the bills.

1.2.4 Personas

Management of houses rental company is a huge-scaled task. That leads to partition of administrative duties.

- **Administrator in terms of entire system** - it means a person who will be dealing with database management and maintaining the system. He will focus on technical aspects of system.
- Second group will be textbfadministrative employees they will be involve in billing the tenants and delivering them various information, e.g. meetings, renovations . They needs to be familiar with systems main functionalities, so probably there will be a need of special user training for them. The separate user group will be tenants. Just people interested in making their lives easier by using e-system that allows to monitor and analyze their mortgage, bills. If one of housing agency goal will be mandatory use of the system, there should be a special user training also for the tenants.

1.2.5 Priorities Assigned to Users

The goal of using housing management system is to simplify the business activities of owners. They need to have a practical tool that will fulfill that goal. Because they are customers and customer is always right, they will be the most important users. The feedback of housing administration will determine if the project is useful and in the end successful. On the other hand tenants attitude to user application will be very important. Simple and user-friendly interface, helpful functionalities that will be the factor that will draw their attention.

1.2.6 User Participation

As a result of previous description and a fact, that success of this project depends on customers and users satisfaction, the research of their needs should be done. Many functionalities may be implemented after consults with them. It is especially important, because different housing cooperatives can have different needs. It may appear, that some functionalities should be implemented as a exchangeable plug-ins.

1.2.7 Maintenance Users and Service Technicians

In order to ensure system stability and high service availability, system admin will provide software maintenance. On the other hand company itself should hire technician (if they decide to maintain their own hardware) and database administrator or person responsible for data maintenance. Of course it can be avoided by provide them such kind of service. Database administration can be provided by OUR company as a part of helpdesk.

1.3 Mandated Constraints

1.3.1 Solution Constraints

The project should be done in programming language named **C#** using .NET framework in order to assure neat and minimalist interface because of embedded well-designed libraries. Accordingly it is necessary to use Model View Controller for Web Application and Windows Presentation Foundation for Desktop Application.

To insure excellent quality of our software from the very beginning of programming, we are going to work in Test-Driven Development. All this work will be organizing in Microsoft Visual Studio. This is very popular IDE facilitates quick start and reliable during work.

1.3.2 Implementation Environment of the Current System

Administration of Council House has up to now three PCs. We have to assure access to external providers (like gas and water provide) and create local database (Internal server at Figure).

The council house consist of two buildings, where are dwell residents. They hold a connection between Administration of Council House by Server, which is encrypted from two sided.

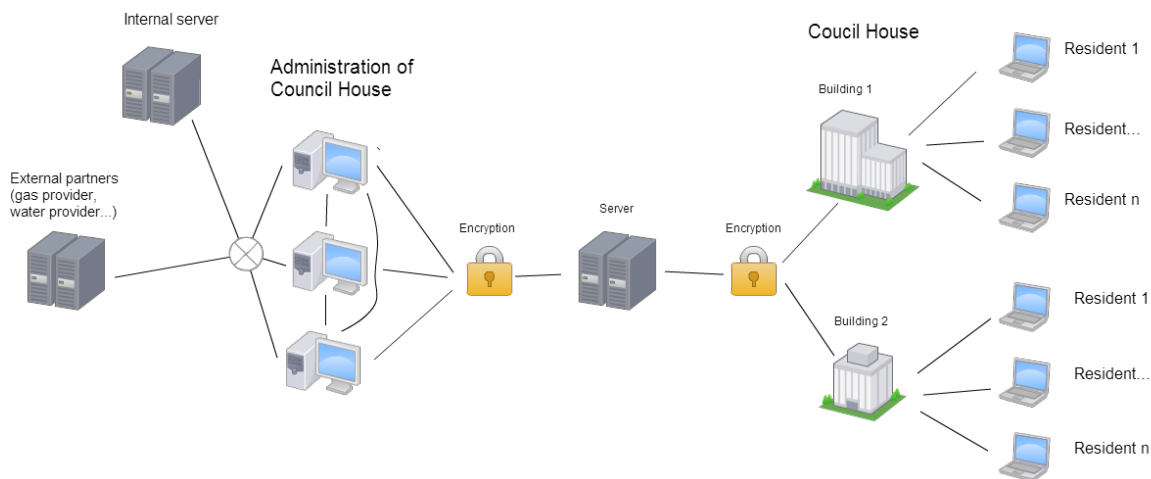


Figure 1.1: Implementation Environment

1.3.3 Partner or Collaborative Applications

Our software will have to collaborate with i.a. gas and water provider. Their interfaces are not known so far.

1.3.4 Off-the-Shelf Software

To implement some of the requirements for the product we have to use some open source software mentioned in 3a. Solution Constraints like Microsoft Visual Studio or .NET frameworks.

1.3.5 Anticipated Workplace Environment

The end users of our applications are residents of council house. Thus they will be work and use this product in their flats. The power sockets are in all the flat, but we know close to nothing about computer equipment of the residents. The workplace of Administration of Council House is located in a few rooms. The required source of power and Internet are provided.

1.3.6 Schedule Constraints

This project starts on 10th March 2015 and ends 20th July 2015. Tasks are divided on 5 types, which every of them has its own deadline. Accurate state deadline limitations are given at the table below.

Task Name	Duration	Start	Finish
1. requirements	10 days	Tue 15-03-10	Mon 15-03-23
talking with clients	5 days	Tue 15-03-17	Mon 15-03-23
preparing documentations	10 days	Tue 15-03-10	Mon 15-03-23
2. design	20 days	Tue 15-03-24	Mon 15-04-20
database	10 days	Tue 15-03-24	Mon 15-04-06
application's interface	10 days	Tue 15-04-07	Mon 15-04-20
3. implementation	30 days	Tue 15-04-21	Mon 15-06-01
3.1 primary features	20 days	Tue 15-04-21	Mon 15-05-18
logging	5 days	Tue 15-04-21	Mon 15-04-27
admin's management	5 days	Tue 15-04-28	Mon 15-05-04
browsing bills	5 days	Thu 15-04-23	Wed 15-04-29
3.2 secondary features	10 days	Mon 15-05-18	Fri 15-05-29
sending bills to users	5 days	Mon 15-05-18	Fri 15-05-22
sending notifications	5 days	Mon 15-05-25	Fri 15-05-29
4. testing	15 days	Mon 15-06-01	Fri 15-06-19
integration testing	7 days	Mon 15-06-01	Tue 15-06-09
system testing	7 days	Wed 15-06-10	Thu 15-06-18
acceptance testing	1 day	Fri 15-06-19	Fri 15-06-19
5. maintenance	21 days	Mon 15-06-22	Mon 15-07-20
getting feedback	10 days	Mon 15-06-22	Mon 15-07-13
fixing bugs	5 days	Tue 15-07-14	Mon 15-07-20

Table 1.1: Deadlines

If we do not build the product by the end of the July, we have to contact with our client to set new dates.

The financial impact of not having the product by the beginning of 2016 will be cost us 50% price of this product.

1.3.7 Budget Constraints

The budget for the project is 100 000 PLN. There are 7 persons included, which overall predicted effort is about 1 500 hours. Is is required to obtain two laptops and assure catering.

1.3.8 Enterprise Constraints

There are 7 persons which can create this project. If the deadlines will be exceeded, we are obliged to hire at least one more person. These people can work at most 12 work a day, but no longer than for 3 days in a row. Standard work time is 8 days a day, but some of us work in another projects as well.

1.4 Naming Conventions and Terminology

1.4.1 Glossary of All Terms, Including Acronyms, Used by Stakeholders involved in the Project

This glossary will be extended throughout the project.

term	definition
<i>project</i>	— doing all the things in order to obtain desired software
<i>council house</i>	— a group of buildings where are dwell residents
<i>resident</i>	— an end-user, which live in a building, which belongs to council house
<i>administration of council house</i>	— all the people which will be maintain ant provide up-to-date content of the database and contact with residents
<i>team leader</i>	— project manager, the person which take responsibility for contact with client
<i>primary features</i>	— all the features which has to be mandatory provided
<i>secondary features</i>	— all the features which can be optionally provided

1.5 Relevant Facts and Assumptions

1.5.1 Relevant Facts

1. **Accounting bills** is a functionality realized by housing cooperative owner. In fact, he may not receive all the bills, so there should be a possibility to make an agreement with e.g. power provider and use their API.
2. **Security of personal data** should be considered. Personal and business information of tenants are confidential every use of them in the system should be legal.

1.5.2 Business Rules

Company willingness of using this product is only a small part of way to success. Also the future users (tenants) should be satisfied.

1.5.3 Assumptions

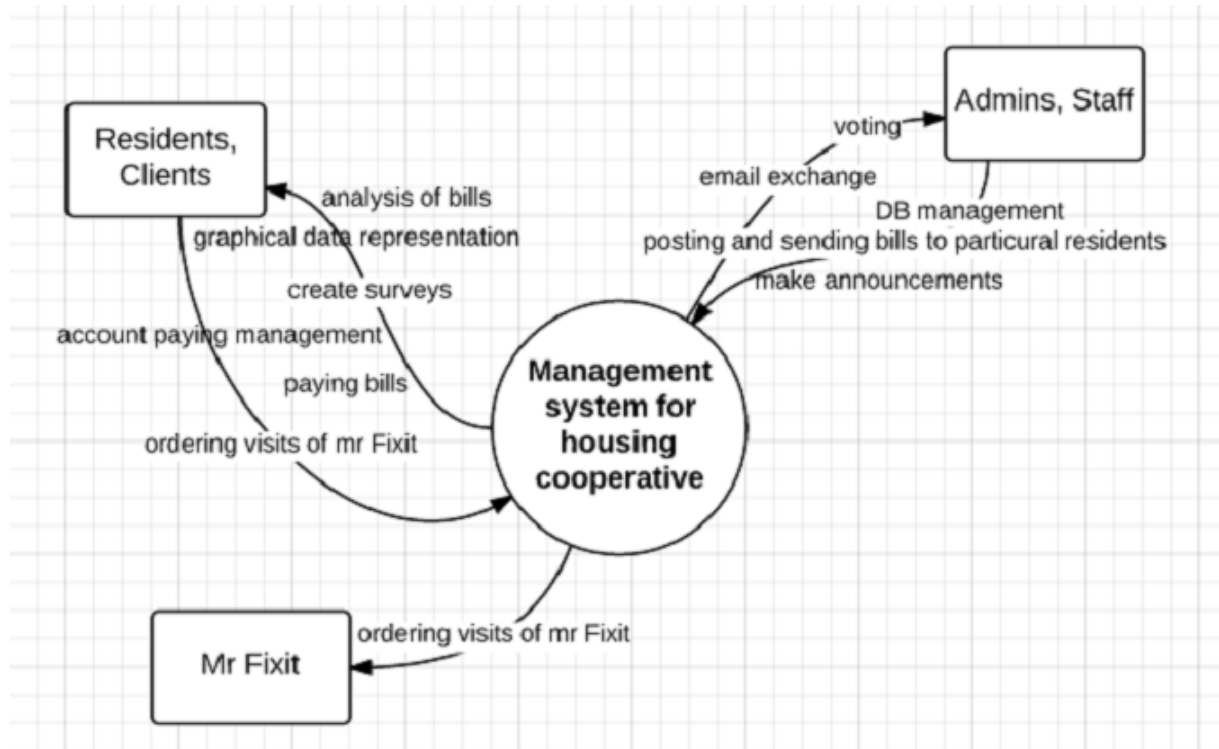
- Software for users should be system independent. Good way to achieve this is to realize client interface as a web service.
- The final product will be still developed after finalizing the transaction. It is very important to make this kind of software up-to-date.
- Any major changes will be consulted with current customers.
- Because the project scope is dependent on client will, the most of functionalities should be implemented as a plug-ins.

1.6 The Scope of the Work

1.6.1 The Current Situation

Existing business processes are mainly manual so there is a need to automate process of sending, analysing and managing of bills, improvement of system of making announcements regarding community is also demanded. Currently, there is few people attempting surveys and voting, making the process easier will make people more cooperative.

1.6.2 The Context of the Work



1.6.3 Work Partitioning

1:

- event: analysis of bills
- input: user data
- output: information about user's bills

2:

- event: account paying management
- input: payments
- output: information about user's bills

3:

- event: database management
- input: create/remove user/building

- output: updated database
- 4:
- event: posting and sending bills to particular residents
 - input: resident's data
 - output: bills
- 5:
- event: make announcements regarding community
 - input: announcement
- 6:
- event: create surveys
 - input: question, options
 - output: survey
- 7:
- event: paying bills
 - input: payment
 - output: updated account balance
- 8:
- event: graphical data presentation
 - input: user's account data
 - output: graph
- 9:
- event: converting graphs into .pdf format
 - input: graph
 - output: .pdf
- 10:
- event: ordering visits of Mr Fixit
 - input: information about fault
 - output: Mr Fixit's notification

1.7 Business Data Model and Data Dictionary

1.7.1 Business Data Model

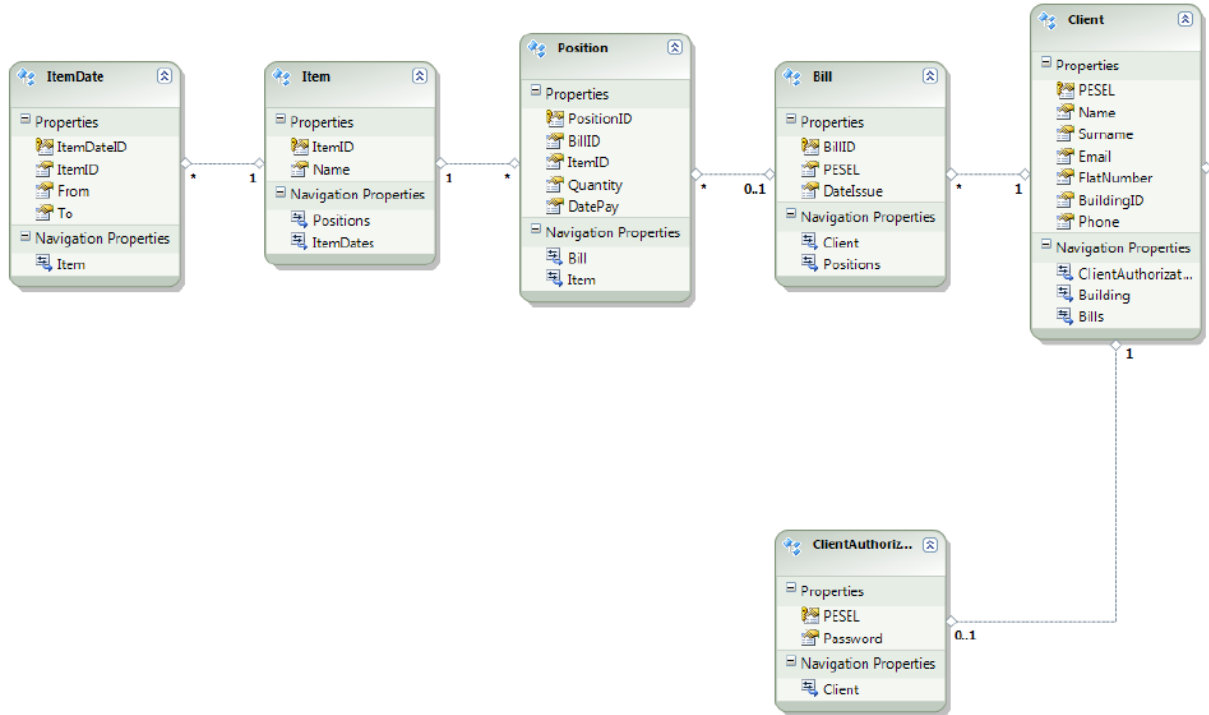


Figure 1.2: Database model

1.7.2 Data Dictionary

Data Name	Description	Definition	Data Type
Client	a resident which lives in a building	client name	Class
Building	a place where client lives	exact address of a building	Class
Bill	an amount of money which client has to pay, f.e. for gas or water	amount of money	Class
Position	a concrete bill with defined amount of money and the kind of bill	bill position + item ID	Class
Item	an item of a bill	item ID + name	Class
ItemDate	a date of a item	itemDateID + name	Class
ClientAuthorization	date need to authorize a client	PESEL + password	Class

1.8 The Scope of the Product

1.8.1 Product Boundary

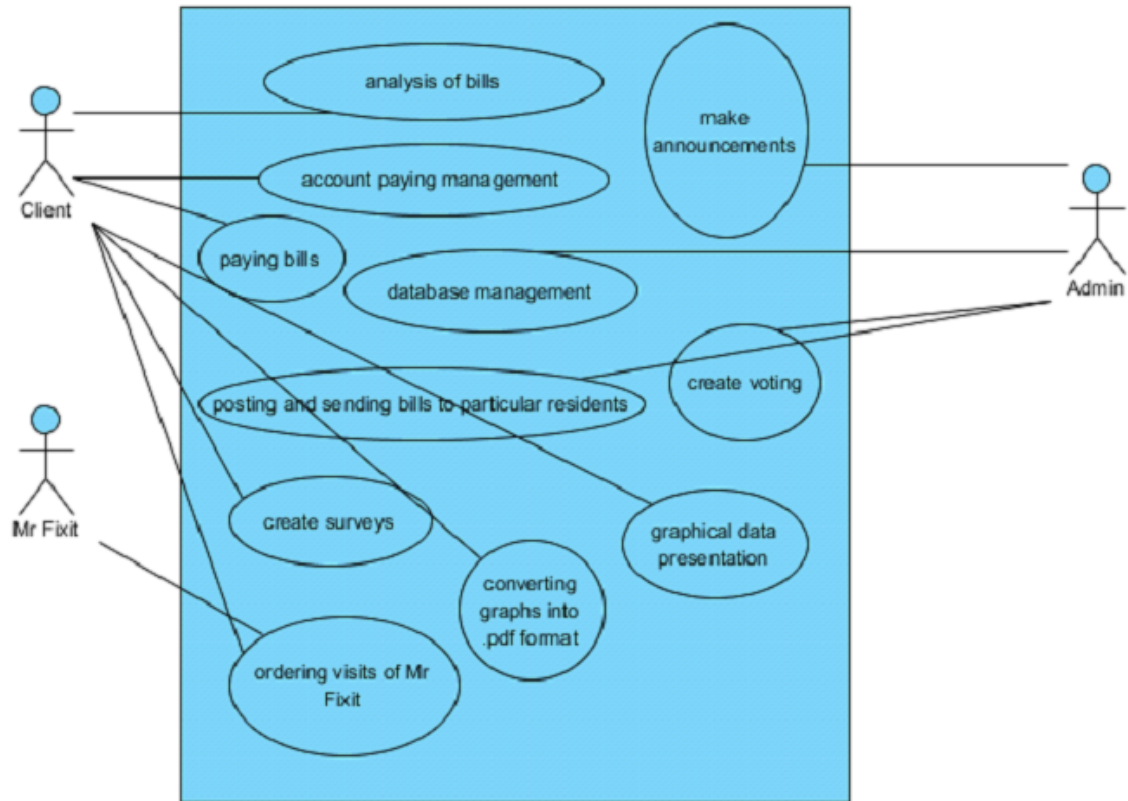


Figure 1.3: Use Case Table

1.8.2 Product Use Case Table

- PUC Name: analysis of bills, input: user data, output: information about user's bills, actor: client.
- PUC Name: account paying management, input: payments, output: information about user's bills, actor: client.
- PUC Name: database management, input: create/remove user/building, output: updated database, actor: administrator.
- PUC Name: posting and sending bills to particular residents, input: resident's data, output: bills, actor: administrator.
- PUC Name: make announcements regarding community, input: announcement, actor: administrator.
- PUC Name: create surveys, input: question, options, output: survey, actor: client.
- PUC Name: paying bills, input: payment, output: updated account balance, actor: client.
- PUC Name: graphical data presentation, input: user's account data, output: graph, actor: client.

- PUC Name: converting graphs into .pdf format, input: graph, output: .pdf, actor: client.
- PUC Name: ordering visits of Mr Fixit, input: information about fault, output: Mr Fixit's notification, actor: client, Mr Fixit.
- PUC Name: create voting regarding expenses of community, input: question, options, output: voting, actor: client, administrator.
- PUC Name: e-mails exchange between collectives administration and their residents, input: email addresses, output: possibility to communicate, actor: administrator, client.

1.8.3 Individual Product Use Cases (PUCs)

- PUC Name: analysis of bills
- Scenario: Client wants to check details about his bills. He can access to it.
- PUC Name: account paying management
- Scenario: Client needs to pay bills. He can do it. Client can access to history of payments.
- PUC Name: database management
- Scenario: New building has been built/removed. New resident has moved in/out. Administrator updates data in database.
- PUC Name: posting and sending bills to particular residents
- Scenario: There is a need to send bills to particular residents. Administrator does it.
- PUC Name: make announcements regarding community
- Scenario: There is a need to notify residents about something. Administrator makes announcement and residents can read it.
- PUC Name: create surveys
- Scenario: There is a need to decide about something. Decision depends on resident's opinion. Survey is created, residents can vote.
- PUC Name: paying bills
- Scenario: Client needs to pay bills. He can do it.
- PUC Name: graphical data presentation
- Scenario: Client wants to see data in graphical representation. Graph is displayed.
- PUC Name: converting graphs into .pdf format
- Scenario: Some clients prefers format pdf. Graph is converted.
- PUC Name: ordering visits of Mr Fixit
- Scenario: There is a fault in the building. Client orders visit of Mr Fixit. Mr Fixit get a message and come to repair fault.
- PUC Name: create voting regarding expenses of community
- Scenario: There is a need to decide about something. Decision depends on resident's opinion. Survey is created, residents can vote.
- PUC Name: e-mails exchange between collectives administration and their residents.
- Scenario: Residents can't communicate with administration during office hours. They can email them via application. Administration can't meet a resident in reference to something. So they can email resident.

Chapter 2

Functional Requirements

2.1 Mandatory requirements

Mandatory requirement 1	
Description	The system for administrator shall provide ability of adding and deleting users.
Rationale	To be able to add and delete residents of new estate by name (if resident of given apartment will change, the old might be deleted and new resident added). It will allow administrator to keep information about bills private (old residents wont have access to bills).
Originator	Magdalena Ronge - Software Engineer
Fit Criterion	Signed users shall always match the real appartment residents. Separate accounts allows users identification.
Customer Satisfaction	6/10
Customer Dissatisfaction	9/10
Dependencies	A requirement providing adding and deleting buildings.

Mandatory requirement 2	
Description	The system for administrator shall provide ability to adding and deleting buildings
Rationale	To be able to add and delete buildings and apartments by unique address. It will allow administrator expand activity in case of new estates.
Originator	Pawel Glowacki - Software Enineer
Fit Criterion	Signed buildings allows for apartments identification.
Customer Satisfaction	6/10
Customer Dissatisfaction	8/10
Dependencies	A requirement providing adding and deleting users (which will be assigned to buildings and apartments).

Mandatory requirement 3	
Description	The system for administrator shall provide ability of assigning users to buildings.
Rationale	For house cooperative to have all information about all residents in buildings and apartments. Help to manage whole estate.
Originator	Pawel Glowacki - Software Engineer
Fit Criterion	Specific apartment shall match the user (by user ID, name and surname).
Customer Satisfaction	6/10
Customer Dissatisfaction	8/10
Dependencies	A requirement providing adding and deleting users (mandatory requirement 1) and a requirement providing adding and deleting building (mandatory requirement 2).

Mandatory requirement 4	
Description	The system for administrator shall provide list of buildings.
Rationale	List view is clearer and makes searching process less time.
Originator	Pawel Glowacki - Software Engineer
Fit Criterion	Administrator shall be able to find building or group of buildings in relatively shorter time.
Customer Satisfaction	5/10
Customer Dissatisfaction	7/10
Dependencies	A requirement providing adding and deleting buildings (mandatory requirement 2).

Mandatory requirement 5	
Description	The system for administrator shall provide list of users.
Rationale	List view is clearer and makes searching process less time.
Originator	Pawel Glowacki - Software Engineer
Fit Criterion	Administrator shall be able to find user or group of users in relatively shorter time.
Customer Satisfaction	5/10
Customer Dissatisfaction	7/10
Dependencies	A requirement providing adding and deleting users (mandatory requirement 1).

Mandatory requirement 6	
Description	The system for administrator shall ensure ability of sending and receiving messages to and from particular users.
Rationale	Facilitation of communication between home cooperative and residents.
Originator	Jaroslav Szumega - Senior Engineer
Fit Criterion	All residents shall be able to send and receive message to home cooperative at any time. Home cooperative should be able to send message to any user (not sorted by particular building).
Customer Satisfaction	9/10
Customer Dissatisfaction	9/10
Dependencies	A requirement providing list of users for administrator (mandatory requirement 5) and a requirement providing list of buildings for administrator (mandatory requirement 4).

Mandatory requirement 7	
Description	The system for administrator shall ensure ability of broadcasting messages to users assigned to selected building or whole housing cooperative.
Rationale	Speed-up of communication process for administrator.
Originator	Jaroslav Szumega - Senior Engineer
Fit Criterion	Home cooperative should be able to send message to one user or group of users (all of them already assigned sorted to particular buildings).
Customer Satisfaction	9/10
Customer Dissatisfaction	9/10
Dependencies	A requirement providing ability of assigning users to buildings (mandatory requirement 3).

Mandatory requirement 8	
Description	The system for user shall ensure ability of sending and receiving messages to and from administrator.
Rationale	User can write about his concerns and ask questions about his bills, he also will receive all information from house cooperative faster than by traditional mail.
Originator	Jaroslav Szumega - Senior Engineer
Fit Criterion	User will have inbox for all mail from house cooperative where user can receive mail at any time. User will also have possibility to send an email by pressing button New message.
Customer Satisfaction	8/10
Customer Dissatisfaction	7/10
Dependencies	A requirement providing list of users for administrator (mandatory requirement 5) and a requirement providing list of buildings for administrator (mandatory requirement 4).

Mandatory requirement 8	
Description	The system for administrator shall provide ability to issuing bills for particular user.
Rationale	Accounting particular user bills for media (water, electricity and waste service).
Originator	Krystian Sulinski - Senior Engineer
Fit Criterion	The administrator will be able to charge a fee (by adding all fees for used media) for particular user assigned to a building.
Customer Satisfaction	6/10
Customer Dissatisfaction	9/10
Dependencies	A requirement providing adding and deleting users (mandatory requirement 1).

Mandatory requirement 10	
Description	The system for user shall provide tabulated preview of all bills by chosen period of time.
Rationale	User needs easy access to all bills and need to has insight into particular months to check how much media was used.
Originator	Michal Kowalski - Software Engineer
Fit Criterion	User will be able to choose particular month from list in website. After choosing month user will see exact amount and price for used media.
Customer Satisfaction	9/10
Customer Dissatisfaction	5/10

2.2 Desirable requirements

Desirable requirement 1	
Description	The system for administrator should provide ability to sort buildings on list by address of building and apartment.
Rationale	Searching process by address to save time.
Originator	Pawel Glowacki - Software Engineer
Fit Criterion	Administrator shall be able to find building or group of buildings in relatively shorter time. Administrator has ability to search building by its address, which will be faster than searching one by one.
Customer Satisfaction	4/10
Customer Dissatisfaction	6/10
Dependencies	A requirement providing adding and deleting buildings (mandatory requirement 2) and a requirement providing list view of buildings (mandatory requirement 4).

Desirable requirement 2	
Description	The system for administrator should provide ability to sort users on list by name or name of building they are allocated.
Rationale	Searching process by surname, name or ID to save time.
Originator	Pawel Glowacki - Software Engineer
Fit Criterion	Administrator shall be able to find user or group of users in relatively shorter time. Administrator has ability to search users by its surname or ID, which will be faster than searching one by one.
Customer Satisfaction	4/10
Customer Dissatisfaction	5/10
Dependencies	A requirement providing adding and deleting users (mandatory requirement 1) and a requirement providing list view of users (mandatory requirement 5).

Desirable requirement 3	
Description	The system for administrator should provide ability to set tariffs for media usage.
Rationale	Home cooperative decides about prices of all media so it needs have possibility to set and change already existing prices.
Originator	Jaroslav Szumega - Senior Engineer
Fit Criterion	Administrator will be able to change tariffs for all media (water, electricity and waste service). Administrator can choose between day and night tariffs and write down new price.
Customer Satisfaction	6/10
Customer Dissatisfaction	2/10

Desirable requirement 4	
Description	The system for administrator should provide table preview with all available tariffs.
Rationale	To make view more clear there is need to introduce tariffs in table.
Originator	Jaroslav Szumega - Senior Engineer
Fit Criterion	After choosing Tariffs option, administrator might choose option Change prices of day/night tariffs where new prices can be writing down.
Customer Satisfaction	6/10
Customer Dissatisfaction	2/10
Dependencies	A requirement providing ability to set tariffs for media usage (desirable requirement 3).

Desirable requirement 5	
Description	The system for user should ensure ability to export and download list of bills by chosen period of time.
Rationale	For saving bills on computer hard drive.
Originator	Michal Kowalski - Software Engineer
Fit Criterion	User shall have possibility to save his bill in *.pdf form.
Customer Satisfaction	6/10
Customer Dissatisfaction	1/10
Dependencies	A requirement providing tabulated preview of all bills by chosen period of time.

Desirable requirement 6	
Description	The system for user should provide table preview with all available tariffs.
Rationale	User needs possibility to check all prices in table view.
Originator	Ilona Brzozowska - Software Engineer
Fit Criterion	After choosing Tariffs option, user will see table with all already existing tariffs and prices to particular media such as: price for water, price for electricity, price for waste services.
Customer Satisfaction	5/10
Customer Dissatisfaction	2/10
Dependencies	A requirement providing ability to set tariffs for media usage (desirable requirement 3).

Desirable requirement 6	
Description	The system for user should provide ability to change password.
Rationale	Users might feel safer when can changing the password.
Originator	Ilona Brzozowska - Software Engineer
Fit Criterion	User has option Change password which will need pass old password and writing twice new password. Each time user changes the password he will receive an email with confirmation.
Customer Satisfaction	5/10
Customer Dissatisfaction	2/10
Dependencies	A requirement providing ability to set tariffs for media usage (desirable requirement 3).

Chapter 3

Non-functional Requirements

3.1 Look and Feel Requirements

	Mandatory requirement
Description	Both systems should be in neutral, pastel colours. Base colour chosen is mint-green.
Rationale	System have to have nice to eye appearance. The system should look professionally but due to users with different computer skills, it should create the impression of an easy-to-use. Pay special attention to the uniqueness of names available system functions. After the first use of the product customer should not be afraid to use it again.
Originator	Magdalena Ronge - Software engineer and Ilona Brzozowska - Software engineer/ Team Leader
Fit Criterion	<p>To verify whether the appearance of the service meets all the requirements, among which were presented graphic templates, the survey will be carried out. The survey will include questions about the individual elements of the system that will be evaluated in a 3-point scale:</p> <ul style="list-style-type: none">• 1-very good• 2-medium• 3-bad <p>Because that is one of the most important non-functional requirement of the system, it will be deemed to be satisfied if, for each of the questions at least 95% of the respondents will reply 1 - "very good".</p>
Customer Satisfaction	9/10
Customer Dissatisfaction	9/10

3.2 Usability and Humanity Requirements

3.2.1 Ease of Use Requirements

	Mandatory requirement
Description	System shall have user friendly interface.
Rationale	Interface should be as easy as possible.
Originator	Ilona Brzozowska - Software engineer, Team Leader
Fit Criterion	<p>To check whether the system meets the expectations, there will be require of two separate treaning courses in two groups.</p> <ul style="list-style-type: none">• One of the group will be staff in the house coopera-tive staff. Due to the fact that the staff provided a detailed training, the requirement will be deemed to be satisfied if 80% of people get a positive result.• The second group will be potential customers. In their case, that requirement will be considered as sat-isfied, a positive test result must obtain above 95% of all people.
Customer Satisfaction	10/10
Customer Dissatisfaction	9/10

3.2.2 Learning Requirements

	Mandatory requirement
Description	System shall be easy to work with.
Rationale	The system ready to use for a wide range of clients.
Originator	Ilona Brzozowska - Software engineer, Team Leader
Fit Criterion	<p>To check whether the system meets the expectations, there will be require of two separate treaning courses in two groups.</p> <ul style="list-style-type: none">• One of the group will be staff in the house coopera-tive. Due to the fact that the staff provided a detailed training, the requirement will be deemed to be sat-isfied if 80% of people get a positive result.• The second group will be potential customers. In their case, that requirement to be considered as sat-isfied, a positive test result must obtain above 95% of all people.
Customer Satisfaction	9/10
Customer Dissatisfaction	7/10

3.3 Performance Requirements

3.3.1 Speed and Latency Requirements

	Mandatory requirement
Description	System for administrator should work smooth.
Originator	Michal Kowalski - Software engineer
Fit Criterion	The time between sending a command from the application layer and receiving a response at the application level should not exceed 3 seconds. This aspect will be comprehensively tested during alpha testing performed by the testing department.
Customer Satisfaction	4/10
Customer Dissatisfaction	8/10

3.3.2 Safety-Critical Requirements

	Mandatory requirement
Description	System shall ensure the safety of the data.
Rationale	In order to ensure safety of data system need to be consultate with the legal department. In addition, the opinion from safety specialist will be taken. In order to use most of the functionality of the system all user will need to sign in to created accounts.
Originator	Ilona Brzozowska - Software engineer
Fit Criterion	The system will be considered safe after a positive evaluation of the legal department.
Customer Satisfaction	4/10
Customer Dissatisfaction	8/10

3.3.3 Reliability and Availability Requirements

	Mandatory requirement
Description	System shall work flawlessly.
Rationale	System should be available 24 hours a day, 365 days a year. During use by the customer, system will be constantly monitored. In case of defects, errors will be immediately corrected.
Originator	Jaroslav Szumega - Senior engineer
Fit Criterion	Beta testing will be taken, which will be recognized as satisfactory after two-week, continued, not disturbed work of the system.
Customer Satisfaction	6/10
Customer Dissatisfaction	9/10

3.4 Operational and Environmental Requirements

3.4.1 Expected Physical Environment

	Mandatory requirement
Description	System shall work in many platforms.
Rationale	System should work on: PC, laptop, tablet or smartphone. The company will seek to maximize the compatibility of the system with different operational systems - to always be available in all or almost all of the features offered by the system. Functionality available through a web browser already guarantees compatibility with any operating system.
Fit Criterion	Opinion on the compatibility of the system will be given by testing department.
Customer Satisfaction	6/10
Customer Dissatisfaction	9/10

3.5 Maintainability and Support Requirements

3.5.1 Supportability Requirements

	Mandatory requirement
Description	Instruction shall be available in Help window for administrator system and in website for users.
Fit Criterion	To check whether the instructions are quite sufficient, a group of people: both users (residents) and administrator (house cooperative) will be asked to install or open the product on the selected device. After installation, it will determine whether the process was: <ul style="list-style-type: none">• 1 - easy• 2 - average• 3 - difficult Requirement will be deemed to be satisfied after receiving 85% of the answers "easy".
Customer Satisfaction	3/10
Customer Dissatisfaction	5/10

3.6 Security Requirements

3.6.1 Access Requirements

	Mandatory requirement
Description	System shall give access only to users who have accounts.
Rationale	Users (residents) wont be have access to any data about other users. Administrator will be having access to all data (all users) such as bills history, water or electricity usage.
Fit Criterion	In order to ensure the security of data held consultations with a specialist in this field will be required. System shall guarantee a positive opinion about data security signed by a lawyer.
Originator	Pawel Glowacki - Software Enineer
Customer Satisfaction	7/10
Customer Dissatisfaction	10/10

3.6.2 Integrity Requirements

	Mandatory requirement
Description	The system should be secured before entering incorrect data.
Fit Criterion	In order to validate the data which will be provided during registration there needs to be proof of identification verification (before creating an account). To protect stored data, copies of all the files in the system will be stored on a server located in a different place than the house cooperative. The files will be sent to the server every day at 3.00 a.m
Originator	Pawel Glowacki - Software Enineer
Customer Satisfaction	5/10
Customer Dissatisfaction	9/10

Chapter 4

Project plan

4.1 Gantt chart

Gantt chart below presenting all required application features. It includes also all dates of planned work. Below chart there is description of all fundamental tasks.

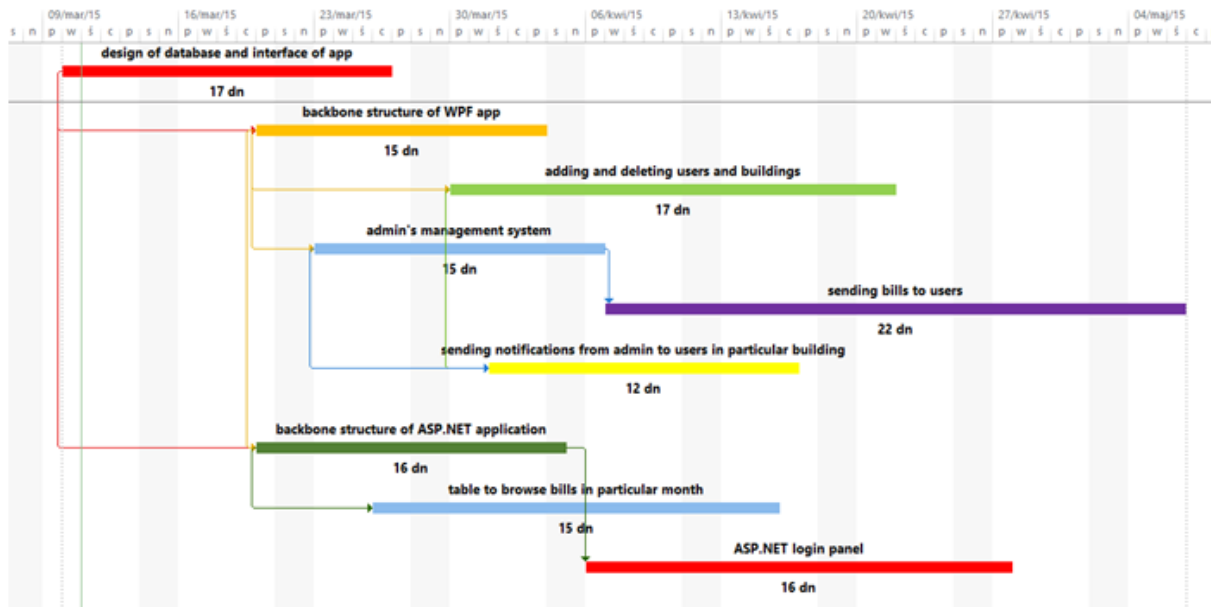


Figure 4.1: Plan of work with exact dates in form of Gantt chart

- **Design of database and interface of an application**

Firstly there is a need to create design of database as a ERD diagram to implement it afterwards. In the same time interface of an application should be considered to be user-friendly, professional, easy and efficient. Interface of an application for users is especially important. For administrators it doesn't have to be that much spectacular.

- **Backbone structure of WPF application**

Then, a graphical subsystem for rendering user-interfaces in applications using Microsoft Windows called Windows Presentation Foundation is chosen and backbone structure of application is created.

- **Adding and deleting users and buildings**

These are very important features that should be applied, because the application is about users, buildings and bills.

- **Admin's management system**

It includes all bills that should be sent to users. There are some quotients inputed by admin such as cost per $1m^2$ of water etc., amount of (for example) water used by particular residents, button to generate total amount of money and sending a bill via email or/and to user's application.

- **Sending bills to users**

Sending bills to users by email, storing it in database, access by user to data via application.

- **Sending notifications from admin to users in particular building**

Sometimes there is a need to send notification. For example resident have to be present at home in particular time because of water meter replacement and sending notification is more efficient than sticking announcement on a paper somewhere on the wall in the buildings.

- **Backbone structure of application ASP.NET**

Than server - side Web application framework designed for Web development to produce dynamic Web pages called ASP .NET is chosen and backbone structure of application is created.

- **Table to browse bills in particular month**

There is a feature that help users to measure, manage and estimate the usage of for example water.

- **Logging to application ASP.NET**

This is a feature that includes users names and hashes of the passwords in database and system of logging to application. It allows to users identification, authentication and authorisation with the high level of security and personal data protection.

Task name	Time	Start date	End date
design of database and interface of app	17 days	tue, 10/03/15	thu, 26/03/15
backbone structure of WPF app	15 days	fri, 20/03/15	fri, 03/04/2015
adding and deleting users and buildings	17 days	mon, 30/03/15	tue, 21/04/15
admin's management system	15 days	mon, 23/03/15	mon, 06/04/15
sending bills to users	22 days	tue, 07/04/15	wen, 06/05/15
sending notifications from admin to users in particular building	12 days	wen, 01/04/15	thu, 16/04/15
backbone structure of ASP.NET application	16 days	fri, 20/03/15	sat, 04/04/15
table to browse bills in particular month	15 days	thu, 26/03/15	wen, 15/04/15
ASP.NET login panel	16 days	mon, 06/04/15	mon, 27/04/15

Table 4.1: Plan of work with exact dates in form of table

Chapter 5

Project estimation

Estimation process is important, but also difficult. In estimation of this product change of requirements and young age of team members will take great matter. Team members are inexperienced and for all of them this project is first on a big scale. Another issue of estimation for house cooperative software is fact that it's immaterial goods. WBS created below should help with estimation process - small tasks are much easier to estimate than whole software creation procedure.

5.1 Work breakdown structure

As Gantt chart give a look for exact division of all implementation tasks. Presented below WBS (work breakdown structure) presents all tasks which have to be considered during all project procedures (from planning until maintaining).

















	Task Mode	Task Name	WBS	Duration	Start	Finish	Predecessors
		1 consulting	WGT11	9,5 days	Tue 15-03-10	Thu 15-03-26	
		1.1 design database	WGT11-AAA	4,25 days	Sat 15-03-14	Tue 15-03-24	
		1.2 design interface app	WGT11-BBB	5 days	Mon 15-03-16	Wed 15-03-25	
		2 planning	WGT22	11,38 days	Mon 15-03-30	Mon 15-04-20	1
		2.1 creating backbone structure for desktop application	WGT22-AAA	6,88 days	Wed 15-04-01	Fri 15-04-10	
		2.2 creating backbone structure for web application	WGT22-BBB	7 days	Fri 15-04-03	Fri 15-04-17	
		3 implementation bases	WGT33	20 days	Fri 15-05-01	Fri 15-06-19	2
		3.1 implementation primary features	WGT33-AAA	15 days	Fri 15-05-01	Sat 15-06-06	
		3.2 implementation secondary features	WGT33-BBB	12 days	Sat 15-05-23	Fri 15-06-19	
		4 testing	WGT44	6 days	Fri 15-06-19	Wed 15-07-01	3
		4.1 bug fixing	WGT44-AAA	5 days	Mon 15-06-15	Wed 15-06-24	
		4.2 integration tests	WGT44-BBB	8 days	Fri 15-06-19	Wed 15-07-01	
		5 delivering	WGT55	14 days	Wed 15-07-01	Mon 15-08-03	4
		5.1 getting feedback	WGT55-AAA	5 days	Wed 15-07-01	Fri 15-07-10	
		5.2 corrections	WGT55-BBB	10 days	Fri 15-07-10	Sat 15-08-01	

Figure 5.1: Work Breakdown Structure in the table form and detailed plan of tasks realization

- **Consulting** contact with client to exchange information about technic aspects regarding costs and databases speed and how interface should like.

- **Planning** plan of the effort and time estimation. Moreover, creating backbone structures for desktop and web application.
- **Implementation bases** focusing on very primary requirements to enable implementation of secondary features.
- **Testing** however this project is based on Test Driven Development, at the end of the implementation process should be making some bug fixing and integration tests.
- **Delivering** spending some time to give the software to the clients, getting feedback and making improvement. These tasks can be done parallely.

5.2 Function Points estimation

It is not a big application so counting unadjusted function-point will be in small range. That's means that total weight in many factors will be having small parcel weights (in interval 1-3). Starting from functionality of software - It has to be considered - what exactly software has to be able to do. This functions are grouped in five categories (below table 5.1).

Category	Multiplier	Weight
External Inputs	3	2
External Outputs	1	1
External Inquiries	3	1
Internal Logical Files	2	2
External Interface Files	2	2

Table 5.1: Function Points categories with complexity and weight of tasks

1. Transactional Functions:

- *External Inputs* - It stands for data collected as listed usage of gas, electricity, water and media bills in a database.
- *External Outputs* - It is function of exportation data from application into pdf form.
- *External Inquiries* - The system is requested for one thing, comined bill of usage electricity, whater etc.

2. Data Functions:

- *Internal Logical Files* - It is data collected from users (residents of house cooperative buildings) stored as tables with listed usage of gas, electricity, water and media bills in a database.
- *External Interface Files* - Group of logically related data, in this project is content of database owned by house-cooperative web application. Residents data have to available for both sides (users and administrator).

To check how many functional points have created software, there is a need to multiply all transactional and data functions complexity (in *Multiplier* column) by its weight for get FP of final product.

$$FP = (3 * 2) + (1 * 1)(3 * 1) + (2 * 2) + (2 * 2) = 18$$

After getting amount of functional points it is necessary to check how many hours in *C#* language is taken for each FP. Some sources prove that one function point is an equivalent of eight hours of work in *C#*. There is a need of final multiplication to get needed amount of time.

$$18 * 8 = 144[\text{hours}]$$

5.3 Detailed plan of realization and ProjectCodeMeter analysis

Coding procedure will take approximately 45 days. The total work that should be done require about 61 working days:

1. **Consulting** takes 9.5 days
 - contact with clients
 - calculating time and effort
2. **Planning** takes 11.38 days
 - creating backbone structures
 - taking into account many implication and hard to predict tasks
3. **Implementation** takes 20 days
 - implementing e. g. admins management system, adding and deleting users and buildings, analysis of paying bills, account and database management
4. **Testing** takes 6 days
 - integration tests and bug fixing using Sonar environmental
5. **Delivering** takes 14 days
 - contact with client to get finish version of the software and getting feedback was went wrong

Any of tasks can start if and only if the last is ended. (For example planning can be started if consulting is done). It looks like waterfall, but providing Test Driven Development as well. This is an assurance, that there will be no reason to move back to the previous ones.

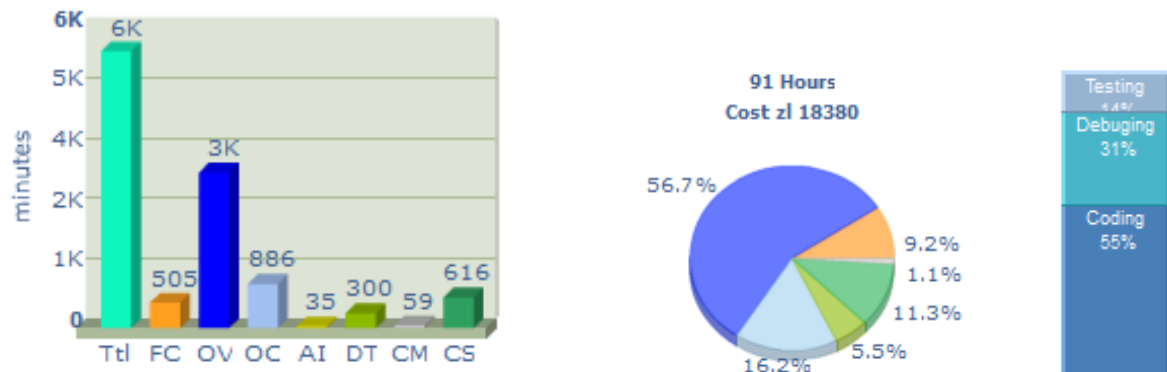


Figure 5.2: Cost and time estimation analyzed by ProjectCodeMeter

Chapter 6

Risk Analysis

6.1 Risk Identification

Root Cause	Condition	Consequence	Downstream Effect
Bad project planning	Project cannot be completed in time with given resources	Necessity to employ another person	Cost increase
Worker skills level/ Bad project planning	Employee can't complete task in given time	Other tasks may not be able to start before completing that one	Delay in project performance
Random situation	Employee is unavailable for some period of time	Company will have to work with reduced personnel	Delay in project performance
Worker skills level	Employee cant fully complete given task	Some part of functionality will not be implemented	Reduced project quality and customer satisfaction
Worker skill level	Problems with implementation important parts of the system	Bugs occurrence in the system	Customer dissatisfaction Additional costs of fixing
Random situation/ Worker skills level	Hardware or software is damaged (inappropriate usage, random situation)	Necessity to buy or repair equipment	Cost increase
Technical problem	Problem with system integration	Necessity implement changes to project	delay in project performance
Worker skill level	Information are not properly secured	Leak of information	legal responsibility
Potential user interoperability	Future user dont want to dedicate time for consulting requirements	Problem with creating appropriate gui	Reduced user satisfaction
Media supply companies interoperability	Media companies dont want to make available some of the user information	Not all bills are collected in developed system	customer dissatisfaction

Table 6.1: Risk list

Source of risk can come from scope, schedule, stakeholder expectations, internal dependencies, security, integration, interoperability, implementation challenges, but they can be considered more generally as a source connected with people, process, technology or environment. Due to the fact that our company starts up in IT business, most of the events that may occur with negative impact on the projects ability to achieve performance and goals, may come from the inexperienced team members in many domains. The other important fact is that our company has short period of time, it is 4 months, to complete the project. Every change to the schedule may results in crossing the deadline.

6.2 Risk Management Plan

The Project Manager has overall responsibility for managing project risk. To make team member aware of risk through all phases of the project are organised special scheduled project meetings related to that topic. Project team members are responsible on that meeting for reporting to the project manager about potential occurrence of risk situations. If any risk factors or event will occur during the project which needs immediate attention, it should be reported via email to the project manager. The project manager is responsible for determining whether any of the identified risk factors or events requires further increased attention. New risk will be included in the risk register. Each notification in the risk register includes following elements: description of the risk event; probability that event will occur; cost, quality or schedule impact. Depending on the probability of risk occurrence and overall impact to the project are considered two possible reactions: attempt to mitigate the chance of occurrence and contingency actions after appearance of the risk factor.

Risk assessment consists of two factors: probability of occurrence and estimation of the impact on project. Both are described by numerical values from 1 to 5, which are corresponded to the factors in the following way:

Probability of Occurrence	
Definition	Value
Frequent	5
Likely	4
Occasional	3
Seldom	2
Improbable	1

Table 6.2: Probability of Occurrence

Estimation of the impact	
Definition	Value
Catastrophic	5
Critical	4
Moderate	3
Minor	2
Negligible	1

Table 6.3: Estimation of the impact

By adding those two numbers it is possible to compare importance of particular risks and focus on avoiding occurrence of the more important ones. The other ones with lower values are more acceptable and in that case will be taken steps to minimize impact after occurrence. Risk with value 8 or more are considered as risks with highly importance, with value between 5 and 7 as risks with middle importance and with value lower or equal to 4 as a risk with low importance.

Risk	Overall Impact	Mitigation	Contingency	CSP Impact
Employee is unavailable for some period of time	Minor + Seldom = 4	In case of planned and known earlier event, extension of worker time to overcompensate later delays in schedule	After consideration of importance of particular task being up-to-date with schedule, employ temporarily another employee or accept delay	Delay in project performance, Additional Cost
Employee can't fully complete given task	Moderate + Seldom = 5	Appropriate preparation and explanation of given task by project manager, spend some time on research	Consult problem between co-workers	Delay in project
Employee can't complete task in given time	Moderate + Occasional = 6	Appropriate estimation of working hours needed to complete the task	Assign other available worker to that task, employ another worker, if task not influent other tasks accept delay	Additional cost
Media companies dont want to make available some of the user information	Moderate + Seldom = 5	Earlier consultations about terms on which media supply companies want to cooperate	Try to renegotiate agreement on different terms	Reduced project performance
Future users dont want to dedicate time for consulting requirements	Moderate + Likely = 7	Find earlier a group of users that will dedicate time to consult requirements	Follow project with overall customer requirements	Reduced user satisfaction
Information are not properly secured	Catastrophic + Occasional = 8	Consult project with security specialist	Try to repair damages and consult with security specialist for further protection	Additional cost delay in schedule
Hardware or software is damaged (inappropriate usage, random situation)	Moderate + Seldom = 5	Instruct workers how to appropriate use an equipment, prepare documentation about configuration of environment to work with required software	Buy or repair equipment	Additional cost delay in project