Norwegian University of
Science and Technology

# National Integration Platform for Citizen Centric eHealth in Norway

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Helsedirektoratet
Norwegian Directorate of Health

# *Abstract*

This report describes the design of the National Integration Platform (NIP) used for Citizen Centric eHealth in Norway. The NIP is a platform to collect different user generated eHealth data from third party solutions and services. It also describes the making of the working prototype. The challenges of this prototype is to demonstrate the transfer of personal and/or medical data from different devices and systems. The intention of the platform is to enable citizens the ability to publish information they produce into the government run NIP. It is worth noting that security is not a requirement of the prototype. To demonstrate these different parts the creation of an Android application (App), a web App and a back-end Application Programming Interface (API) was required.

The motivation for working in this project is to innovate and create a new platform that can be used to better understand the health of citizens. The citizens gather various health data from different locations and devices and in return provide a better understanding of the citizens health. Together with educated health professionals and doctors this can be a powerful tool for improving the quality of life of the users. The most interesting part was to figure out how to design a system that can have the high level of security required to transfer personal health information.

The demands were to plan, design and describe the NIP and to develop a prototype. The demonstration of this product is aimed mainly at two groups of people: 1. Educated health professionals 2. Developers The product should have a demonstration side that is easy for the first group to grasp, understand and form an idea of how it will work while also making it appealing and technical for the second group.

The result of this project is first and foremost a working prototype of a NIP. It is also a web App and an Android app to make the demonstration easier to grasp. This report is also part of the result which has the purpose of documenting the problem, the process, the workflow and the final products.

# *Preface*

This report is for the main project in the course TDT4290 Customer Driven Project at NTNU. The team consisted of a three students from NTNU.

The team would like to thank our supervisor Meng Zhu for his guidence, help and advice for this project.

In addition we would also like to thank our customer Helsedirektoratet and their contact person Helge Blindheim. Say something about helge

Thank the people from usability tests valuable feedback

# Contents

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# Abbreviations

| | |
|---|---|
| **API** | **A**pplication **P**rogramming **I**nterface |
| **App** | **A**pplication |
| **IDI** | **I**nstitutt for **D**atateknikk og **I**nformasjonsvitens |
| Department of Computer and Information Science | |
| **NIP** | **N**ational **I**ntegration **P**latform |
| **NTNU** | **N**orges **T**eknisk-**N**aturvitenskalige **U**niversitet i |
| Norwegian University of Science and Technology | |

# Chapter 1

# Introduction

Write a short text about what this chapter is about.

## 1.1 Project description

This project is part of the Customer Drivent Project (TDT4290) at NTNU. The purpose of the course is to let students acquire practical experience in development of a medium-large software project, including experience in project management, group dynamics, customer relations

## 1.2 The client

The customer of this project was the Norwegian Directorate of Health (Helsedirektoratet).

Helsedirektoratet er eit fagdirektorat og myndigheitsorgan som ligg under og blir etatsstyrt av Helse- og omsorgsdepartementet. Helsedirektoratet har også oppgåver frå Kommunal- og regionaldepartementet.

The Directorate has, among other, the task of digitalizing Norway's health care system by providing services for both specialists and citizens.

The customer was represented by Mr. Helge T. ... His contact is shown in table 1.1

| Name | Phone | E-mail |
|---|---|---|
| Helge T. Blindheim | 46675321 | Helge.T.Blindheim@helsedir.no |

Table 1.1: Customer representative

## 1.3 Involved parties

The people involved in this project were a) the customer, b) the team and c) the supervisor. The customer, described in the previous section, was represented by Mr. Helge ... The team consisted of three students from the Department of Computer and Information Science (IDI) at the Norwegian University of Science and Technology (NTNU). The group was supervised by Zhu Meng.

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| Emanuele Di Santo | ... | lemrey@gmail.com |
| Sebastian Zalewski | 95107928 | zalewski@stud.ntnu.no |

| Name | Phone | E-mail |
|---|---|---|
| Zhu Meng | 73551189 | zhumeng@idi.ntnu.no |

## 1.4 Project drivers

## 1.5 Problem domain

## 1.6 Project objective

## 1.7 Duration

The project started on august 21th and the final presentation is on november 21th. That gives us a total of 13 weeks to work on the project. The instructors specify a workload

of 24 hours per week according to the course page[*]. That makes a total of 312 hours per student. We are a group of three students which makes the total 936 hours.

Start date: 21.08.2013 End date : 21.11.2013

[ADD TO BIB] Retrived 25.09.2013 http://www.ntnu.edu/studies/courses/TDT4290/2013

# Chapter 2

# Project management

## 2.1 Planning

### 2.1.1 Work plan

### 2.1.2 Resources

### 2.1.3 Limitations

### 2.1.4 Milestones

### 2.1.5 Tool selection

This section will describe the different tools we used during this course

Git and GitHub "Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency." [bib]http://git-scm.com/

Sublime Text

Intelijei IDE

Google Docs

Apache Maven

Travis CI

Latex

Balsamiq Mockups

Lucidchart

## 2.2 Organization

### 2.2.1 Roles

### 2.2.2 Weekly schedule

## 2.3 Quality assurance

### 2.3.1 Templates

### 2.3.2 Customer relations

### 2.3.3 Supervisor relations

## 2.4 Risk management

# Chapter 3

# Preliminary Studies

This chapter contains

3.1 dev metho 3.1.1 waterfall 3.1.2 scrum 3.2 existing solutions 3.2.1 HealthVault 3.2.2 open ehealth 3.2.3 human api 3.3 tech 3.3.1 server 3.3.2 database 3.3.3 web page 3.3.4 android 3.4 testing

## 3.1 Development Methodology

TODO

### 3.1.1 Waterfall Model

The waterfall model is a software development process where each task is performed in a sequential order. Before moving to the next phase the preceding task needs to be finished. The progress of the project is seen as flowing downwards through the different phases, hence the name waterfall. In the original model the phases consisted of seven different tasks:

1. Requirements specification
2. Design
3. Construction (implementation or coding)

4. Integration
5. Testing and debugging
6. Installation
7. Maintenance

Because each phase needs to be perfected and completed before moving to the next phase, this brings up some difficulties if the requirements were to change during the development process. However the model is easily understandable, structured, and disciplined. All the phases are divided into different sections, and this makes it easier to understand the progress of the project. In practice it can be very hard to adapt to this kind of development model. It can be hard for a system designer to predict future implementation difficulties of a type of design, hence the design of the system may change during the process. Another problem is that the customer is not always sure about the system requirements, and often will the customer change them during the development.

### 3.1.2 SCRUM Model

TODO

### 3.1.3 Conclusion

TODO

## 3.2 Existing Solutions

TODO

### 3.2.1 HealthVault

TODO

### 3.2.2 Open eHealth Foundation

TODO

### 3.2.3 human/api

The human API is a platform for human health data. They have an API that contains multiple different well defined JSON strings for different kinds of human related data. Each JSON string contains all the necessary information that is needed to represent each type of health data. For example heart rate is defined by an id, user id, time, value and unit in the following way:

```
{
  "id": "string",
  "userId": "string",
  "time": "date",
  "value": "int",
  "unit": "string"
}
```

### 3.2.4 Conclusion

TODO

## 3.3 Technologies

TODO

### 3.3.1 Server

Java
Spring Framework
TODO

Apache Tomcat Server
TODO

### 3.3.2 Database

#### MySQL

TODO

### 3.3.3 Web Page

#### HTML5

HTML is the standard World Wide Web's markup language. It is used to structure and visualize web pages on the internet.

#### CSS3

CSS describes the look and format of a document written in HTML.

#### Javascript

TODO

#### JQuery

TODO

#### Chart.js

Chart.js is a Javascript library for creating graphs TODO

### 3.3.4 Mobile Technologies

Android SDK
TODO

### 3.3.5 Conclusion

TODO

## 3.4 Testing

TODO

### 3.4.1 Conclusion

## 3.5 Summary

TODO

# Chapter 4

# Requirements specification

## 4.1 Stakeholders

## 4.2 Funcional requirements

## 4.3 Non-funcional requirements

### 4.3.1 Quality requirements

## 4.4 Use cases

# Chapter 5

# System architecture

## 5.1 Overview

## 5.2 NIPEN

## 5.3 Front-end

## 5.4 Heart rate

## 5.5 Weight

# Chapter 6

# Sprint 0

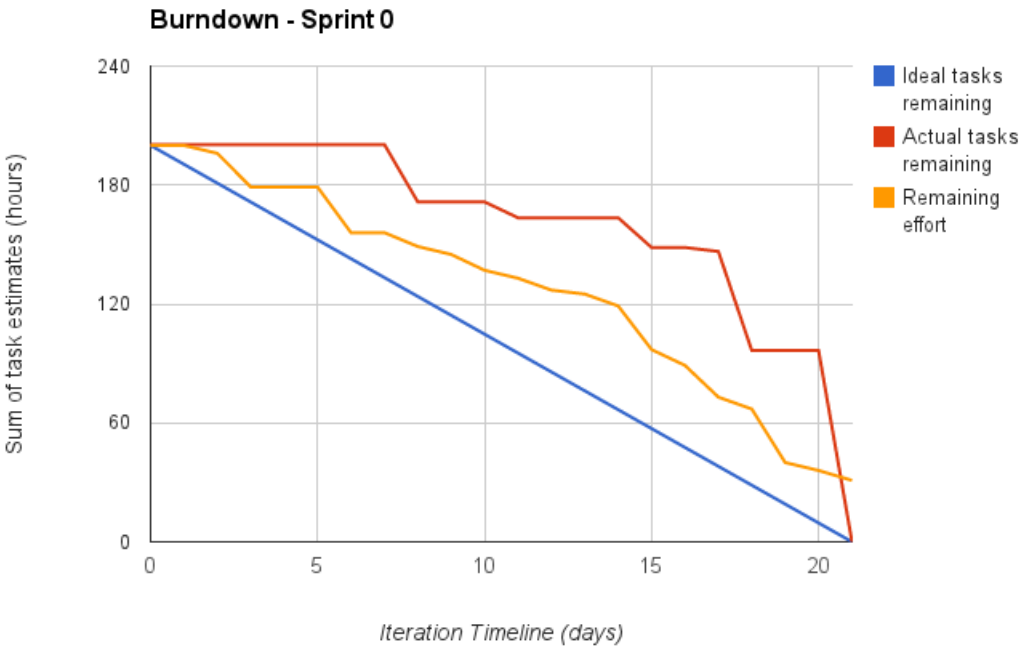
This chapter is meant to give an overview of sprint 0. Section 9.1 gies and overview of the planning. Section 9.2

## 6.1 Planning

** We planned to have 2 weeks sprint but in the middle of the sprint we changed the first sprint to a 3 week sprint. That makes some of our numebrs inconsistent. Refering to the status reports and the weekly meetings. We usually estimated 60 hours per week of work but the first sprint ended up beeing estimated at 200 hours for 3 weeks**

what we planned to do shall we include some data from scrumdo? definitely a chart..

## 6.2 Duration




## 6.3 Goals

what did we expect to achieve by the end of this sprint (general progress in the project)

## 6.4 Feedback

from customer, from supervisor

## 6.5 Problems

## 6.6 Evaluation

our thoughts about this sprint

# Chapter 7

# Sprint 1

## 7.1 Planning

what we planned to do shall we include some data from scrumdo? definitely a chart..

### 7.1.1 Expected results

what did we expect to achieve by the end of this sprint (general progress in the project)

## 7.2 Feedback

from customer, from supervisor

## 7.3 Evaluation

our thoughts about this sprint

# Chapter 8

# Sprint 2

## 8.1 Planning

what we planned to do shall we include some data from scrumdo? definitely a chart..

### 8.1.1 Expected results

what did we expect to achieve by the end of this sprint (general progress in the project)

## 8.2 Feedback

from customer, from supervisor

## 8.3 Evaluation

our thoughts about this sprint

# Chapter 9

# Sprint 3

## 9.1 Planning

what we planned to do shall we include some data from scrumdo? definitely a chart..

### 9.1.1 Expected results

what did we expect to achieve by the end of this sprint (general progress in the project)

## 9.2 Feedback

from customer, from supervisor

## 9.3 Evaluation

our thoughts about this sprint

# Chapter 10

# Sprint 4

## 10.1 Planning

what we planned to do shall we include some data from scrumdo? definitely a chart..

### 10.1.1 Expected results

what did we expect to achieve by the end of this sprint (general progress in the project)

## 10.2 Feedback

from customer, from supervisor

## 10.3 Evaluation

our thoughts about this sprint

# Chapter 11

# Sprint 5

## 11.1 Planning

what we planned to do shall we include some data from scrumdo? definitely a chart..

### 11.1.1 Expected results

what did we expect to achieve by the end of this sprint (general progress in the project)

## 11.2 Feedback

from customer, from supervisor

## 11.3 Evaluation

our thoughts about this sprint

# Chapter 12

# Testing

## 12.1 Main Section 1

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### 12.1.1 Subsection 1

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### 12.1.2 Subsection 2

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aliquet consequat. Ut nec nulla in ante ullamcorper aliquam at sed dolor. Phasellus fermentum magna in augue gravida cursus. Cras sed pretium lorem. Pellentesque eget ornare odio. Proin accumsan, massa viverra cursus pharetra, ipsum nisi lobortis velit, a malesuada dolor lorem eu neque.

## 12.2 Main Section 2

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# Chapter 13

# Conclusion and further work

## 13.1 Main Section 1

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### 13.1.1 Subsection 1

Nunc posuere quam at lectus tristique eu ultrices augue venenatis.

### 13.1.2 Subsection 2

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## 13.2 Main Section 2

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# Chapter 14

# Reflection

## 14.1 Main Section 1

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### 14.1.2 Subsection 2

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## 14.2 Main Section 2

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# Appendix A

# Assignment for Customer driven project

**Assignment for Customer driven project**

**Title:** National Integration Platform for Citizen Centric eHealth in Norway
**Customer (Company):** The Directorate of Health, Department of the Health Portal
**Address:** Universitetsgata 2, Oslo

**Assignment text:**

*Background*

The Directorate of Health has a national the task of digitalizing Norwegian healthcare, both by providing coordinated services for specialist healthcare (hospitals) and by providing digital services for citizens in general and patients specifically. Examples of such services are ePrescriptions, that is implemented on a national basis, the National Summare Care Record, that will go live in Trondheim in August 2013, and the citizen centric health portal (helsenorge.no) that has been live since June 2011.

National eHealth projects are complex, long running and costly. There are obvious reasons for this. Among these are the complexity and criticality of healthcare, and the scale that national eHealth services represents.

At the same time, the trends in technology development and consumer adaption of new technology continue to develop. Moderate prices and consumer friendly devices

that monitor individuals' health and wellness are increasingly becoming available in the market space. Combined with a continuous increase in digital competence in the population, they will influence citizens' behavior and perspective on their own health situation in the future.

In addition to this, private providers develop great eHealth solutions with consumer and patient orientation. Medhelp.org and Healthvault.com are only two among many examples. Ambient assisted living has the potential of revolutionizing life for senior citizens with failing health.

The relevant question is: How can the substantial and long running eHealth projects of the government sector connect to and leverage the dynamics in the market and consumer behavior? The answer under investigation is the National Integration Platform (NIP) for Citizen Centric eHealth in Norway.

*Assignment*
The assignment is to plan, design and describe a NIP, and to develop a prototype.

The task such a platform should fulfil is to offer interoperability with third party solutions based on available application programmable interfaces (APIs). All third party solution providers must adhere to specified and standardized rules regarding authentication, security model, messaging and privacy to interact with the NIP.

The intention of such a platform is to enable the following:

- Citizens' ability to publish information they produce from devices in their possession and third party software solutions, including smart phone and tablet apps, into the government run citizen centric health portal (helsenorge.no)
- Citizens' ability to fetch information about themselves from helsenorge.no to import it into third party software solutions of their own choosing

The assignment is to describe the architecture and major components of the NIP, how it will function on the "outside" regarding third party integration, and on the "inside" regarding integration with helsenorge.no.

It is also essential that the solution adhere to Norwegian privacy regulation and information security. Its requirements for integration should also encourage privacy by design within third party solutions.

The prototype should make use of one or more use cases to demonstrate how interaction is performed, how privacy and security concerns are managed and how the end user experience will be.

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Name:
Tlf:
Mobile:
Fax:
E-mail:

# Appendix B

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