Trondheim Electric Bicycle Rental System Vision Document

Version <2.0>

Revision History

Date	Version	Description	Authors
28022018	0.1	Created document	Elisabeth Marie Opsahl, Anette Olli Siiri, Patrick Thorkildsen, Eivind Rui Timdal, Quan Nguyen Tran
06032018	1.0	First draft	Elisabeth Marie Opsahl, Anette Olli Siiri, Patrick Thorkildsen, Eivind Rui Timdal, Quan Nguyen Tran
14032018	1.1	Added Gantt	Elisabeth Marie Opsahl, Anette Olli Siiri, Patrick Thorkildsen, Eivind Rui Timdal, Quan Nguyen Tran
23042018	2.0	Final draft	Elisabeth Marie Opsahl, Anette Olli Siiri, Patrick Thorkildsen, Eivind Rui Timdal, Quan Nguyen Tran

Innhold

1.   Introduction

1.1   Purpose

The purpose of this vision document is for the group to define a clear, united vision of the system. This will make sure all the team members have the same vision in mind when developing the system. Writing this document will make the process more effective, and the end product more successful. The document can also be looked at later in the process to confirm that the system matches the vision. The vision document is also a great way to give the stakeholders insight of the groups vision for the system.

1.2   Overview

This document describes the main features and key stakeholders, the risk associated with the project.

2.   Positioning

2.1   Business Opportunity

Trondheim Bicycle Rental System is not primarily a profitable project. The purpose of the system is not to make money, but to give the citizens a better living environment by reducing air pollution, as well as an alternative means of transportation after all commercial cars were banned in Trondheim city centre.

The Bicycle Rental System will pay for its own expenses by requiring a rental fee. When a customer rents a bicycle they need to buy a prepaid card. When this card is bought they register as a member and a deposit has to be paid. You can buy access to use the bicycles for a period at a time, this period can be a week, a month or 180 days. If the customer damages the bicycle as the result of a user error, their deposit will be used to pay for the repair expenses. If the bicycle is overdue for return or not returned at all, a compensation claim is recharged. This will also be included in the Terms of Service.

2.2 Problem Statement

The problem of	air pollution in downtown Trondheim
affects	everyone in Trondheim,
the impact of which is	reduced living conditions in the form of low air quality,
a successful solution would be	a electrical bicycle rental system to replace cars and ban commercial cars from driving in the city center.

2.3 Product Position Statement

For	people in Trondheim city center.
Who	need an alternative mean of transportation.
The electric bicycle rental system	is a tool for renting electric bicycles
That	makes cycling an alternative type of transportation (along with taking the bus) for people who do not own a bike. The system also makes renting a bicycle a lot quicker, cheaper and easier to do
Unlike	traditional bikes, rental shops.
Our product	is always available, cheap, accessible, and easy to use. It can also show different statistics that can be useful for the Trondheim city counsel.

3.   Project goals

3.1   Project plan

Activity	Start date	Duration	End date
Collaboration Agreement	12.jan	7	18.jan
Domain model	15.feb	1	15.feb
Vision Document	28.feb	9	08.mar
Wireframe	07.mar	8	14.mar
ER model	12.mar	3	14.mar
Use-case	12.mar	3	14.mar
Sequence Diagram	12.mar	5	16.mar
Database implementation	15.mar	5	23.mar
Database connection	19.mar	4	23.mar
Admin and GUI implementation	20.mar	33	22.apr
GPS simulation	20.mar	33	22.apr
Project hand-in(M)	23.apr	1	23.apr
Presentation(M)	25.apr	1	25.apr
Wiki	28.feb	54	22.apr
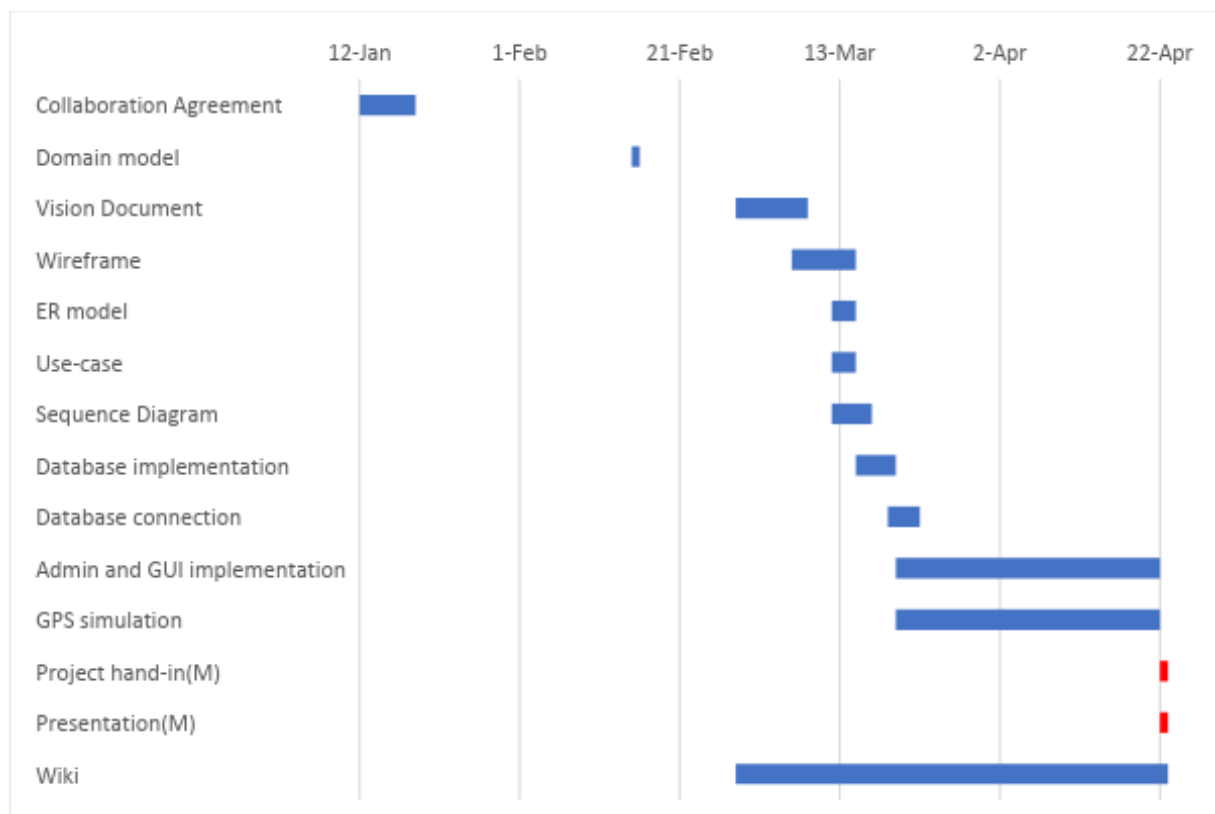
3.2   Efficiency goals

Increased number of people who are physically active every day in Trondheim.

Better health among the people who live and work in Trondheim.

Make it more attractive to work in Trondheim.

3.3   Result goals

Develop a computer system as an aid for renting bikes in Trondheim. The system will be completed within 23rd of april 2018.

Each member of the group is supposed to spend 150 working hours, give or take 10%, with a salary of 1300 NOK an hour.

3.4   Process goals

Get the desired grade on the project.

Improved skills in several areas (programming, databases).

Gain first-hand experience in working with databases in java in a realistic scenario.

Become more familiar with working with a team (improved collaboration and communication skills).

4.   Stakeholder and User Descriptions

4.1   Market Demographics

The demographic is for everyone in or around downtown Trondheim who needs a bicycle as a mean for transportation, whether it be to carry heavier loads or to get to their location faster. By having a docking station at a parking lot just outside of the no-car zone, people can drive to the parking lot and rent a bicycle for the rest of the commute. People living in downtown Trondheim can use it to get around in town easier. The general demographic is anyone that has any business in downtown Trondheim.

4.2   Stakeholder Summary

Name	Description	Responsibilities
Trondheim municipality	Customer	ensures that the Trondheim electric bicycles are available to the public. Approves funding Assesses documentation External quality assurance and quality control.
Team 2	Software architect	Develop and maintain the software needed to run the rental system
Firm not assigned yet	Hardware producer	Manufacturing the machines controlling the docking stations

4.3 User Summary

Name	Description	Responsibilities	Stakeholder
Bicycle technician	Maintain bicycle repairs, and register new bikes, and find non returned bikes.	Register new bikes to the system. Collect reports of damaged bikes and flag them for repairs. Add repair reports on specific bikes.	Self
System admin	Manage docking stations, and collect bicycle statistics	Collect various statistics from the system: bicycle statistics docking station statistics including power consumption	Self
Bicyclist rental customer	Rent and hand in rented bicycles at one of the docking stations in town (primary end user of the system)	Register user and payment card in the system Rent bicycle at a docking station	Self

4.4   User Environment

The customer will rent a bicycle from designated docking stations with a payment card. The docking stations will be placed outside, and the bicycles are to be used on asphalt roads.

4.5   Stakeholder Profiles
4.5.1   Trondheim municipality

Representative	Grethe Sandstrak, Nils Tesdal
Description	Customer, Consultants
Type	Software consultants, financial consultants
Responsibilities	Ensures that the Trondheim electric bicycles are available to the public. Approves funding Assesses documentation External quality assurance and quality control.
Success Criteria	Success is defined as increased air quality and living conditions, and the system a popular mean of transportation.
Involvement	Their representative will be joining the software developers in meetings and briefings. They will also read the documentation.
Deliverables	Supplying electric bikes Supplying gps tracking devices for the bikes
Comments / Issues	None

4.5.2 Team 2

Representative	Elisabeth Marie Opsahl, Anette Olli Siiri, Patrick Thorkildsen, Eivind Rui Timdal, Quan Tran
Description	Programmers
Type	Software architect
Responsibilities	Designing and implementing the software required for the system.
Success Criteria	Delivering a well functioning system by the 23rd of april.
Involvement	Team 2 is the primary lead on the project
Deliverables	Implementing the software in java for the bicycle renting system. Designing the database associated with the bicycle system. Document and creating user-manuals describing the system
Comments / Issues	Docking station compatibility

4.5.3 Docking Station Producer

Representative	Unknown
Description	The manufacturer of the docking station system
Type	Hardware producer
Responsibilities	The company is responsible for making the docking stations on schedule and creating drivers which can be utilised by this project
Success Criteria	Deliver a usable system with compatible driver.
Involvement	Unknown
Deliverables	Software drivers for the docking stations, and hardware specifications.
Comments / Issues	Update this section when more information is available.

4.6   User Profiles

4.6.1   Bicycle technician

Representative	Unknown
Description	This group both include authorised bicycle mechanics and other technical personnel (janitor type).
Type	Casual user, they should learn how to use the system within half an hour.
Responsibilities	Find bicycles that is need of repair. View and comment repair request and place priority flag and mark repairs as complete.
Success Criteria	Having a user friendly system which contains the feature they need to maintain the city's bicycles.
Involvement	During the project they will act as Testers for our bicycle-technicians features.
Deliverables	None
Comments / Issues	The user interface for the bicycle technicians should be as self explanatory as possible.

4.6.2   System admin

Representative	Sample group of potential system admins that can test the system.
Description	The system admin
Type	Expert user. IT-support type.
Responsibilities	The system admin primary work is add other users to the system and docking stations. They will also have the opportunity to collect statistics.
Success Criteria	Success for the user is defined as a stable-system, that's easy to maintain.
Involvement	During the project they will act as Testers for our System admin features.
Deliverables	None
Comments / Issues	None

4.6.3 Bicyclist rental customer

Representative	Potential bicycle rental customers that test the system.
Description	the end customer of the system
Type	Casual user, will abandon the system if it's too hard to use. Will not bother to read instructions manuals at all.
Responsibilities	Register themselves into the system. Should be able to check-out and in bicycles at the docking stations. Add payment card and if they desire comments on repairs needed for specific bicycles.
Success Criteria	The customers defines success as a simple and self explanatory program where they can rent different types of bicycles.
Involvement	During the project they will act as Testers for our end user features. Early on they should participate in wire-frame testing.
Deliverables	None
Comments / Issues	The user interface for this user should be as self explanatory as possible

4.7   User Needs

Need	Priority	Concerns	Current Solution	Proposed Solutions
No vacant bicycles	High	No vacant bicycles at the docking station because too many people rent from the dock.	Refill bicycles to the docking station from another docking station.	Expand the amount of bicycles and docks at the docking station.
No vacant dock at docking station	High	No dock available at the docking station to hand in the bike.	Take bicycles from the docking station to fill up other docking stations.	Expand amount of docks at docking station.
Interface not easy enough to use	High	Interface is not easy enough to use for the system to go smoothly for the average user.	User Manuals and intuitive GUI.	Improve the user interface.
Insufficient funds	Low	Customer not having enough funds on their payment card.	Add fund at station.	Expand card subscription choices to pre-paid cards.
Not easy to find relevant information	Medium	Hard to get information regarding prices and docking station locations.	Map at docking station saying where every docking station is and the price for renting.	Make a webpage, develop an app, improve the GUI.

4.8 Alternatives and Competition

4.8.1 Trondheim Bysykkel

- Well placed around town
- Many people not happy with the bikes they provide (from reviews)
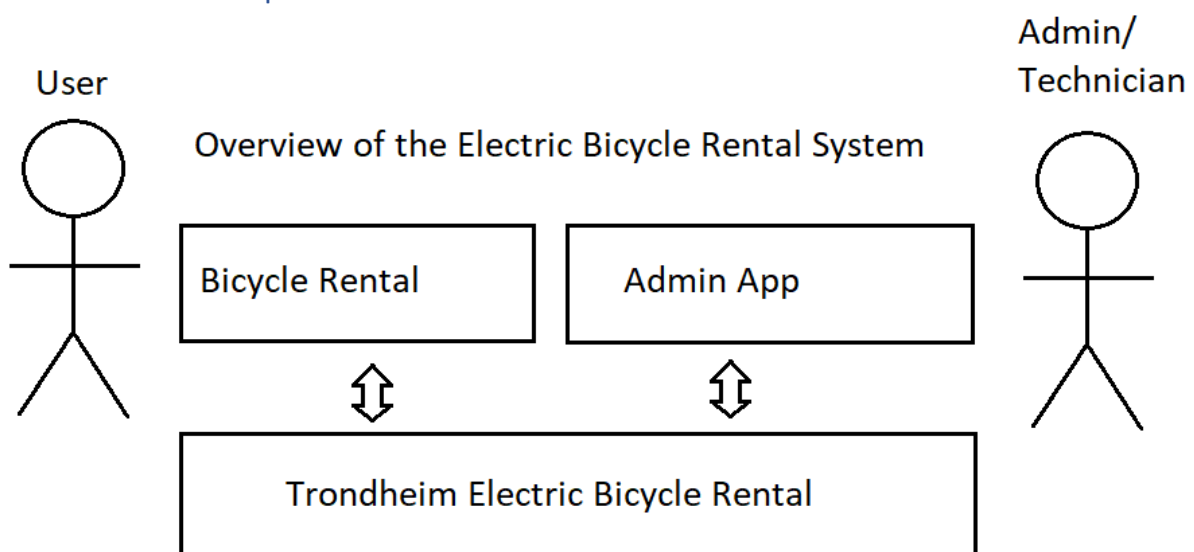- Bikes not electric

4.8.2 Trondheim Biketours

- Also offers guided bicycle tours
- Not an automatic system
- Bikes not electric
- Shop placement could be more central

4.8.3 Public transport (bus and taxi)

- well established
- people with movement disability can utilise public transport
- expensive to use
- not always on demand

5. Product Overview

5.1 Product Perspective

The computer system will be connected to several stations that lock the bikes in place and lets the user interact with the program on a screen. The program also needs to be connected to the bikes (more specifically, the GPS that is mounted on the bikes).

An admin will have full access to the system, being able to write and read all the tables and read all the features in the admin app. A technician will have access to a limited version of the admin app where they only get access to bicycle status, which docking station the bicycle is located at and being able to update bicycle status.

5.2   Summary of Capabilities

Bicycle rental system

Customer Benefit	Supporting Features
Repair staff can easily find bicycles that need to be repaired	When a broken bike is reported the repair staff will be able to see which docking station the bicycle is located at
Customers can help themselves without the need of contacting staff	The system is automatic and the rental stations are easy to use
Trondheim city council	Find statistics over the bicycle rental system to keep track on how well the rental system is going, the economy, power usage and other statistics that can be useful for themselves or useful to show further to others.

5.3   Assumptions and Dependencies

It is assumed in this project that the team is only responsible for the system. The manufacturing of the docking stations, hiring the technicians and everything else is not in the team's responsibility area.

It is assumed that all damages at the bicycles are covered by an insurance. It is also assumed that if an accident happens to a customer while cycling at one of the bicycles all health expenses is covered by an insurance.

5.4   Risk analysis

When creating a new system it is important to do a risk analysis to prevent the system from failing. In this project there is several risks we need to consider:

1. The docking system machines is manufactured by another firm. There is a big risk to have another company manufacture the docking station machines because the system and the machines may not collaborate. There can be complications implementing the bicycle rental system to the machines. This can cause delays and get very expensive. To prevent this, a close cooperation between the group and the docking station firm is important. It is also important that the system is programmed independently of the client? machines?.

2. Another risk is if less than expected wants to use the bicycles. This can happen if the market is smaller than estimated, if the localisation of the docingstations is worse than predicted or if the bicycles are regularly stolen. To prevent this it is important to make a user test that can make a reliable estimate of the marked and can figure out what the users want and need from the system. It is also important to locate the docking stations in areas where there is a lot of people.

If the bicycles are regularly stolen, or if the bicycles are often damaged. This will be expensive for the users. The damages may not be notified which can lead to the users cycling on broken bicycles. This is a big irritation factor to the users. If the bicycles are of low quality and not comfortable to use. If the bicycles are poorly maintained or damaged, we may experience a decline in end users.

4. Hacking is a high probable risk that can lead to very severe consequences. Since the system is saving personal information about the customers and track the bicycles with the GPS it is very important that the information not end up anywhere else outside the system. The information saved is sensitive, if it leaks it will lead to serious consequences for both the users and for the team. It is the programmers responsibility to develop a system that is secure enough to prevent hacking. That is why it is important to prioritise the security of the system from the very beginning.

5. The GPS devices are supplied by Trondheim municipality. The bicycle rental system is depending on the GPS system to work for the technicians to find the damaged bicycles. If the GPS system doesn't work it is still possible to rent bicycles, this will not affect the customers. The risk is not serious and it's not that probable.

6. If there is lack of competence in the team or any members for some reason have to be absent for a longer period of time, the project may exceed it's time limit. This can get expensive. If the time limit is exceeded there will be unexpected expenses for salary for the project team, there will be a loss of income because of the delay.

This is a problem that is difficult to predict and difficult to prevent completely. If this happens it is important to prevent further damage by doing research of the subjects that is missing in the team's common competence.

Risk analysis:				
Very probable		3	6	4
Probable				1
unlikely			2	
very unlikely		5		
	Insignificant	Less serious	Serious	Very serious

5.5   Estimated costs

Action	Estimated cost
Salary	1300 NOK per hour
Number of employees	5
Number of hours	150
Uncertainty of hours	10%
Total expenses	975 000 kr +- 97 500 kr

6. Product Features

6.1 Payment

Customers will be able to use their debit card to add funds to a prepaid cards. The prepaid card will be used to rent the electric bicycles in the system.

6.2 GUI

Message to user about which bike they are supposed to pick up.

(a bicycle flagged for repairs or with a low charging level will not show up as rentable for the customer).

6.3 Authorising bicycles (dock-to-user and user-to-dock transaction)

Open the locks on the bike/activating the bike for the user when they rent the bicycle, and lock the bike when you return it.

6.4 Collect statistics

Statistics including but not limited to charging level, customers, GPS-tracking, time tracking, bikes in each docking station, status on bikes(currently rented, ready to be rented, unavailable).

6.5 Admin app

Application for admins with full access, technicians will have access to the bikes, but not to pricing and gps-tracking.

6.6 Compensation Claim

After enough time without delivering the rented bicycle back, will a compensation claim automatically be sent to the customer.

6.7 Privacy and safety

Encrypt personal information. Sql injection, hash with salt. A relational database is used.

7. Constraints

GPS constraints. It should not be used to track the customer, but a tool to track the bicycle.

Accuracy of the GPS.

Safe transaction (payment).

Limited language options (might be expanded on in the future)

Privacy issues the customer might have must be specified in the Terms of Service.

8.   Quality Ranges

Availability: The automatic system will be available 24 hours a day, 7 days a week

Usability: The system should be easy to use, and the UI understandable and simple

Maintainability: The GPS system will make the bikes easy to locate and maintain.

9. Priority

Feature	Priority
Payment	low
GUI	low
Authorising bicycles	medium
Collect statistics	high
Admin app	high
Compensation Claim	medium
Privacy and Safety	high

10.   Other Product Requirements

The system needs to be able to run on java on the embedded docking station.

The system need to be able to handle several database transactions at the same time.

11. Documentation Requirements

- **User Manual**

  The GUI aimed for the users should be self explanatory, however a poster with graphical instructions will be placed at each docking station. The instruction will be explained in both English and Norwegian.

  Technicians and admins will receive a more detailed user manual so they know how the system works. This will allow technicians to take specific bicycles out of the system, and admins to understand how the different parts of the system functions. The detailed manual will include how to use the GPS tracking, remove and add bicycles, payment method.

- **Installation manual**

  Description of how to install the system.

- **Source code**

  The programming code of the system.

- **Database model**

  Model that shows the logical structure of a database, and shows how the data is stored, and how it can be organized.

- **Class diagram**

  Describes the different classes programmed and the relationship between them.

- **Project Structure**

  The layout of the project.

- **Domain model**

  Describes the different database tables and the relationship between them.

- **Use-case diagrams**

  A list of actions the user can do in the system.

- **use case text**

  Text version of the use case diagram for the user.

- **Sequence diagrams**

  A UML diagram showing the object interactions in a timed sequence.

- **Wireframes**

  A visual example of how the GUI of the project was planned. Balsamiq was used for this.

- **Vision Document**

  Documentation of the team's vision for the project. Our goals and priorities.