

MASTER THESIS

# HOW SOCIAL ARE SOCIAL INTRANETS IN THE NETHERLANDS?

Identifying requirements for the development of new social intranets.

Floris-Jan Overink

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**Study Programmes**

MSc Business Information Technology (BIT)

**Graduation Committee BIT**

N. Sikkel (Faculty of EWI, University of Twente)

A.A.M. Spil (Faculty of BMS, University of Twente)

**Supervisor Nerds & Company**

A. Ariese

**NERDS &  
COMPANY**

**UNIVERSITY OF TWENTE.**

# Management Summary

**Problem** – Nowadays the working environment continuing to digitalise. Knowledge is being digitalised and people are collaborating online from different locations. Companies are trying to keep up with this digitalisation and are looking for one tool for all the employees that will help them do their work. One of the tools that can be used for this is social intranets. These intranets are also known as enterprise 2.0 and enterprise social media. Companies are using these kinds of social software more and more over the past years. There is only one problem with social software. It is very difficult to introduce these into business environments. End-users have different feelings towards the use of social software and many factors influence the final use of the intranet by the end-users.

**Purpose** – The objective of this research is identifying success factors of social intranets in different segments, in order to identify the requirements for the development of a new social intranet.

**Design/Methodology/Approach** – In order to achieve the objective of this research several steps have been taken. First, a literature research of the success factors of social intranets, enterprise 2.0 and enterprise social media, is conducted. Based on the results of this review and a developed interview framework three case study are done. Employees of three different companies from three different domains are interviewed about the intranet they use to identify the success factors of those intranets. These results are analysed and subsequently conclusions and recommendations are made.

**Results** – From the literature study and the case study, twelve requirements have been identified that can be divided between two groups, functional and implementation requirements. The functional requirements can, in turn, be divided into five groups: social media, knowledge management, collaboration and general requirements. The implementation requirements focus on the implementation of social intranets and are based on several implementation steps. The results, of this research show that the implementation is essential regarding the final use of the social intranet. In the results, an implementation scheme is presented. Based on the results it might be useful to follow at least some of these steps in order to implement a successful intranet. A summary can be found in the table below.

Functional Requirement	Implementation Requirement
The intranet provides the possibility to adopt a personal profile.	The intranet shall be implemented into the business strategy and the company's culture.
The intranet shall have an idea board.	The intranet shall focus on competing systems and ensuring its usability.
The intranet shall have the possibility to post intranet posts, and tag, rate and comment on those posts.	The organisation shall prepare managers and supervisors to make them understand the usefulness of the intranet.
The intranet shall have a fixed knowledge base.	The intranet shall function according to several guidelines and procedures.
The intranet shall have modern collaboration tools.	The organisation shall install a change manager before implementation.
The intranet provides multiple device support.	
The intranet provides the possibility to appoint different user roles for to maintain and control the intranet.	

*Table 1 Overview of the Functional and Implementation Requirements*

**Recommendations** – Based on the literature review, case studies and additional research the following recommendations are done.

- The intranet should be developed in three different modules: social media, knowledge management, and a collaboration module, that can be connected. The first reason for this is the possibility of a new business case. It will become possible to sell the modules separately. For example, customers do not have to pay directly the whole intranet, but can pay for one module at a time. The second reason step-by-step implementation will be possible. In Chapter 7 a framework is presented for the development and implementation of a social intranet.
- Research should be done into gamification and the use of cryptocurrency in social intranets. These technologies can help by raising the overall use of the intranet by the employees of a company.
- Another technology that can be ground-breaking is the use of chatbots. Chatbots might become a game changer regarding online collaboration in groups.

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# 1. Introduction

The working environment is digitalising more. Companies are trying to keep up with this digitalisation and are trying to implement it on the work floor by trying to make collaboration via digital ways easier and trying to manage the knowledge of all their employees. A possible solution for this is the use of a social intranet. A social intranet embraces the features for knowledge management and collaboration. The aim of this research is identifying the success factors of a social intranet and identifying the requirements for the development of social intranets. The identification of the success factors is done scientifically to search for the best practices and success factors of social intranets. In this chapter an introduction into social intranets is given, as well as the research objectives and research questions of this research. Also, the research methodology and research design are presented. Finally, an outline of the report structure of the thesis is given.

## 1.1 Context

During the late nineties, the phrase social intranet made its introduction to describe an intranet with social media features. The basis of this introduction was the usage of Web 2.0.

Web 2.0 is defined as a business revolution driven by the use of the web as a platform for innovation and the creation of value [1]. Web 2.0 is used as a platform to improve ties in social networks as well as knowledge sharing and reusing activities in organisations [2]. By involving web development and design to facilitate interactive sharing, user-based design, and collaboration on the World Wide Web [1]. As a result of this, the social intranet was developed among other things.

A social intranet features social media tools, like blogs, wikis, discussion forums, and social networking. These tools are used for most of all by employees to use as collaboration vehicles for sharing knowledge with other employees [3][4]. Social intranet is not the only term used for this phenomenon. Different terms are used to label these technologies, like Enterprise Social Media and Enterprise 2.0. Besides knowledge sharing people can use these tools for example to create an personal profile [4].

Social software has become successful on the internet where systems like Wikipedia and Stack Overflow show that knowledge can easily and usefully be shared. Companies attempted to introduce social software into their business environment, but this was rather unsuccessful. One of the reasons for this is that the enterprise context differs from the open web regarding the motivation of people to contribute [5]. The reason for this can be that less attention has been paid to know technical, organisational and managerial pitfalls at the beginning of enterprise software projects [6].

The motivation for this research is to find out why it is so difficult to introduce social software into different business environments. And, identifying the various pitfalls that have to be taken for successfully introducing social software within business environments.

## 1.2 Objectives

As shortly mentioned in the introduction the main objective of this study is the following:

*“Identifying the success factors of social intranets in different segments, in order to identify the requirements for the development of a new social intranet.”*

This aim can be split up into three specific parts, success factors of the social intranet, success factors in specific segments, and identifying requirements for the development of a new social intranet. These different parts are highlighted below.

### 1.2.1 Success Factors of Social Intranets from Literature

The first goal of this study is identifying the success factors of a social intranet from literature. As described in chapter 1.1, social intranets feature tools that can be used for collaboration and sharing knowledge with other employees. Identifying these success factors is the first step in the requirements engineering process.

### 1.2.2 Success Factors from Specific Cases in the Netherlands from Different Sectors

The second goal of this study is identifying the success factors from specific cases in the Netherlands from different sectors. The reason for this is gathering different kinds of information from different cases to substantiate better the success factors of a social intranet found in the literature.

### 1.2.3 Identifying Requirements for Further Development

The last goal of this study is identifying the requirements from the identified success factors of social intranets. Based on the different success factors different requirements can be identified of the development of a new social intranet.

## 1.3 Research Questions

The main research objective is mentioned in the previous section. In order to achieve this objective, the following main research question will be answered. The main research question is:

*“What are the requirements for a to be developed social intranet, based on the success factors identified in different segments and different social intranets?”*

The main research question is answered by answering the following subquestions:

### 1. What are the success factors of a social intranet?

In order to answer this question two subquestions have been formulated:

- 1a. *What functionalities should a social intranet have?*
- 1b. *How can a social intranet be implemented within an organisation?*

These subquestions will be answered based on a literature review into *social intranets*, *enterprise 2.0*, and *enterprise social media*. The exact research methodology is discussed in the next chapter. The results of these questions are presented in chapter 2 of this report.

### 2. What are the success factors of social intranets in the case studies?

The result of this question will be presented as an overview of requirements for the development of a new social intranet. Different requirements will be identified from different segments based on a case study. The case study will be introduced in chapter 3 of this report. In this introduction of the case study, different cases and the methodology that is used are discussed. Combining the requirements gathered from the different segments will result in a basis to start the development of a new social intranet. The results of this question are presented in chapter 4 of this report.

### 3. What aspects should be used based on success factors of a social intranet from a literature review and case study?

This subquestion will be answered to validate the results of the literature review and case study. The results of both studies will be compared to answer this question. In chapter 5 of this report, the answer to this research question is presented.

## 1.4 Research methodology

The research will be conducted using the Design Science Research Methodology (DSRM) from Peffers et al. (2007). In figure 1, an overview of the DSRM is given. The research is conducted following the different steps of the DSRM. These various steps were taken to perform a structured scientific research. Below, the different steps of the DSRM are elaborated and how it is related to this study.

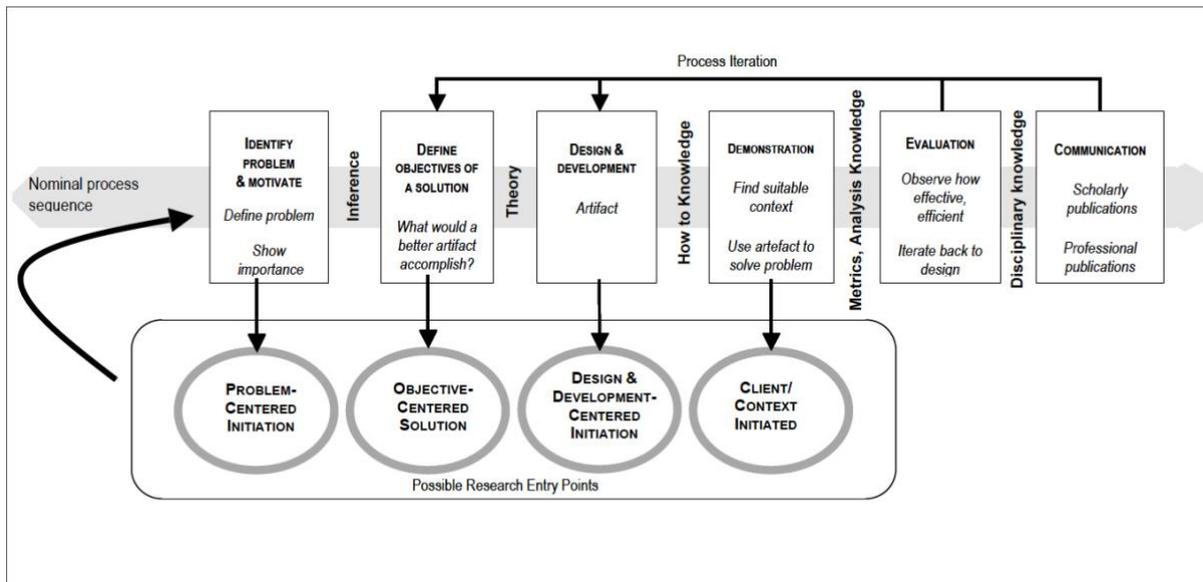


Figure 1. Design Science Research Methodology (DSRM) Process Model [7]

### 1. Identify Problem & Motivation

During the first phase, the problem will be identified and defined. Furthermore, motivation is given for the importance of this research.

In the case of this study, the problem and motivation of this study are outlined in the form of a context. This context helps to define the objectives of a solution for this study. The context is presented in chapter 1.1.

### 2. Define Objectives of a Solution

During the second phase, the objectives of the solution will be defined. In the case of this study, it is the identification on how to gather the right requirements for the development of a new social intranet. The objectives and the corresponding research questions are presented in chapter 1.2 and 1.3.

The first research questions also will be answered in this phase. The first research question will be answered based on a literature review. The description of the literature selection and general results of the literature review can be found in Appendix A of this report. The answers to the questions can be presented in chapter 2 of this report.

### 3. Design & Development

In this phase, the artifact will be developed. In the case of this study, it is the creation of a framework from the identified requirements used as a basis for the development of a new social intranet. The development of this framework will be done via a case study. The case study is presented in chapter 3. The results of the case study can be found in chapter 4.

Once the results of the case study are clear, the case study will be validated with the results of the literature review. This validation is done in chapter 5. After the validation, the artefact will be developed in the form of a framework.

### 4. A demonstration, implementing the artifact in a suitable context

In this phase, the artifact will be implemented in a suitable context. The scope of this study is not big enough to implement the artifact during the time of this study.

### 5. Evaluation of the artifact

In this phase, the implemented artifact will be evaluated based on how efficient and useful it is. Just as at point 4, the scope of this study is not big enough to evaluate during the time of this study. Instead of doing an evaluation a validation is conducted. The model is validated based on the different segments and the literature review on social intranets.

### 6. Communication

In this phase, the research will be published. The publishing can be done scholarly or professionally.

## 1.5 Research Design

The design of the research can be found in figure 2. The design starts on the left side. The blue squares show the corresponding research questions. The yellow squares show the corresponding chapters of this thesis. The main research question is answered based on the three sub-research questions and after the validating all the results.

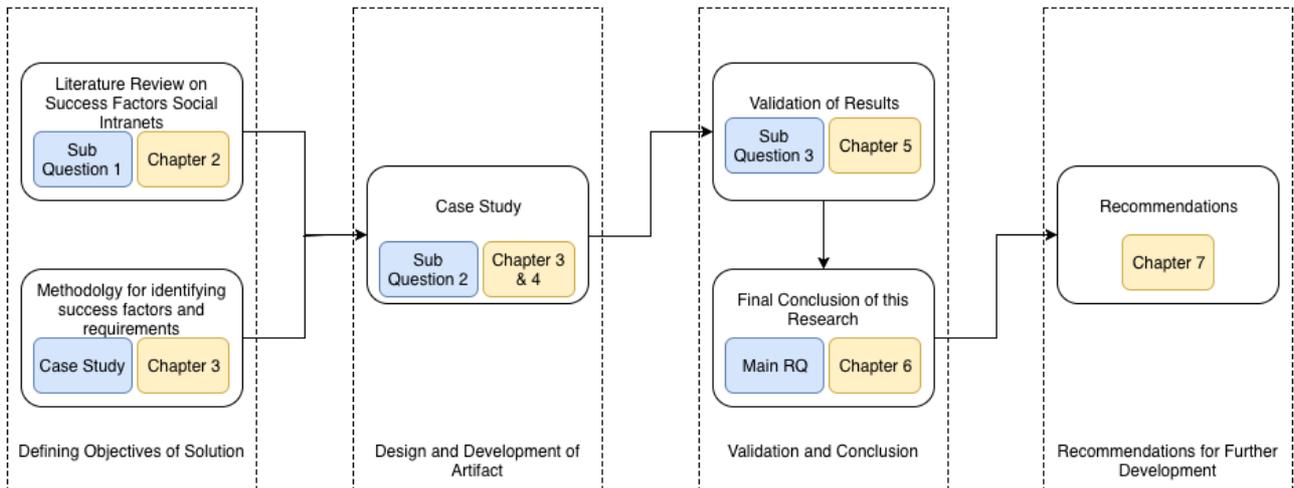


Figure 2 Research Design

## 1.6 Outline Report

The outline of this report can be found in table 1.

Chapter	Topic
1	Introduction of social intranets. Presentation of the research objectives, research questions, research methodology, and research design.
2	Presentation of the success factors of a social intranet based on a literature review.
3	Introduction of the case study with the corresponding framework.
4	Overview of the results of the case study.
5	Validation of the case study and literature review.
6	Conclusion, discussion, and future work of this research.
7	Recommendation based on the results.

Table 2 Outline Report

## 2. Success Factors of Social Intranets

In this chapter, the results of a literature review will be presented. How the literature selection is made, and the general results of the found literature can be found in Appendix A. The success factors of social intranets will be presented in two chapters. First, the different aspects of social intranets will be presented. Second, the different challenges that occur when a social intranet is implemented will be presented. In the end, an overview is given of the success factors of social intranets.

### 2.1 Aspects of Social Intranets

In the literature, there is a lot written about aspects of social intranets, Enterprise 2.0, and Enterprise Social Media. As we already now Web 2.0 is the predecessor of those applications. The web 2.0 web technologies are implemented and used for intranets, extranets, and business processes. Social software is based on the web 2.0 idea and thus on knowledge management, collaboration, and co-creation [6]. The adoption of social media technology has arisen within organizations. These technologies have added new layers of visibility to the organizational communication allowing all members of the organization to see and hear what each other have to say [8]. The outline of this chapter is based on different concepts of social intranets, first the social media part of the social intranet is explained and second the knowledge management and collaboration part of the intranet is explained.

#### 2.1.1 Social Media

The part that makes a social intranet social is the social media developed by Web 2.0 technologies that is used within the intranet. The term social media is used a lot in different papers and is often used interchangeably with social software. Another term for social media is Social Networking Sites (SNS) [9]. SNS are communication tools that are part of social software and are often based on internet technologies, like instant messaging, text chats, forums and virtual worlds. Examples of websites that use these technologies are Facebook, Myspace, and LinkedIn. Via these web-based services that allow the individual to construct a public or semi-public profile within a bounded system, to articulate a list of other users with whom they share a connection. This technology can also be used by companies in a social intranet [9]. For example, a software company uses a social intranet with SNS functions. Every employee has to update his profile on his first working day. The employee fills in his personal information, like birthday, phone number, hobbies and travel method for eventual carpooling. Another functionality that has to be filled in is the skills profile [10]. In this skills profile, every employee has an overview of his co-workers' skills. This means that the system knows the skills of the employees and this makes it easier to find the right co-worker with the right skill. Another benefit of this personal profile is that colleagues easily can see who has the same interest or hobbies and maybe workout together after office hours. This overview improves the internal communication among colleagues.

Additional functionalities of an SNS can be the possibilities to share new ideas. These ideas can be work-related or not work-related like a new water cooler for at the office floor. These ideas can be made and shown on a timeline on the social intranet. An employee had then the possibility to tag the post, rate it or comment on it. The employee can rate the idea, tag someone in it or gives his opinion about it [10]. These communication options can also be used in the knowledge management part of the social intranet. The underlying idea is that this ensures more participation of the employee at the intranet and more employees will eventually use it [9].

The use of an SNS in an intranet also has some limitations. It is time-consuming for employees to use it. In the time they are browsing on the intranet they can also work. Ensuring the sustainability of it can be difficult. It could be challenging to use it for a longer time. Just as knowledge management systems, the SNS also needs engagement from the employees. They need to be willing to use it, and it is even better to see that their supervisor or manager is using it. The use of it by the supervisor or manager will ensure more engagement for the SNS [9].

#### 2.1.2 Knowledge Management & Collaboration

Over the years knowledge has become a critical driver for business success. Businesses are putting more effort in knowledge management to improve and sustain their competitive advantage [11]. Knowledge management is a constant process of sharing knowledge between knowledge owners and knowledge recipients and is nowadays also used for collaboration [8]. These days more people work from distributed places. Therefore, it is crucial for organization to building trust and collaboration between employees through ICT mediated communication within these geographically distributed

employees [12]. The functioning of knowledge management depends strongly on the engagement of employees in the knowledge sharing process [11][13]. The respondent engagement occurs in three types of communication channels of knowledge management systems. The first one, a private communication channel, for one-on-one knowledge sharing. The second one, a group communication channel, for few-to-few knowledge sharing. The last one, public communication technologies, many-to-many communication[11]. The use of these channels depends on three factors.

- (1) *Individual Factors*: employees want to maximize their self-interest and pay-offs. Sharing personal insights may carry costs for some individuals. There is intrinsic and extrinsic motivation of the employees. Intrinsically motivated people are more likely to engage in a task, as well as work to improve their skills. Extrinsically motivated people think about a desirable outcome for them. It focuses on goal-driven reasons, like cost (effort) and benefit (reward) [8]. Kettles et al. [14] have researched the incentives on knowledge sharing using Enterprise Social Media. They had several findings of the participation of employees in a social intranet. Individuals who believe sharing knowledge is essential are more willing to contribute to the knowledge management than individuals who do not. People paid a fixed salary for their primary work task make more knowledge contribution than people paid a piece-rate. Paying these people with fixed salary to share knowledge will increase the number of knowledge contributions [5][12]. An another known individual factor is the level of education and job level of an employee. Employees with high education and job levels tend to use professional networking more frequently and to expect greater benefits [15].
- (2) *Organizational Factors*: The visible and invisible culture of organizations encompasses the norms and values of the employees. It is known that similar employees tend to interact more with each other than with non-similar employees. Knowledge is also bound to social structures and belongs to local communities of practice. Therefore, organizations should support and encourage employees to share and create knowledge. The organizational culture and friendship may encourage this process [8]. Another organizational factor is the Sociability of the platform. To make a knowledge management system more effective, it should define rules of behaviour as well as role-specific tasks and responsibilities [13]. Some employees have a responsibility to maintain the system and ensure other employees use it well. Furthermore, the top management of a company needs to support the knowledge management strategy. Employees who are working with the knowledge management system need to get time to use it, but also an example. If the top management also uses the system, employees are more willing to use it [12].
- (3) *Technology Factors*: The technology factor has been built on several pillars. It depends on the universal availability of technology, the importance of time deployed in technology, the system that the platform has been built upon, the design of the interface and the impact to the individual regarding cost. If we dig deeper into these factors, we see that the usability is an important aspect. The knowledge management system should be easy to use and self-explanatory, visual buttons and excellent readability. The use of the system can be supported by the use of small tutorials [13]. Another essential technological factor is that it should provide mobile device support and platform stability [13]. If employees can use it at multiple devices and locations, they will be able to use it more often. All these factors influence the amount of knowledge that is shared by employees.

A knowledge management system can be filled with knowledge during the development. Most knowledge management systems have a supply-side (push system) and demand-side (pull system). The supply-side provides pre-compiled knowledge to passive respondents. This knowledge can be information about terms of employment and official holidays. The demand-side of the system exists of the customization and creation of knowledge in response to knowledge needs and request [6]. Examples of this can be found in table 2 and will be discussed below.

Knowledge Management Tool	Reference
Wiki	[5][15][10][9][16][17][18][19][20]
Blogs	[10][9][20]
Microblogs	[9]
Podcasting	[13][21]

Table 3 Knowledge Management Tools

### 2.1.2.1 Wikis

Most papers see Wikis as a solution for knowledge management. A wiki provides a collaborative environment in which authors contribute pieces of knowledge that fit in together like a jigsaw[9]. A wiki is a valuable tool that supports the development of a common ground for shared understanding across professional boundaries [12]. Wiki technology can be used as a community platform to collaborate, but

also as a personal authoring environment [9]. Anyone can create new pages as well as add, edit or delete content within an existing page. Wikis mainly have two components. The wiki technology and the social norms or principles enabled by the technology which is referred as the wiki way. To use a wiki properly, users need to work following minimum guidelines and rules about the utilization of the wiki [5][16]. Based on three case studies the following barriers to a successful wiki have been found [5]. *Outdated content*: All the content needs to be up-to-date. Otherwise, employees cannot trust it. *Navigational structure*: The navigation structure of the wiki needs to be clear. Rigidly defined structures or a Wiki master can be a solution to this problem. *No moderation*: There should be a wiki moderator that links content, label old entries and help to organize content. Furthermore, sufficient wiki articles need to be implemented right from the start [17], monetary rewards for the user should be considered, wiki support need to be provided and content finding need to be improved to ensure the success of a wiki [5]. An example of wiki support is the use of mail2wiki plugins. The plugin makes it easier to forward information from the mail towards a wiki [15]. On the opposite, the use of the wiki also has some limitations. It can have quality issues with the content available. It is difficult to quickly find the right content. The sustainability is not always right. The use of the wiki can be time-consuming [9]. Once a wiki is introduced the wiki success model of Bhatti et al. [19] can be used to monitor which type of users have improved performance through the use of the wiki.

#### 2.1.2.2 Blogs

Blogs are online journals consisting of discrete entries typically displayed in reverse chronological order, so the most recent post appears first. Blogs can help to inform and educate employees [22]. It is possible for readers to comment on blogs, allowing the primary author to engage in interaction with his or her audience. Employees use blogs for their job or of their own accord because they have something important to say. Blogs give employees the possibility to write about their experiences or company news. The usage of blogs has some limitations. Writing a blog can be time consuming. It can be challenging to structure them for natural search. It is essential that the management support blogs. Supporting can be done in several ways, one of the ways is to write blogs by themselves. Some employees do not have any idea what blogs are. So, they need guidelines and training on what to blog [9].

#### 2.1.2.3 Microblogs

Microblogs allow users to exchange small elements of content. It can play a crucial role in the quick diffusion of ideas within a social network via viral marketing mechanisms. Employees can choose whom they are following and from whom they want to know what they are doing. Within organizations it can help to know from each other what they can expect. On the other hand, microblogging can cause some noise and lack of contextual information. It also has a risk of sensitive information disclosure because individuals can easily share informing peer to peer. In the end, it takes time to make it effective [9].

#### 2.1.2.4 Podcasting

Podcasting is a method of publishing audio or audio/video files to the internet that allows users to subscribe and receive new files automatically through notifications. Podcasting is often used as a learning or marketing tool to broadcast organizational knowledge such as training material and policies and to connect with employees and others [13]. Wei & Ram [21] did research into podcasting in an organizational context. Their findings show that employees are not so eager to use podcasting for learning purposes unless the content of the podcast met their interests. In this case, employees would change their perceptions and thoughts about podcasting.

A social intranet exists roughly of three aspects, social media, knowledge management and collaboration tools. The knowledge management and collaboration tools are closely related and often are used at the same time. In a social intranet four knowledge management tools are identified. They all have their own characteristics and capabilities. Depending on the organization a tool can be picked.

## 2.2 Implementing a Social Intranet

Amongst the results of the literature research, many papers are focusing on the implementation of Social Intranets, Enterprise 2.0 and Enterprise Social Media. Most of them are established on Web 2.0, and on the basis of that is developed to a new modern system. It is clear that there is not one good solution of social intranet implementation, but there are specific measures that can be put in place to potentiate the successful implementation of social intranets [20].

Different papers address different topics about implementation. However, there is a thin red line in papers with topics about implementation problems and challenges. If we look more into the specifics of these papers we see five different topics. *Cultural challenges, Technology and IT Challenges, Business Operation and Process Challenges, Attitude and behavioural Challenges, and Company Structure and Management Challenges.*

The outline of this chapter is based on the challenges and problems mentioned in these papers. The different challenges and problems are addressed and extended with solutions from other papers. In the end, an overview is given of the different challenges.

### 2.2.1 Cultural Challenges

The implementation of a social intranet can be different for each company. Each company reacts differently to change. In the case of implementing a social intranet the company's culture depends on how easily the company can adapt to a new system. One of the most mentioned problems was the *change in the working method*. Once a company uses a new social system, the employees have to work with it. It can happen that employees do not accept this change [6][23][24].

The second problem that occurs is the *open knowledge-sharing values* that change within a company. Once a company is going to use a social intranet that has a knowledge management system integrated into it, the company's culture may change from not sharing knowledge with others and collaboration to a company where knowledge is shared. It depends on the willingness of employees to share knowledge and collaborate if the implementation will go easily or not [6][23][24].

Another problem that can occur is the *social media policy* of a company. If it is not allowed to use social media on the work floor, it can become an issue if people, on the other hand, have to use a social intranet [6].

Three separate problems have been identified. To address these problems the newly introduced social intranet has to be integrated into the company's business strategy and a social intranet should be created. The social intranet must engage with flexible organizational structures and an open and innovative corporate culture, and this will harness the competitive advantage [20][25][26][16]. Once it is a part of the company's business strategy and culture, it is easier to adjust the rest of the company towards the new intranet.

An solution to make employees more willing to share information is the introduction of an incentive structure. The use of incentives can motivate employees to share their valuable information with the company and other employees [5][13][25]. Another solution to support cultural changes is to invest in change management during the implementation. Change managers can help the company grow towards the new situation and keep in mind essential aspects of the culture, by organising workshops and discussion session to reduce the fears of the employees [6][12].

### 2.2.2 Technology and IT challenges

Just as every other IT project the implementation of a social intranet also has IT and technology challenges. The first challenge is the *lack of competence* of the employees. The new software should have good *usability* to tackle the problem of the lack of competence. These two factors will influence the change of success of the new intranet [6][23][24].

Another challenge is the *influence of competing systems*. If a company introduces a new tool for a current one, questions from employees could arise about why they should switch to another tool, if they can carry on using the existing tool [6]. The basis of this problem may lie on the specific software functions of the new system or possible system inefficiencies. The new system can have too many new functions for the employees that it can be overwhelming. Alternatively, functions of the new system are more inefficient in use than the same functions in the previous system. A reason for this could be the integration with other systems that they were using, or the integration of new interfaces interfered with automated processes of the employees [6][23][24]. A solution to this problem can be a step by step implementation. Not all the features of the social software will be unlocked at once. Users will gradually become accustomed to the new intranet [6].

### 2.2.3 Business Operation and Process Challenges

The introduction of a new system will influence different business processes. Sometimes it is not clear for an organization what the *benefits* are of a new system. Lack of understanding of usage, but also the incorrect or diverging use of the software individually and in teams can make it unclear what for the system is used. Before the implementation of the new application it should be known what the goals are and the benefits for the employees [6][23].

That the goals and benefits should be known upfront is substantiated by Razmerita [27]. One of the main sources of failures by the implementation of a Social Media enhanced Platform in a case

study was a lack of strategy in how the platform should be used. Nobody had any idea how the company wanted to use the system, so right from the beginning, it was confusing.

Stocker & Müller [28] wrote in their paper about use and benefit of corporate social software. They endorse the importance of understanding the benefits of the new system. Employees with a higher perceived benefit are the users with the high factual use of the system. During the implementation, the needs should be clear and what the primary goal and benefits are, if this is the case employees are more willing to use it.

Sometimes companies think the implementation of the intranet is done, once it is being used. These companies underestimated the *care and maintenance efforts*. Companies have to plan on how the further maintenance and development of the tools will be carried out and how content will not become outdated [6]. Good care and maintenance of the system can be achieved by maintaining, monitoring and continuously evaluating the system [25].

Another challenge is the *lack of processes or alignment*. By the start of using a newly introduced social intranet, right processes of use should be described. For example, if the company introduces the intranet with a collaboration system, different people are going to collaborate in groups via the system. It happens that different employees are using the system differently because processes are not clarified. Therefore using the system can become unclear [23][24]. The wrong use of the system can be the result of a lack of experience within the company through the use of collaboration systems. If these kinds of problems occur, there should be support available to help employees solving their problems and ensuring that the system is used in the most efficient way [6][23][25].

During the implementation, the focus should already be on ensuring the *quality of content*. The system should provide production rules, and function that checks the compliance of rules and gives automated feedback. This controlling can be done via an automated checklist. This checklist could support different types of information well as document formats. By the use of this standardization of the intranets, quality of information is guaranteed [13].

It is also important to ensure content quality to prevent inefficient content in the social intranet [25]. As the knowledge management system of the intranet is not filled yet or filled with inefficient content employees can be less willing to use it, because they do not see the point of using it [23]. To increase the chance of making it a success providing sufficient information right from the start may help [17].

Another thing that needs to be kept in mind during the implementation is identifying the boundaries of the system and knowing who are going to use it. If the social intranet contains a knowledge management system that is used for boundary-crossing work it can be useful to introduce a network leader. With the right resources, the can coordinate and facilitate collaboration with the social network and ensure it is used in the right way [12].

#### 2.2.4 Attitude and Behaviour Challenges

The daily users of a social intranet are the employees of a company. Employees have their attitude and behaviour towards the introduction of new systems. The employees can have the feeling that they are forced to use the system. If this is the case, they are more likely to refuse it. Usage must be based on voluntariness to provide information [6].

Another issue that occurs among employees is their *prejudice* against social software. This prejudice can be the fault of an unclear benefit, but also a wrong social media policy. If employees do not see the benefits of the system, they are reluctant to use the system and rely on other systems. It can also be the effect of low self-confidence. If they do not see the benefit, it can be seen as a problematic system, and people avoid using the new system [6][23].

By keeping the attitude and behaviour of employees in mind, the highest value could be reached throughout the support of the communication via the social intranet. All the employees should feel "free" to use the intranet. The adoption of the intranet should always follow clear goals, which ought to be continuously monitored and if necessary adjusted, so the employees keep a good feeling about the system [29].

Another important aspect that needs to be kept in mind during the implementation is making sure all employees will be active users of the social intranet. Razmerita [27] did research a collaboration system using social media. She looked into the Social Media enhanced Platform Podio. By the implementation of Podio within the case company there was no organizational-wide training or introduction. As a result, one of the most significant challenges became ensuring that all employees are active users of the application. Now with this experience, the case company decided that all new employees have to follow an introductory training session about using Podio. These training go through the basic functionalities of Podio. Also, employees are being coached when needed. These

trainings and coaching conversations help to introduce Podio to new employees of the organisation and ensure that they will start using Podio right from the start. The roll-out of the new system must occur on an extensive base, and a hand full convinced users can already help by stimulating other for using the system [17]. The use of training is substantiated by Lykourantzou et al. [25]. They reported that user training is a highly significant factor to the success of a corporate wiki platform and it should consist of guidance regarding both the cultural and the technological aspects of the tool.

### 2.2.5 Company Structure and Management Challenges

The structure of the company also influences the implementation of the new applications. An aspect of this is the dynamics of an organization. The extent to which an organization's hierarchy can adapt to different situations. If the newly introduced social intranet changes anything to the organization, it is the question of whether the organization can maintain its current activities and align it with the social intranet. The transparency and resources of the organization can influence this. It helps the implementation if the employees can see the *involvement of the top management* or the *motivation* that the top management presents with a social software introduction. The top management influences the company strongly. If the employees see that the top management is using the system, they are more willing to use it themselves. This type of influence also applies to the middle management of the organization. If they are prejudiced against the system and employees notice this, they are less willing to use the new system [6][24][17]. This type of influence of managers is substantiated by Meske & Stieglitz [29] in their paper on the adoption and use of social media. Successful adoption of social media depends on the support of the CEO and a well-structured adoption process.

The mindset and competencies of managers dictate the manager's impact. Isaias and Antunes [20] did study Enterprise 2.0 implementation in small and medium companies. They suggest to measure the effectiveness of the newly implemented tools, in an example context of fierce competitiveness, need for accountability and budgetary constraints. As said managers play a vital part in the adoption of innovative technology, it becomes imperative to engage them with the new technologies, so that they can lead their companies towards a social intranet. The creation of a suitable measurement can help managers.

A summary of the challenges of implementation discussed above is given in table 3.

<b>Challenge/Problem Area</b>	<b>Overview challenges</b>
<b>Cultural Challenges</b>	<ul style="list-style-type: none"> <li>- Change of the working method.</li> <li>- Change of open knowledge sharing values</li> <li>- Social media policy of a company</li> <li>- Companies business strategy and culture</li> </ul>
<b>Technology and IT Challenges</b>	<ul style="list-style-type: none"> <li>- Good usability of the system to tackle the lack of competence of the employees</li> <li>- Influence of competing systems</li> </ul>
<b>Business Operation &amp; Process Challenges</b>	<ul style="list-style-type: none"> <li>- Benefits of new system not clear</li> <li>- Care and maintenance efforts after implementation</li> <li>- Lack of processes or alignment</li> <li>- Ensuring quality of content</li> <li>- Boundaries of the system</li> </ul>
<b>Attitude and Behaviour Challenges</b>	<ul style="list-style-type: none"> <li>- Attitude and behaviour towards new systems</li> <li>- Prejudice against social software</li> </ul>
<b>Company Structure and Management Challenges</b>	<ul style="list-style-type: none"> <li>- Involvement of management</li> <li>- Motivation of management</li> </ul>

Table 4 Challenges and Problems of Implementation of Social Intranets

## 2.3 Success Factors of Social Intranets

Based on the results of the previous two sub-chapters sub-question 1: “*What are the success factors of a social intranet?*” can be answered.

The answer to this question is presented by answering the two questions regarding the functionalities of a social intranet and how to implement a social intranet within an organisation. The success factors of a social intranet can be presented in requirements and an implementation process.

The requirements are developed from the identified functionalities of the social media and knowledge management and collaboration part of the social intranet. The requirements can be found in table 4, on the next page, and are presented based on the different concepts.

The following implementation process is developed based on the different challenges that can occur during implementation. The process is presented by the means of a checklist. Every point in this checklist should be checked in order to successfully implement a social intranet within an organisation.

- *Integrate social intranet into the company's business strategy and culture:* Once the company has decided to invest in a social intranet the company should adjust its business strategy and culture in such a way that it provides support for the new social intranet. It will make the final implementation go easier and harness competitive advantages [20][25][26][16].
- *Focus on competing systems and usability:* In the development phase, the focus should lie with competing systems and usability. A competing system can be a system that is currently used for specific processes and is to be replaced by the social intranet. The new social intranet should at least make these processes easier. Otherwise, the employees who are going to use the new system are less likely to use the new system [6][23][24].
- *Prepare different managers and implementing managerial tools:* To make the social intranet a success all managers from different levels should support the system. Therefore, it is essential to involve them and show them the right motivation for the system. It can help to create suitable measurement tools for the managers to measure the effectiveness of the newly implemented tools [6][17][20][24].
- *Appoint a social intranet coordinator:* The social intranet coordinator can provide support if problems occur among employees due to a lack of experience [6][23][25]. The coordinator also facilitates the use of the collaboration system for boundary-crossing work and helps to prevent problems with the use of the collaboration tool [12]. At last, the coordinator has the responsibility to keep the information on the intranet up to date.
- *Standardized guidelines and processes:* Guidelines are processes, rules and, supporting checklists that help preventing employees from using the system differently. These processes should prevent the system from becoming unclear. Furthermore, rules should help in maintaining the quality of content. Rules can help employees create knowledge in a structured way [23][24]. The use of checklists supports this. By the use of this standardization of the intranets, quality of information is guaranteed [13].
- *Fill the social intranet with enough content:* Once, the social intranet is developed and is ready to be implemented, it should be filled with information upfront. Employees will directly be able to see the point of using the intranet, and it will increase the chance of making it a success [17][23].
- *Start change management to show benefits and taking down prejudices:* Change managers can help the employees adjusting to the new intranet and showing them the benefits of it. It can be done by organising workshops, discussion sessions and training [6][12][17][25].
- *Step-by-step implementation:* Implement different parts of the intranet step-by-step. For example, start with the social media features and after a few weeks implement the next part, knowledge management. This step-by-step implementation will help the users gradually becoming accustomed to the new intranet [6].
- *Maintenance and care:* Once the system is fully implemented the company needs to ensure the maintenance and care of the system to develop the system further and ensuring the content will not become outdated. It can be achieved by maintaining, monitoring and continuously evaluating the system [6][25].

<b>Concept</b>	<b>Requirements</b>
<b>Social Media</b>	The social intranet must offer the possibility to create a personal profile for each employee. Personal profile information exists for example of the birthday, phone number, hobbies and skill profile.
	The social intranet must have the possibility to create an idea board and second-hand sales board.
	It must be possible to tag, rate or comment on social intranet posts.
<b>Knowledge Management &amp; Collaboration</b>	Different employees should have various tasks and responsibilities regarding the social intranet to make the general use of the social intranet more effective.
	The managers of the company need to support the social intranet to make it more useful.
	During the development of the Social Intranet, the focus should be on usability.
	The social intranet must provide mobile device support and platform stability.
	The knowledge management and collaboration tool must have a clear navigational structure.
	The knowledge management and collaboration tool must be managed by a moderator to prevent for example outdated content.

*Table 5 Requirements for a Social Intranet*

## 3. Case Study

In this chapter, the case study is presented. The case study is done to gather information about success factors and requirements on social intranets used in different segments. The information is gathered via multiple interviews that are conducted at three different organisations from three different segments.

The outline of this chapter is as follows: First, the methodology for the case study is presented. Second, the interview framework that is based on the methodology and results of subquestion 1 is presented. At last, the case study review method is presented.

### 3.1 Methodology of Case Study

The methodology of this Case Study focusses on identifying different success factors and requirements of a social intranet.

In order to identify success factors and requirements, several techniques can be used. The technique that suits this process the best depends on the situation. A process used for identifying success factors and requirements is requirements engineering. Once it is known what application needs to be developed, the requirements can be elicited. Requirements Engineering can be part of domain analysis. However, it is also conducted apart from domain analysis'.

The use of requirements engineering can help identifying requirements. The aim of requirements engineering is getting to know what to build before the development of the system starts in order to prevent high costs. Requirements engineering focusses on identifying, modelling, communication and documenting the requirements for a system, and contexts in which the system will be used. Requirements describe what has to be done, but not how to implement them. In overview, the requirements engineering process consists of five main activities: elicitation, analysis and negotiation, documentation, validation, and management [33].

Requirement elicitation is the process of discovering requirements and identifying system boundaries by consulting stakeholders. One of the elicitation techniques is the Classic/Traditional one [34]. Examples of these techniques are interviews, surveys, questionnaires, task analysis, and introspection. These techniques focus on the gathering of data. Two of these techniques are considered for this case study. The selected techniques seem the most suitable for gathering data about social intranets.

First, interviews. Interviewing is a method for discovering facts and opinions held by potential users and other stakeholders of the system.

Second, focus groups. Focus groups are an informal technique where a group of four to nine users from different backgrounds and with different skill discuss in free-form issues and concerns about features of a system prototype [33].

#### 3.1.1 Interviews

Interviews can be conducted for the collecting of qualitative data for uses analysis [30][31][32]. Interviews can be conducted with stakeholders, for example, employees, to get qualitative data about the artifact. In the case of this study a social intranet. Wilson [32] distinguishes three different types of interviews, *structured interviews*, *semi-structured interviews* and *unstructured interviews*.

- (1) *Structured Interview*. This is a verbal questionnaire in which the interaction is limited by a script and a fixed set of questions. It is used for obtaining general information, assessing knowledge about a subject, gathering focused information, asking specific questions, collecting uniform data and comparing results across different groups of users on a fixed set of responses.
- (2) *Semi-structured Interview*. This combines predefined questions like those used in structured interviews with the open-ended exploration of an unstructured interview. Interviewers that use the semi-structured interview approach generally follow a document called an interview guide, or interview schedule as presented in Appendix B. Semi-structured interview is used for gathering facts, attitudes and options, gathering data on topics where the interviewer is relatively sure about that the relevant issues have been identified.
- (3) *Unstructured Interview*. This is a conversation with users and other stakeholders with a general topic and agenda, but no predetermined interview format or specific questions. This one is used for gathering data on general themes, developing new insights, investigating a new product, exploring a new domain, gathering sensate information, understanding how experts solve problems and following up on a quantitative.

On first sight, semi-structured and unstructured interviews seem the most suitable for interviewing users of social intranets. It seems logical that every user uses the social intranet differently. Besides, different segments and companies have different social intranets. So, conducting a structured interview does not seem the best option. In Appendix C. the strengths and weaknesses of the other two options are showed in table 24 and table 25.

Based on the analysis of tables 24 and 25 in Appendix C. it seems that conducting semi-structured interviews is better for gathering the success factors and the requirements. The main reason for this is that it can be ensured that particular points are covered. Based on the results of chapter 2, the focus of the interview has to be on two points. First, the different functionalities and requirements of social intranets. Second, the implementation of the intranet. By conducting semi-structured interviews, it will be easier to find out if success factors occur more often within the same segment or between all the segments because the same questions are asked.

### 3.1.2 Focus Groups

Focus groups are group interviews where topics supplied by the moderator are discussed among the respondents with the moderator controlling the time spent on particular topics. Focus groups often take place at other places than the work sites of the employees. A focus group study is hardly based on a single event; usually, there is a series of three or more sessions to determine if there are any common and divergent pattern themes [32]. According to Wilson [32], focus groups can be used for eliciting the following:

- A range of ideas or reactions to a particular topic.
- Attitudes, preferences, and opinions on a topic.
- Information that could be helpful in designing other studies.
- Information is helping to understand confusing results from a quantitative study.
- Feedback on competitors
- Reactions to product concepts.
- General problems with a product or service.

Focus groups are most useful during the problem definition phase, requirement gathering, conceptual design and implementation phase. These groups can also be used to get feedback on products and services that are currently being used. In comparing the focus group technique with the different interview techniques, the strength and weaknesses are noted in Appendix C.

### 3.1.3 Suggestions for the Interview Framework

The case study for this research exists of gathering information from three different corporations for three different segments. It was challenging to find corporations that wanted to cooperation with this research. Therefore, it is decided to keep a low threshold. Based on the results of the previous two sections and the contact with a contact person of the corporation it was decided to conduct multiple semi-structured interviews scheduled for 30 minutes each. Interviews are less time consuming than focus groups. Semi-structured interviews are more suitable for this situation because several topics need to be addressed during the interview, but there are also topics not known yet because the different corporations are using different social intranets.

Therefore, the framework should be based on the semi-structured interview guide developed by Wilson [32]. In the next section, the framework is presented.

## 3.2 Interview Framework

Based on the methodology used for this case study and the results of the literature review done in chapter 2 an interview framework is developed for identifying the success factors of a social intranet. The framework that is developed for conducting semi-structured interviews and is based on the rough outline of a semi-structured interview guide developed by Wilson [32]. This framework can be found in Appendix B.

Wilson [32] developed a framework for interviews of approximately 90 minutes. For this research, the interviews will last approximately 30 minutes. This boundary condition time means that it is not possible to ask everything I want to ask during the interview. The framework developed for this research can be found in Appendix D. The translated version used for the interview can also be found in Appendix D.

The interview will last approximately 30 minutes. Therefore, choices had to be made. The main part of the interview will be the general questions and open discussion. In this part of the interview, it needs to become clear what the success factors of the social intranet in the specific

segment are. Two questions in this discussion focus on the implementation of the social intranet. As said, the last part of the interview will focus on the structured topics.

Because of the lack of time, only questions will be asked regarding the functionalities and requirements. The implementation questions are asked in the general part of the interview.

### 3.2.1 Interview process

Before the interview starts, a pre-briefing needs to be done. Preferably two days before the interview takes place. During the pre-briefing, the respondent is briefed about what is going to happen. The interviewer introduces himself or herself and explains the goals of the interview.

At the beginning of the interview, a pitch will be done to repeat the essentials of the briefing. After the pitch, the respondent is asked if the interview can be recorded for working out the interview afterwards.

The interview starts with some introduction questions like when did you use the social intranet for the last time? What functionalities do you use often? What functionalities do you never use? These easy questions will be asked to get the conversation going.

Once the interview is in progress more specific questions will be asked. These questions are the essential part of the interview and are focussing on the success factors of the social intranet in the specific segment. The following questions will be asked: What are the benefits? What does not work very well? How was the social network implemented in the organisation? What could have been done differently? Depending on the answers of the respondent follow up questions will be asked on the previously asked question.

During this open discussion, a checklist is kept. This checklist is used to know what structured topics already have been addressed during open discussion.

The interview starts with general questions of the social intranet. It is possible that the respondents will address topics from the structured topics. If this is the case, the interviewer can check in the checkbox whether it is discussed and if it is a part of the intranet, this only applies to the structured topic questions. The functionality of the checkbox is twofold. To check whether the topic has been discussed. Also, check if it is part of the intranet. So, no checkmark means that the topic is not discussed yet. Checkmark in yes means the topic is discussed, and it is part of the intranet. The last 10 minutes of the interview the interviewer starts with the structured topics.

The interviewer now knows what topics already have been discussed. So, focussing on the remaining questions from the structured topics is possible.

In the end, some closing comments will be made. Ideally, this will be done after 30 minutes, so all the time has been spent in the interview.

## 3.3 Case Study Review Method

In this subchapter, the standardised process for analysing the interviews is presented.

The interviews will be analysed in three steps. Each step focusses on the general findings of the general questions and findings of the structured topics. The findings of the case study review will be presented in Chapter 4.

### *Step 1: Individual analysis*

Each interview will be individually analysed based on the interview framework, interview recordings, and notes.

1. The general questions are worked out. If some specific success factors, requirements or other aspects are quoted they will be noted.

### *Step 2: Case analysis*

All the analyses of the interview of a specific case will be combined. This analysis will be done in three steps.

1. A word cloud will be made out of the interview transcripts.
2. The results of the general questions will be combined. If possible, quotes will be combined. If relevant, unique quotes will be presented as well.
3. The findings of the structured topics will be combined and worked out. The various standardised overviews will be combined into an overview for the specific segment.

Based on these results it will be checked how the case studies compared to the success factors from the literature review.

### *Step 3: Overall analysis*

In the last step of the analysis, all the results will be combined. The three steps from step 2 case analysis will be repeated for a total overview. This complete overview will be used for the development of a social intranet model.

## 4. Case Study Review

In this chapter, the results of the case study are presented. First, the results of the three different cases are presented. In the end, a complete overview is given of the results of the case study. The results of the different cases are presented in three ways. First, an introduction about the specific domain is given. Second, a word cloud is made out of the interview transcripts to highlight the most used words and terms. Third, the important findings and benefits of the case are presented. Fourth, general topics are discussed. At last, fixed topics are discussed. The fixed topics are presented in two ways. First, the functionalities that are used less and often are discussed. Second, specific topics about implementation and functionalities are discussed.

### 4.1 Municipality

#### *General information*

In the Netherlands are 380 different municipalities. In the area of Twente, there are fourteen municipalities. There are three big city-municipalities in Twente. The municipality that cooperates with this research has approximately 1500 civil servants employed.

#### *Social Intranet*

The municipality that is cooperating uses a social intranet for two years. This intranet also has a static and a dynamic part. That static part is called *the service square* and has all the information employees might need to use during the work. The dynamic part exists mainly from groups that can be created.

These groups can be created for formal and informal purposes. Within these groups, specific information can be shared, via Wikis.

Furthermore, the organisation uses a face book. Via this face book, it is possible to look up information on colleagues if they filled it in. Finding their interests, birthday and working hours is possible.

Lastly, the municipality has the ambition to develop the group functionality of the intranet further. They are looking for an integration with Microsoft Office 365 that should make it possible to work together on the same documents that are part of the intranet.

#### 4.1.1 Word Cloud of the Municipality Case



Figure 3 Word Cloud Municipality Case

Looking into the word cloud, the following words besides social and intranet stand out.

- Groups
- Messages
- News
- Search
- Colleagues
- Work
- Reading

Comparing these to the main benefits and important findings below it is the good representation of the interviews. The intranet is used to *search* for information about *colleagues*. Information is in this case a collective term for among other things phone number and working hours.

Furthermore, the respondents stay in contact by *reading messages* and *news*. Also, the respondents were talking about their *work* and the possibility of collaborating in *groups*.

#### 4.1.2 Main Benefits and Important Findings

Five employees of the municipality were willing to participate in this research. The employees are all working in different divisions of the municipality. The employees are using the social intranet for different purposes but they all had in common that they do not use the intranet for informal purposes. The main benefits and important findings of this case study are presented below.

##### *Main Benefits*

- ⇒ The social intranet of the municipality is often used to look up information about colleagues.
- ⇒ The respondents say that a significant advantage of the social intranet is to stay in contact with the rest of the organisation. Via the intranet, they can easily stay up-to-date.

##### *Important Findings*

- ⇒ The social intranet cannot easily be used for collaboration, because some key collaboration pieces like document version management, the possibility to collaborate at the same time in the document, and an action items overview are missing.
- ⇒ The social intranet pushes too many notifications to the users. The users do not know what's important anymore.
- ⇒ The knowledge base of the intranet is not used often because the structure is unclear and has low readability.
- ⇒ The different supervisors do not support the use of the intranet. Therefore, employees of the municipality do not feel obligated to use it.
- ⇒ None of the respondents is using the intranet for social purposes, for example, selling personal stuff on the second-hand sales board. The intranet is only used for work-related activities.
- ⇒ The social intranet of the municipality is easy to use and very intuitive according to the respondents.

#### 4.1.3 General Topics

The significant advantage of the intranet for the respondents is the possibility to look up information about colleagues. The respondents look up different kinds of information about colleagues, like phone number, where and when they are working, speciality and specific knowledge and when their birthdays are. Another significant advantage is the contact with the rest of the organisation.

All the respondents said that the advantage of the social intranet for them is staying in contact with the rest of the organisation. Via the intranet, they can easily see and read what colleagues are doing and what the municipality is up to.

The intranet has also functionalities that are working less well for the respondents. One of the first issues that was addressed by a respondent was the functionalities of the group collaboration. The respondent said that some key collaboration pieces are missing like document version management, collaboration at the same time in the same document, and an action items overview. Therefore, the municipality is testing to collaborate with Microsoft SharePoint. It is yet not known how this will collaborate with the current social intranet. It is still a possibility that the government is going to work with SharePoint and the social intranet or integrate these two applications and keep working with the intranet.

This collaboration problem is also the issue when civil servants have to collaborate with city council members. City council members cannot easily use the intranet. Specific groups have to be created for them because they are not allowed to have access to all the information that is shared on the intranet. The creation of specific groups makes it more difficult to collaborate. Furthermore, they

are using another application instead. This application, Ibabs, is used for discussing and processing council meeting document. Therefore, there is no need for using the intranet.

Another issue that has occurred was the use of notifications by the intranet. The respondents said that the notifications are useful, but if you use the intranet intensively you get quickly too many notifications. Approximately 25% of all the notifications are useful. The others are seen as spam and are not anymore notified by the respondents. The most useful notification is the e-mail that is send with information about most liked posts on the intranet. Via this notification the respondents can see what topic is important for them to read.

The knowledge base is not used very often by the respondents. There were some complaints about the knowledge base among the respondents. There was a complaint about the structure and how unclear it was. Another issue was the readability of the items in the knowledge base. It is not possible to use different fonts. Therefore, employees of the municipality cannot easily scan the text and read what they want to read. The respondent with the complaints was using other techniques to make it more readable, but this is not a good solution to the problem.

At last, there are some problems with the different supervisors within the organisation. One of the respondents has a higher function within the municipality. The respondent said the employees of the city have to read the intranet. Municipality news is only communicated via the intranet and not anymore via e-mail. Therefore, all the employees have to use the intranet to stay up-to-date. To achieve this some of the supervisors refer to the intranet as an information source. If someone did not read a new message, the supervisor is referring to the intranet and says you should have read it. Unfortunately, none of the other respondents was aware of this legislation. One respondent noted that his supervisor was supporting the use of the intranet, but not that much. So, the municipality has some clear rules about the use of the intranet, but the organisation is not able to give compliance to the regulations.

#### 4.1.4 Fixed Topics

In this section, functionalities that are used often and less by the respondents are presented, and specific topics about the implementation and specific functionalities are presented. The more detailed elaboration of the results can be found in Appendix E. In this section a summary is given.

##### 4.1.4.1 Functionalities that are used often and less

Based on the results of the interviews it is possible to say that the following functionalities are used the most often: Respondents use the intranet for looking up information about colleagues. The respondents search for birthdays, phone number, specialities and more. One respondent looks up colleagues based on their specialities: *"Sometimes I need information about a certain topic like asbestos. Then I search for asbestos in the intranet, and if the colleagues have filled this in as a speciality these colleagues pop up as a result, and I can get in contact with these colleagues."*

Besides, respondents are using the intranet for reading posts on the intranet and replying to them. The respondents read all kinds of messages from municipality news to specific group posts. The replies the respondents make on these posts are sometimes content related or just giving a compliment or to tag a colleague.

On the other hand, the following functionalities are used less. None of the respondents is using the social intranet for social and personal interaction with colleagues. One respondent said the following about this aspect: *"A second-hand sales board should not be part of a social intranet, it is too personal. Personal initiatives for charities can be presented on the social intranet, because it is for charities and the municipality should stimulate this."* They only use the intranet for work-related activities.

Furthermore, most of the respondents do not use the social intranet for collaboration with different project groups and colleagues. They prefer to use other tools or even contact in real life.

Almost all the respondents do also not use the knowledge base of the intranet. They do not need to look up information because they already know it or ask the right contact person if they need specific information. Another reason for this is that the knowledge base is hardly readable. The respondent says that it is difficult to put clear information online: *"It is difficult to write clear posts for the knowledge base because it is not possible to use different font styles and sizes."*

##### 4.1.4.2 Specific Topics

Based on the results of the interviews it is possible to say something about the implementation and specific functionalities of the intranet.

It can be said that the implementation of the intranet was done ok. Almost all the respondents knew how the intranet was implemented back in the days. It was apparently announced, and some

employees could become an ambassador. After the implementation, the employees of the municipality could attend some training or workshops. The municipality even organised after a year a new workshop to make more employees active in the use of the intranet. Nowadays it is also possible to watch some YouTube tutorials about the use of the intranet.

About the specific functionalities can be said that almost all the respondents have filled in their profile. Some respondents even filled in their knowledge and skill about certain topics to become better found when other colleagues are looking for them. Almost all the respondents know that the communication department is responsible for the main part of the intranet. There is only one process for the use of a specific part of the intranet. That is the process of posting a message in the general municipality news bulletin. Only one respondent said that a supervisor should have a supportive attitude regarding the social intranet. All the other respondents said that their supervisor was not that supportive of the use of the intranet. This is probably department dependable. At last, all the respondents said that the intranet is very easy to use. Most of them were also content with the navigational structure of the intranet.

## 4.2 Hospital

### *General Information*

In the Netherlands are around 315 hospitals. In the area of Twente, there are two hospitals. The organisation structure of Dutch hospitals is based on the way it is financed and the medical specialists that work in it. Based on legislation from the Dutch government hospitals have to control their finances, and the need to be profitable. The hospitals offer services for a fixed price, and production figures need to be achieved. Hospitals in the Netherlands are operated as businesses.

The hospital that cooperates with this research has yearly over 200.000 patients and, over 3200 employees take care of these patients every year.

### *Social Intranet*

The social intranet of the hospital is being used since October 2015. The intranet has a dynamic and a static part.

The static part is maintained by the communication team and is only used for knowledge management. Employees can find standard information about the processes and for example medicine books in the online hospital library.

All the employees maintain the dynamic part of the intranet. Employees can create their landing page that has some fixed widgets but also the possibility for widgets chosen by themselves. Employees have the possibilities to create groups for formal and informal businesses. Within these groups, it is possible to share messages and tag specific colleagues in these messages to notify them about the message and group pages can be created.

Pages are wikis with specific information for that group. For example, the group of the childbirth department has information in this page (wiki) that is only usable by themselves.

Another functionality of the intranet is personal and group cloud services. Employees can easily share documents and files via the intranets cloud.

Lastly, the intranet also has a face book. In this face book, it is possible to look up colleagues and find information about them.



- ⇒ The knowledge base of the hospital has double, inconsistent and not up-to-date information in it.
- ⇒ The respondents of the hospital do not use the intranet for social purposes.
- ⇒ The employees of the intranet do not use the intranet consequently. Therefore, messages are posted on the intranet and send by email.
- ⇒ All the respondents use the intranet to read intranet post. Most of them only read the general news messages about the hospital. Therefore, they want that these messages have a more prominent place on the intranet instead of the top left corner.
- ⇒ All the respondents are using the groups on the intranet for collaboration.
- ⇒ The use of the intranet is not supported and fostered by all the supervisors. Only two respondents are using the intranet frequently because their supervisor wants them to.

### 4.2.3 General Topics

The significant advantages of the intranet for the respondents are the possibilities to look up information in the knowledge base and to look up information about colleagues. Another advantage of the intranet was the knowledge base that is used to look up information for work activities.

The intranet had also some functionalities that worked less well for the respondents. The biggest issue of the social intranet was the search possibilities for looking up colleagues or specific departments of the hospital. The main problems were missing and inconsistent information. Employees of the hospital have to fill in their information. Some employees did not fill in everything and did not update their outdated information. The most significant problems are the inconsistencies with phone numbers and job titles. Phone numbers are most of the times not up-to-date or are even directed to a central number. Moreover, employees can fill in their job title. The fact that they can fill in them

job title results in that they write job titles differently and write the job title for example if a word starts with a capital letter or not, and sometimes they have different medical terms for the same job titles. Because of these reasons, the system is inconsistent with the available information about the employees and different departments.

Another aspect of the social intranet that did not work well is the knowledge base. According to the respondents, the knowledge base is unclear, and some of the information in the knowledge base is double, inconsistent and not up-to-date.

Furthermore, most of the respondents want the general news post on the intranet to have a more central and prominent position on the home page. Now it is on the left side with just the title of the new article. The respondents say that these news messages are more important for them than general intranet posts from random colleagues.

None of the respondents was using the social intranet for informal and personal purposes. Some of them were even irritated by colleagues because they were posting personal stuff on the intranet. They do not want to be bothered by a colleague that for example sells honey on the intranet.

At last, most employees from the hospital do not use the intranet that consequently. Therefore, information is still shared double, via the intranet and per email. Another issue is the inconsistency of use between several departments of the hospital. There is not a general procedure for the use of the intranet. Every department is using the intranet for its own purposes if the department is using it at all.

### 4.2.4 Fixed Topics

In this section, functionalities that are used often and less by the respondents are presented, and specific topics about the implementation and specific functionalities are presented. The more detailed elaboration of the results can be found in Appendix E. In this section a summary is given.

#### 4.2.4.1 Functionalities that are used often and less

Based on the results of the interviews it is possible to say that the following functionalities are used the most often: the intranet is used by the respondents for looking up colleagues and departments. They look up phone numbers and the location of specific departments in the hospitals. Almost all of the respondents are using the knowledge base of the intranet. The knowledge base is used for looking up meeting reports, manuals and specific procedures.

Furthermore, the intranet is used for reading different posts on the intranet. Most respondents use this functionality to read news about the hospital. Almost all the respondents said the following about new post on the intranet: *“I think the general news post about the hospital should have a prominent central place in the intranet. These messages are more important for the employees than*

*messages about another car damage or lost key*". Other respondents use the intranet for reading a specific post about the department where they are working.

The intranet is also used for collaboration. Respondents work together in groups. Within these groups, information about the patient (no medical) and documents are shared. One of the respondents said the following about collaboration via the intranet: *"We share personal information about the patient via the group, like if a patient is married for 40 years we give the patient a bouquet of flowers."* One respondent only used the group to inform about the implementation of a new software system in a specific department.

At last, the intranet is also used for getting quicker to a specific application. At the home page of the intranet, some shortcuts are presented to get quicker to a specific application.

#### 4.2.4.2 Specific Topics

Based on the results of the interviews it is possible to say something about the implementation and specific functionalities of the intranet.

It can be said that the social intranet was not implemented well in the hospital. The respondents that were working in the hospital during the implementation said that it was not well implemented. Two respondents that started working later in the hospital said that they did not have an introduction to the intranet in their first weeks in the hospital. Two respondents went to the communication department for support. The department gave them the support they needed. After the implementation, there was minor training. The training was not that extended and useful. One respondent said the following about the possibility of a training: *"I got a training for working with sensitive personal patient data. It could have been a possibility to spend the last 10 minutes of this training introducing the intranet to the employees. There was time left and could have been helpful."*

About specific functionalities can be said if the respondents are using them. Almost all the respondents filled in their profile. None of them filled in their work experience and skills. All the respondents know about the second-hand sales board, but nobody is using it. Four of the respondents know who is responsible for the intranet. They say that the communication department is responsible for the general part of the intranet and the group leaders are responsible for the different groups.

Furthermore, it can be said that respondent whose supervisor foster them in the use of the intranet are using the intranet more. Two respondents had a supervisor that supports the use of the intranet. These respondents were using almost all the parts of the intranet, including the group collaboration part. In the end, the intranet is easy to use and pretty intuitive. It can be better though if the navigational structure of the knowledge base improves. Currently, it is hard to find what you are looking for and some information is posted double on the intranet.

## 4.3 Housing Corporation

### *General Information*

In the Netherlands housing corporations provide building, managing and renting out living space. It is essential that this living space is affordable for the tenant. Think for example of social rental housing. Furthermore, the corporation's activities are carried out on a non-profit base. Many housing corporations were initially associations or foundations. In the nineties most, corporations became independent, and they have changed more and more into project developers. Besides, it was often the question of whether the corporations did work socially and did not develop expensive housing.

The housing corporation that cooperate with this research provides approximately 4.000 houses that are rented out, maintained and managed by this organisation. The organisation is doing this with more than 60 employees.

### *Social Intranet*

The social intranet of the housing corporation is called after a little guy. This name is made up by employees of the housing corporation for an internal contest about the new name of the social intranet. Furthermore, the little guy is the personification of the intranet.

The social intranet of the housing corporation is used for sharing messages, looking up colleagues, and downloading documents. The employees of the housing corporation are posting many messages on the intranet. These posts are about what they are doing on the job, but sometimes also personal stuff is shared.

The intranet also has some social functionalities consists of events, a face book, a second-hand sales board, a vitality part for sharing recipes, tips and sports activities, and a photo album for sharing photos from company activities.

It is also possible to download documents from the intranet. This feature has some similarities with knowledge management functionalities. Different documents and information are shared via this functionality of the intranet.

Furthermore, the users of the intranet can quickly look up who are working in the different teams. Furthermore, they can create new groups for new projects. In the project part of the intranet, specific information about the projects can be found.

The social intranet of the housing corporation has the status end of life. It is currently not known what the housing corporation is going to do with the intranet.

#### 4.3.1 Word Cloud of the Housing Corporation Case



Figure 5 Word Cloud Housing Corporation Case

Looking into the word cloud, the following words besides intranet stand out.

- Messages
- Document
- Information
- Work
- Groups
- Search
- Colleagues

Comparing these to the main benefits and important findings below it is an ok representation of the interviews. Respondents use the intranet to post, read, and reply on *messages*. The respondents also use the intranet to *search* for *information* about *colleagues*.

Furthermore, the respondents said that they are not able to *work* together via *groups*. Also, the respondents use the intranet to download *documents*.

In the word cloud are words missing about the second main benefits of the intranet of the housing corporation. The reason for this could be that the respondents used different terms to address this benefit of the intranet.

#### 4.3.2 Main Benefits and Important Findings

Five employees of the housing corporation were willing to participate in this research. The employees are all working in different functions. All the employees are using the social intranet for different purposes.

#### *Main Benefits*

- ⇒ All the employees of the housing corporation are using the intranet actively. Everyone is posting, replying and liking intranet posts.
- ⇒ The employees are fostered and supported by their supervisors to post messages on the intranet. The supervisors also are using the intranet frequently and meanwhile promoting the use of the intranet.

#### *Important Findings*

- ⇒ The biggest complaint about the intranet was the lack of speed. Sometimes it takes up to 30 seconds to complete a simple search task.
- ⇒ The lack of information at profiles of colleagues also frustrates the users of the intranet. It is not helpful if you cannot find what the working hours of a colleague are.
- ⇒ The lack of collaboration via the intranet is also a negative point of the intranet. Employees cannot collaborate in groups through the use of the intranet. They search for alternatives, so there is not one standard method for collaborating with your colleagues within the housing corporation.
- ⇒ The implementation of the intranet is done great. All the respondents say it went very well and should change nothing regarding the implementation.
- ⇒ There are no rules regarding the use of the intranet. Therefore, all the employees can decide how they want to use the intranet. If there is a problem, they can help each other or correct each other. The respondents say that this works fine.

### 4.3.3 General Topics

The social intranet of the housing corporation has two significant benefits. First, the whole organisation is using it. Every employee has access to the intranet and is using it. Even the so-called craftsmen who work out of the office maintaining the different rental houses. They can use the intranet via their smartphone. The second advantage continues further on the first advantage. Every employee is posting messages on the intranet. The employees who are working in the office share what they are doing and tell their colleagues if there is a new update. Even the craftsmen post messages on the intranet of for example a newly renovated kitchen with before and after renovation pictures. By the use of the intranet, all the employees keep each other informed, and that is seen by the respondents as a big plus of the social intranet.

The intranet has also some functionalities that work less well for the respondents. The main complaint about the social intranet was the lack of speed. There were several examples that it took approximately 30 seconds to act. It takes time to look up information about a colleague, to post a message or to search for information on the intranet. The lack of speed often results in frustrated users of the social intranet.

Besides the lack of speed of the search function of the intranet, it is not suited to search for all the information on the intranet. It only gives results of information that has been posted on the intranet at most a few months ago. The search engine does not give any results of information that has been posted on the intranet for more than a year ago.

Another issue with that frustrates users of the intranet is the lack of information about colleagues. The intranet can be used to look up telephone numbers, working hours and a profile picture of colleagues. It often occurs that the information is not up-to-date. The colleague can have changed his or her image to a cat picture or the working hours have changed. A suggestion for this problem from one of the respondents is making company rule for this part of the intranet. Everybody has to keep its personal information up-to-date.

The last issue that occurred more than one time among the respondents and was the lack of a collaboration tool. The intranet can create groups. These groups can only give an overview of who is participating in this group. If a message is sent within this group, everybody on the intranet sees this message in her or his timeline. This also applies to document sharing. Therefore, employees are using Dropbox to share documents and another employee tried to start working with a project management tool like Asana. One of the respondents works a lot with external people. The respondent started using Asana with these people and tried to introduce it within the housing corporations. Besides that, the colleagues of the respondent were not willing to use this tool it also not General Data Protection Regulation (GDPR) proof for the organisation.

#### 4.3.4 Fixed Topics

In this section, functionalities that are used often and less by the respondents are presented, and specific topics about the implementation and specific functionalities are presented. The more detailed elaboration of the results can be found in Appendix E. In this section a summary is given.

##### 4.3.4.1 Functionalities that are used often and less

Based on the results of the interviews it is possible to say that the following functionalities are used the most often: All the respondents are using the intranet to post and read messages. Posting and reading messages can be seen as the core of the intranet of the housing corporation. One of the respondents said the following: *"We are encouraged by our supervisor and colleagues to post about our working activities and other work-related news. It is also allowed to post jokes or personal information on the internet. All the employees are doing this, and that makes it a handy tool."*

Furthermore, the intranet is used for looking up information about colleagues. Respondents look up telephone numbers and working hours of colleagues.

At last, the intranet is used a lot to download specific documents like collective labour agreement, hr-documents and mileage declarations. One respondent is using it as follows: *"Colleagues can download documents for changes that I do have to make to the system, like personnel changes. They fill in what I have to change and send it to me. This works perfectly"*.

On the other hand, the following functionalities are used less. The intranet is hardly not used for group collaboration. It is possible to create groups but it is not possible to collaborate with these groups. Therefore, this functionality is not used often. Another function that is hardly used is the possibility to look up who are participating within teams and projects. One respondent specifically said that this function is not being used: *"I do not need to use this functionality of the intranet for my function. On the other hand, I also know the information is not up-to-date anymore because several colleagues left."*

At last, nobody is using the second-hand sales board of the intranet. One respondent used it once to sell IT hardware of the corporation.

##### 4.3.4.2 Specific Topics

Based on the results of the interviews it is possible to say something about the implementation and specific functionalities of the intranet. About the implementation can be said that all the respondents said the same. The respondents knew about the social intranet before it was implemented. They knew what they could expect and knew how they were supposed to use it. The communication employee was responsible for the intranet during and after the implementation. In discussion with her supervisors and direct colleagues, the communication employee decided to not offer any training and impose no rules to the employees about the use of the intranet.

One respondent said the following: *"It was a conscious choice that we made not to introduce usage rules. We trusted our employees, if something went wrong they would help or correct each other. Moreover, it turned out that it worked like this"*.

All the respondents say the intranet is easy to use and some even say it is intuitive. Furthermore, there were no problems with the intranet. Only big functioning problems related to the speed of the intranet.

About the specific functionalities of the intranet, the following can be said. All the respondents filled in their profile. They all filled in all the information their colleagues could need to do their jobs. None of the respondents is using the second-hand sales board for personal purposes. The intranet does not have a specific idea board. Instead, the intranet has a vitality place where for example healthy recipes and workouts can be shared. One of the respondents is using this place for sharing ideas about these topics.

The core functionality of the intranet of the housing corporation is that all the respondents are posting, reacting, and liking messages on the intranet. All the respondents also said that they are encouraged to post about their work on the intranet. Every employee of the housing corporation is doing it. It helps that the intranet is easy to use for the respondents and that they all know who is responsible for the intranet. If there is any problem, they can directly address the right colleague for solving them.

The navigational structure of the intranet can become better. Two respondents said that it is sometimes not clear what is downloaded if you click on it in the download section. The other point that could be better is the missing categories to find relevant information easily.

At last, there are some issues with the use of the second device. One respondent said that the craftsmen are using it. However, no craftsmen were interviewed for this research, and all the other respondents were not using it or cannot use it because of technical issues with it.

## 4.4 Complete Overview

In this sub-chapter and complete overview is given about the results of the different segments. The results are compared to the following four topics:

- (1) Word cloud of all the cases combined
- (2) Functionalities that are used often and less by a specific segment and what if the segment determines it.
- (3) How the social intranet is implemented in the specific segment.
- (4) Specific functionalities that were a result of the literature study done in Chapter 2.
- (5) How the responsibility of the social intranet is managed in the different segments and if managers and supervisors are supporting the use of the intranet.

### 4.4.1 General Word Cloud



Figure 6 Word Cloud Overview

Looking into the word cloud and comparing the general cloud to the others it is a good representation of the interviews.

#### 4.4.2 Often and Less Used Functionalities

In this section the functionalities that are used often and less by the different cases are discussed. First, the functionalities that are used often are compared and presented. Second, the functionalities that are used less are compared and presented.

##### *Looking up information about colleagues*

All the different cases use the social intranet to look up information about colleagues. In table 6 an overview is given.

<b>Looking up information about colleagues</b>		
<b>Municipality</b>	<b>Hospital</b>	<b>Housing Corporation</b>
4 out of 5	5 out of 5	3 out of 5

*Table 6 Overview of functionality for looking up information about colleagues*

As the table presents in all the cases, this functionality is used a lot. Based on the interview results, it can be a bit more specified. The respondent of the municipality that is not using this functionality said that it is not necessary to use, because the respondent is familiar with all the people in the organisation and therefore does not need to use the intranet. One respondent of the housing corporation is using an application on the work telephone. In this application, all the numbers of colleagues are listed.

All the three organisations had the same issue regarding the use of this functionality. In all the cases the personal information was not up-to-date. The main reason for this was the fact that the employees are responsible for their own information. In the hospital, employees could fill in their own function. What resulted in different function titles for the same jobs and therefore it became more difficult to find the right colleague. A common problem was the fact employees did not have a profile picture or missing information.

The housing corporation had one other functioning problem, and that was the speed of the functionality. It sometimes took 30 seconds to look up a colleague, what resulted in frustrated employees.

At last, the hospital was also using the functionality to look up the location of specific hospital departments. If a patient had to go to another department, the employee of the hospital could look up the right location of this department.

##### *Using the functionality of writing, reading, and replying on intranet posts*

This functionality can be split up in three parts. Writing intranet posts, reading them, and replying on them. Only the housing corporation is using all three functions, the others only on or two. In table 7, an overview is given.

<b>Writing, reading and replying on intranet posts</b>		
<b>Municipality</b>	<b>Hospital</b>	<b>Housing Corporation</b>
Reading and replying	Reading	Writing, reading, and replying
5 out of 5 / 4 out of 5	5 out of 5	5 out of 5

*Table 7 Overview of functionality of writing, reading and replying on intranet posts*

As the results present, in all the different segments intranet posts are read. The respondents of the three different organisations are using them for different purposes. In the municipality case, the respondents are reading municipality information, news posts, and information of groups. In the hospital case, the majority are only reading hospital news posts. Two others that are also actively using the group collaboration functionality of the intranet are reading new information of the groups. The respondents of the housing corporation case are reading all different kinds of intranet posts and are checking it multiple times a day.

Regarding reading new posts about the municipality and hospital multiple respondents from the different segments mentioned that the news posts should have a more prominent place on the intranet. In both cases, the new posts are posted in the top left corner of the intranet with a place for approximately ten posts. If a user of the intranet did not check the intranet regularly, it could be that the user missed an important post. Besides, the respondents said that they think it is more important to read specific news about their organisation instead of posts from a colleague that tries to sell own honey.

The respondents of the municipality and housing corporation also replied on posts. In both cases, they reply to compliment on posts, start a discussion or help colleagues if they know information about the topic.

The respondents of only one organisation are also writing posts on the intranet. The housing corporation has the internal rule that every employee should post about his or her working activities. Therefore, all the employees are posting updates and information colleagues about their work. In the hospital case, none of the respondents was writing intranet posts. One of the two respondents who actively used the groups for collaboration said that the supervisor of the department wants to write the posts. The supervisor wants to check everything before it is posted, and therefore the supervisor is posting on the intranet. All the respondents of the municipality did not feel the need to post on the intranet and update their colleagues about their working activities.

*The use of the knowledge base*

Only the respondents from the hospital case were using the knowledge base a lot. The housing corporation is not using an exact knowledge base, but the respondents are looking up knowledge and forms via a download functionality. Therefore, this functionality of their intranet is seen as a knowledge base for this research.

The municipality has a knowledge base, but only two respondents are using the knowledge base to look for information. One of the respondents has the responsibility to put information about a specific department in the knowledge base. The respondent has some difficulties with uploading a clear piece of text because only one font can be used and no headings can be added. In table 8, an overview is given about the use of the knowledge base by the different segments.

<b>Use of the knowledge base</b>		
<b>Municipality</b>	<b>Hospital</b>	<b>Housing Corporation</b>
2 out of 5	4 out of 5	3 out of 5

*Table 8 Overview of the use of the knowledge base*

The respondents of the hospital are all using the knowledge base. Only one respondent used it only for looking up the pay dates. Therefore, this respondent is not accounted for this functionality. All the other respondents are using it for looking up for example reports, manuals and specific procedures. One of the issues with this knowledge base was the lack of clarity. At some places, it has double information and sometimes the information is outdated.

The housing corporation has not a real knowledge base, but a download section. Meanwhile, it is used as a knowledge base. Some forms are downloaded here, but also information is looked up here for example meeting minutes.

*Group collaboration and short cuts at the homepage*

Only the hospital has two functionalities that are used often compared to the other segments. The functionality collaboration via groups is also implemented in the intranet of the municipality. The housing corporation does have a group functionality but not a real group collaboration functionality.

All the respondents of the hospital are using the groups for collaboration. Most of them are using it to get informed by their colleagues about specific information for their work. Others use it to share documents or even guiding an implementation process of a new computer application in a department.

The municipality is not using it for collaboration. Some say that they do not need to use it for their function. Others prefer to use other collaboration application like Wunderlist and Evernote. The main note against working together via groups on the intranet is that the real collaboration functionalities are missing. They cannot work efficiently together by the use of this functionality.

The intranet of the housing corporation does not have a clear collaboration functionality. They main note about this is that they want to start using it in the future if the intranet is developed further.

Another functionality that is unique for the intranet of the hospital are the shortcuts at the homepage. The intranet of the hospital has several shortcuts to other application that are used by employees of the municipality. Almost all the respondents are using these shortcuts and say they use it on a daily basis to get for example at the hour registration application.

**4.4.3 Implementation of Social Intranet**

Looking into the implementation of the Social Intranet it is possible to distinguish three different activities: the implementation itself, the support from the organisation and training that were offered. In the case of the hospital, it is also possible to look at how new employees are getting to know the intranet. Because two respondents were not working in the hospital during the implementation.

### *The implementation itself*

The respondents from the municipality case said the implementation was done ok. The organisation announced the intranet, and the municipality organised a contest for coming up with the best name for the intranet. Furthermore, the municipality appointed ambassadors. These ambassadors helped to develop the intranet. One of the respondents was an ambassador. The respondent was at first very content with the intranet. However, after implementation, the respondent was not content anymore and lost all the thrust in the intranet.

Only two respondents from the hospital do remember how the intranet was implemented. One did not know it anymore, and the two others did not work in the hospital yet. The two who remembered the implementation said it was an abrupt implementation without any announcement.

All the respondents from the housing corporations were aware of the new intranet before implementation. They became aware because a contest was organised for coming up with the best name. As a result, the intranet got a name and a little guy called Flint as intranet identity. The week before the implementation all the employees got mail at their home addresses with information about Flint. They all knew what they could expect. None of the respondents did remember any problems with the implementation, and they were still happy to use Flint as their social intranet.

### *Support in the use of the intranet*

In some cases, the communication department of the corporation offers some support for their employees. The respondents of the municipality case said that the communication department is responsible for the intranet. None of the respondents called for their help because they did know how to use it.

Two respondents from the hospital case asked the communication department of the hospital, who is responsible for the intranet, for help. The department explained how to use the specific functionalities of the intranet. One respondent got help with the establishment of the personal home page. All the others knew they could get help from the communication department.

All the respondents of the housing corporation case knew who is responsible for the intranet. They mainly go to them when there are functional malfunctions. Furthermore, they do not use the support. Besides, there are no rules for the use of the intranet. If there are any problems, the employees should help each other or address each other with the faults they made. As a result, all the respondents said that this works well, and there are no frustrations regarding the use of the intranet.

### *Training*

The municipality did organise some training and workshops after the social intranet was implemented. The training was optional. After a while, some new workshops were organised to get more people to use the intranet, and YouTube instruction videos about the functionalities of the intranet became available. According to the respondents, the training was not that necessary because it is easy to use. The respondent that was also an ambassador during the implementation said that it is good that the municipality is organising a workshop to get more people to use the intranet.

During the implementation of the social intranet in the hospital, there was minor training. One respondent had a specific administrator training. This training was during the implementation therefore not all the functionalities were working, and the training felt useless. New employees of the hospital do not get any training in the use of the intranet. The respondents who start working after the implementation in the hospital only got a standard tutorial once the intranet is used for the first time. One respondent who started working in the hospital after implementation training could be useful and could become part of other training we get about the use of the digital application.

The housing corporation did not offer any training. They said it is easy to use and the users cannot break anything. The only thing the employees got was a memo about the use of it. All the respondents said this was a good choice because the intranet is easy to use and intuitive.

#### 4.4.4 Specific Functionalities

During the interviews, the focus was one specific functionality that is part of an intranet retrieved from the literature study done in Chapter 2. In this section, we compare the face book, second-hand sales board, idea board, posting, liking, tagging, reacting, ease of use, navigational structure and devices.

##### *Face book*

<b>Use of the face book</b>		
<b>Municipality</b>	<b>Hospital</b>	<b>Housing Corporation</b>
4 out of 5	4 out of 5	5 out of 5

*Table 9 Overview use of the face book functionality*

Almost all the respondents filled in their face book, also known as a personal profile, in the intranet. Only two respondents filled in their face book partial. One did not share all the personal information, and the other did not have a personal picture.

In all the cases the employees can fill in their profile. They can decide what they want to fill in. In the hospital case, the employees have to use another application to fill in more specific data like function title, department and telephone number.

#### Second-hand sales board

Use of the second-hand sales board		
Municipality	Hospital	Housing Corporation
1 out of 5	0 out of 5	0 out of 5

Table 10 Overview use of the second-hand sales board

Only one respondent is using the second-hand sales board for personal purposes. Some of the respondents check the sales board for fun. Another typical, reaction from the respondents was that the second-hand sales board should not be on the intranet. People can sell their stuff on *marktplaats* (e.g. a large Dutch second-hand sales website) and should certainly not use it during working hours. At last, only one respondent used it for selling hardware from the housing corporation and therefore it is not seen as real usage.

#### Idea board

Use of an idea board		
Municipality	Hospital	Housing Corporation
1 out of 5	0 out of 5	1 out of 5

None of the intranets has an idea board that can be compared with a traditional idea's mailbox. At the municipality, only one respondent uses the intranet to share ideas. The sharing of ideas is done by posting specific questions and the use of polls. Some of the respondents said that it might be a good thing to add an idea board.

In the hospital, none of the respondents used the intranet to share ideas. A typical reaction to this question was that many colleagues are posting car damage and theft of personal items on the intranet. With the suggestion that maybe this should be done on a specific spot of the intranet and not in the general channel.

At the housing corporation, only one respondent shared ideas on the intranet. The ideas are shared in the vitality part of the intranet about food and health. Some respondents said that an idea board is not a good solution. The colleagues are only posting socially accepted posts. Also, if an idea might harm a colleague, it will certainly not be posted. One respondent saw the benefits of it and said it could certainly help.

#### Posting, reacting, liking and tagging

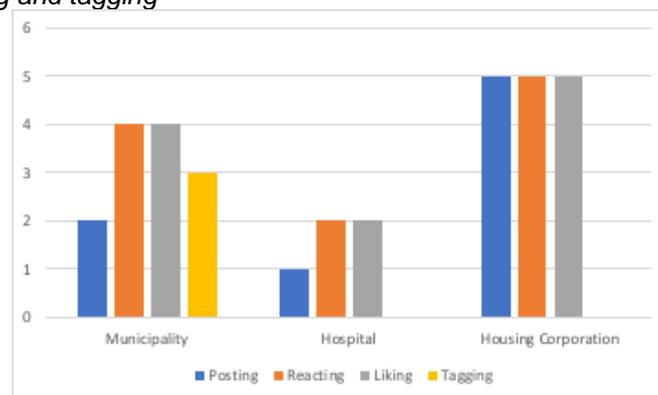


Figure 7 Overview posting, reacting, liking and tagging

The respondents use the different functionalities of the intranet in different ways. All the respondents of the housing corporation use all the functionalities that are available for them, they cannot tag each other because they do not have this functionality.

Two respondents of the municipality are posting intranet posts. One respondent is doing it because it helps with the function of the respondent.

The respondents of the hospital are hardly using these functionalities of the intranet. Only one respondent is posting messages, and this person also likes messages. One respondent only likes messages, and another only reacts on posts.

#### Ease of use

Ease of use of the intranet		
Municipality	Hospital	Housing Corporation
5 out of 5	3 out of 5	5 out of 5

Table 11 Overview ease of use of the intranet

Only two respondents of the hospital had problems with the ease of use of the intranet. They say it still does not feel natural to use. The respondents of the housing corporation were very content with the intranet, but the functioning could be better. The intranet is still very slow.

#### Navigational structure

Navigational structure of the intranet		
Municipality	Hospital	Housing Corporation
3 out of 5	0 out of 5	3 out of 5

Table 12 Overview navigational structure of the intranet

None of the navigational structures was as perfect as the ease of use of the different social intranets. The two respondents of the municipality case complained about the unsorted information and double information on the intranet. It takes time to find what you are looking for.

All the respondents of the hospital said the navigational structure is not good. It is hard for them to find what they are looking for in the knowledge base. It is not clear where you can find what information. Furthermore, it is not orderly once you click on a specific department. On the other hand, the navigational structure of the social part is clear, and the shortcuts at the home page are helpful as well, but sometimes it is easier to use the standard Windows path to find the application instead of the shortcuts.

Two respondents of the housing corporation said the navigational structure could be improved. One respondent had problems with the use of the icons on the left, and they do not tell what you are clicking on. The lack of information is also present when a user of the intranet wants to download something. It does not show what you are clicking on. At last, the lack of categories is a problem. By the use of categories, information could be quickly found.

#### Devices

Use of multiple devices for the intranet		
Municipality	Hospital	Housing Corporation
2 out of 5	2 out of 5	2 out of 5

Table 13 Overview of the use of multiple devices for the intranet

All the respondents of the municipality knew that the intranet could also be used on multiple devices. Only two are using it on their iPad or their telephone. The others do not want to use the iPad because of the token and extra time it takes to log in. Others said the intranet is only used at work from behind the desktop.

In the hospital, only one respondent did not know it could be used on multiple devices. Only two respondents use it sometimes on their telephone or iPad. The others do not use it on multiple devices and only use it at work from behind the desktop.

Only one respondent from the housing corporation case is using the intranet from an iPad. One other said the craftsmen are using it from their mobile phone. However, a respondent said it could not be used that easily due log-in problems.

#### 4.4.5 Responsibility and Support of Intranet Use

In both cases of the municipality and hospital, only one respondent does not know who is responsible for the intranet. The respondents think it might be the communication department. The other respondents say the same about who is responsible. The communication department is responsible for the general part of the intranet. The group leader or supervisor of a group is responsible for keeping the group up-to-date

In the case of the housing corporation, all the respondents know who is responsible for the intranet. They say that the communication employee is responsible for the functioning of the intranet. Problems are addressed to this employee. On the other hand, it is not clear who is responsible for the specific data on the intranet. The prevailing thought is that this is also the communication employee.

<b>Support of the use of the intranet</b>		
<b>Municipality</b>	<b>Hospital</b>	<b>Housing Corporation</b>
1 out of 5	2 out of 5	4 out of 5

*Table 14 Overview of the support of the use of the intranet*

In table 14, an overview is given about the support of the use of the intranet. In the first two cases, the intranet is hardly supported. Only one respondent of the municipality said the supervisor is supporting the use of the intranet. One other even said the supervisor is not using it and does not use it at all.

In the case of the hospital, only two respondents are using the intranet. Both respondents are using the intranet because their supervisor wants them to use the intranet to communicate about the work of their department. The others say that their supervisor is hardly using the intranet.

At last, almost all the respondents of the housing corporation say that their supervisors support it. Their supervisors are also using the intranet, sometimes this could be more, but they are supporting and are fostering the use of the intranet by their employees.

## 5. Analysis of the Results

In this chapter, the results of the case study will be analysed and some suggestions will be made based on the analysis. The results will be analysed using the results of the literature review done in chapter two. First, the developed requirements of chapter two are compared with the results of the case study. Second, the implementation checklist of chapter two is compared with the results of the case study.

### 5.1 Requirements of a Social Intranet

In this chapter, the requirements of the social intranet are discussed. The requirements of a social intranet are discussed on the basis of three concepts. First, social media related requirements. Second, knowledge management related requirements. Third and last, collaboration related requirements.

#### 5.1.1 Social Media Concepts

In this section different social media concepts are discussed. First, the use of a personal profile is discussed. Second, the possibility to have an idea board and second-hand sales board is discussed. Third and last, the possibility to tag, rate or comment on social intranet posts is discussed.

##### *Personal Profile*

*“The social intranet must offer the possibility to create a personal profile for each employee. Personal profile information exists for example of the birthday, phone number, hobbies and skill profile.”*

All the social intranets from the different case studies have the functionality of a personal profile or face book. In all the cases the employees can fill in personal details like phone number, skills, working hours, and they can add a personal picture.

The respondents from the three cases could fill in the following information: work phone number, working hours, department, function, skill/knowledge, a personal picture and personal information like home address, hobbies, and personal phone number. In all the three cases nobody filled in their personal, not work related, information. The typical reason for this is that it does not belong to work. Alternatively, the respondents do not want to share this personal information with any colleagues. The respondents do not want to mix private and work-related stuff.

Some of the respondents of the municipality case were only using the skills and knowledge section of the personal profile. It can be useful for them when they have to find a colleague with specific a specific knowledge or skill. For example, when a colleague is needed with knowledge about asbestos. It is possible to search on asbestos and get an overview with colleagues with knowledge about this topic. The functionality of skill and knowledge was not used in the hospital. The typical reason for this was that is pretty clear what the skill of a cardiologist is. The housing corporation is a smaller organisation compared to the others and the respondents of the housing corporation did not mention this functionality.

The biggest issue with the functionality of a personal profile was the missing and inconsistent information. In all the three cases the respondents get annoyed when they are looking for a colleague work number or working hours, and the information is not up-to-date or even missing. The hospital case had an extra problem with this functionality. The employees of the hospital can fill in their function, and the department, they are working. There are a lot of different medical terms for specific functions in the hospital or employees have multiple functions and only use the most important medical term. The use of different non-common terminology ensures that it is more difficult to find them. Furthermore, the employees of the hospital write job terms in alternative ways. The different ways of writing results in a lot of different filters that can be applied and does not make it quicker to find a colleague.

All the three different social intranets are using personal profiles. To improve this functionality, I suggest making it obligated for employees to fill in the personal profiles. It happens a lot that colleagues cannot find the right details. In the case of the function, departments, and eventual also the phone number of the employees it can be a solution to make Human Resources (HR) responsible. HR can ensure the data is correct and no typing's or other terms are used. It could help to link it to the personnel database. Furthermore, if parts of the personal profile are not used by the employees, remove them from the intranet. If it is hardly used then it is not necessary to be a part of the personal profile.

### *Idea Board and Second-Hand Sales Board*

*"The social intranet must have the possibility to create an idea board and second-hand sales board"*

#### Second-Hand Sales Board

As said in the previous chapter almost none of the respondents are using the second-hand sales board. The common reaction about this functionality is that it is private and has nothing to do with work.

I interviewed five respondents per case. Fifteen respondents are a small amount compared to the whole organisations. Therefore, I do not want to suggest to remove the second-hand sales board as functionality. I do suggest to give it a less prominent place in the intranet. Notify the employees of the second-hand sales board. If they want to stay up-to-date they could subscribe for it and then get notification about new stuff that is being sold. Furthermore, even if someone subscribed for the second-hand sales board, do not put new posts of this board on the main timeline of this employee. The employee can use for example the notifications to get to the sales board and then the timeline of the employee is not contaminated with personal stuff.

#### Idea Board

None of the intranets had a specific functionality of an idea board. Some respondents used the intranet to share ideas on the general part of the intranet or a more specific place on the intranet. The respondents also did not give a clear answer to the question if the intranet should have an idea board. The answers were divided as presented in the previous chapter.

Therefore, I suggest implementing an idea board. The idea board should be like a traditional idea mailbox. In this traditional idea mailbox, employees were able to share their ideas. The employees could choose if they wanted to do this anonymously. The function of sharing anonymous ideas could be added to the intranet. A little bit more research can be done into the correct implementation. For example, supervisors could have the responsibility to make anonymous ideas public if they are good for discussion or it is a possibility to directly post them anonymously on the intranet.

#### *Tag, Rate, and Comment on Social Intranet Posts*

*"It must be possible to tag, rate or comment on social intranet posts."*

In all the three cases it is possible to comment on social intranet posts. It is also possible to rate posts in the form of liking in all the three intranets. Only the intranets of the municipality and the hospital have the functionality of tagging someone. If a user of the intranet thinks a post is interesting for a colleague the colleague can be tagged and the colleague will get a notification.

The intranet of the housing corporation is missing this functionality. Currently, this functionality is not being missed, but some respondents said it could be useful if a next version of the intranet has the functionality of tagging or at least a functionality of getting notifications.

The functionality of commenting, tagging, and liking social media posts is still a core functionality of the intranet. It makes it possible for colleagues to communicate with each other, but also compliment on each other. Therefore, I suggest to maintain this functionality and ensure it has an extensive notification functionality combined. Tagging is only done to notify a colleague. The notification function has to be built in for that. Meanwhile, it can be extended with other possible notification and personal choices for receiving specific notifications.

One of the biggest issues regarding this functionality is that it is time consuming [9]. The respondents of the housing corporation are checking the social intranet multiple times a day and put time and effort in it to write posts and respond on posts. The respondents of the hospital put hardly any time in the social intranet. One of the reasons for this is that they are too busy working. The underlying idea of reacting, liking, and tagging is to get more people to use the intranet [9]. To achieve this, employees could be rewarded for sharing their thoughts and knowledge on the intranet. Rewards could be fixed salary or time to use the intranet, eventually this will increase the number of contributions [5][12][14]. Another possibility could be the use of gamification [33]. Gamification could make it more fun to use the intranet but research has to be done into the different organisations what kind of gamification will work and if it works.

### 5.1.2 Knowledge Management & Collaboration Concepts

In this section different knowledge management and collaboration concepts and some umbrella concepts are discussed. First, the two concepts are discussed in general. Second, the roles of different employees, outdated content and managers regarding the social intranet are discussed. Third, the usability and navigational structure are discussed. At last, mobile device support are discussed.

### *Knowledge Management & Collaboration Tools*

All the three social intranets have some knowledge management tools. All three have in common that employees can share information via intranet posts. These posts could be seen as blog posts. It is not sure whether they are exact blog posts, but they have at least one thing in common. The posts are written to inform and educate other employees [22].

The housing corporation has a place in the social intranet where documents can be downloaded. This place is used as kind of knowledge base that can be compared with the other cases.

The hospital and municipality case have in common that they have a knowledge base. This base is a passive system where the employees can pull off the information they need. Specific appointed employees put information in this knowledge base.

Looking deeper into the results of chapter two regarding knowledge management tools it is striking that the Wiki functionality is only used as group collaboration functionality in the hospital and municipality case. In the hospital case, it is called *pages*. The respondents of the hospital case did not use the functionality within their groups. It is not exactly known if the municipality is using it. None of the respondents clearly said that they were using this functionality a lot within a group in which they participated. The employee of the communication department that helped with scheduling the different interviews was positive about this functionality and said that departments share specific department information within the department group of the intranet. The results of the interview did not give this as a clear result.

Wikis is a knowledge management tool that can be used optimally for collaboration. Wiki technology can be used as a community platform to collaborate, for example, a specific department that works together in a group on the intranet. It can also be used as a personal authoring environment [9]. Anyone can create new pages as well as add, edit or delete content within an existing page [16].

Wikis are a good solution for groups and departments to share specific information that is relevant only for the group or the department. I think it can be interesting for all cases to make Wikis part of the group collaboration tools for specific knowledge sharing. It is important that each group has a wiki master that guarantees the up-to-date content and navigational structure. This wiki master can link content and label old content and help to organize content. A monetary reward should be considered to make it work [5][17]. Appointing a 'knowledge base master/moderator' and reward this person monetary also could be considered for the general knowledge base.

Looking deeper into the results of the case studies it can be seen that the collaboration tools are not functioning that well. None of the respondents was using all the collaboration tools of the intranets, some said real collaboration tools were missing, and some even used Evernote and Wunderlist as alternative. One respondent of the municipality said that they are doing a pilot with Microsoft SharePoint. They are doing this to be able to collaborate in the same Word document with multiple persons, share files in the cloud, and be able to do version management on documents.

Based on all the results I suggest collaboration via groups stay part of the social intranet but have to be upgraded with project management functionalities. The current group collaboration tools do not connect with the other used tools of the different organisation, for example, respondents of the hospital case said they could schedule meetings via the intranet, but no one does it because everything is scheduled via Outlook. At first, per organisation, it should be identified what kind of tools are currently being used and what is needed, like Wikis, file management, and being able to collaborate in documents.

### *Role of Employees and Outdated Content*

*"Different employees should have various tasks and responsibilities regarding the social intranet to make the general use of the social intranet more effective"*

In all the cases the communication department or employee are responsible for the functioning of the social intranet. If there are some problems, the employees are addressing these problems to the colleagues of the communication department.

Based on the interview results the hospital and municipality have employees with specific tasks regarding the intranet. Some employees are responsible regarding the information available in the knowledge base. They have to fill it and have specific rights regarding the use of the intranet. It is not known if the housing corporation has something similar. The respondents were not sure about this.

Based on all the results of the interview, I suggest that all the three corporations should ensure the responsible employees take their responsibility. A common reaction to the use of the knowledge base was that the information was outdated or not clear. Therefore, another employee

should address the responsible employees on their duties. This employee can also take the overall responsibility for the use of the system.

In the hospital and municipality case, many employees are not using the intranet right or are not using it at all. The communication department should make someone responsible for this task and ensure that more employees are going to use it and directly using it in the right way. This will make the use of the knowledge base more effective and more employees are willing to use it [12][13].

#### *Support of Managers*

*“The managers of the company need to support the social intranet to make it more useful.”*

Another issue regarding the use of the intranet is the support of the managers and supervisors of the company. In the housing corporation all the employees are using the intranet and this is stimulated by all the supervisors and managers. In the cases of the hospital and municipality a trend can be seen. The respondents who are using the intranet actively have a supervisor that supports and foster them to use it. One respondent of the municipality had a higher function within the organisation.

This respondent said the following: *“All the supervisors are stimulating their employees to use the intranet. Of course, not all the supervisors will do this, but in the end, they have to use it because some communication is only via the intranet.”* If we compare this quote with the responses of the other respondents from the municipality a difference can be seen. Clearly, the respondent with the higher function say that the organisation is doing well regarding this point. The other employees say some improvement can be made by the support of their supervisors.

Based on the results and this analysis, I suggest that the organisations put more focus on the responsibilities of the supervisors, managers, and directors within the organisation. If the management also uses the system, employees are more willing to use it [12]. In all the three cases the respondents with a stimulating and motivating supervisor are using the intranet more than the other respondents.

#### *Usability*

*“During the development of the Social Intranet, the focus should be on usability”*

The usability of all the intranets was good. The intranet of the housing corporation had some speed issues, but the overall usability was good. All the intranets felt in general very intuitive.

Based on the results of chapter two and the interviews, I suggest that the intranets can make the next step when they focus on visual buttons and excellent readability. Unless the good usability, this was sometimes an answer from the respondents that for example said that the knowledge base was not readable. It was not possible with the standard features from the internet to make it readable as you should read a website [13][34].

Furthermore, I suggest that all the intranets get a small tutorial that pops-up the first time it is being used and easily can be found if something is not clear on the intranet [13]. Only one respondent from the hospital case of all the cases named this feature.

#### *Navigational Structure*

*“The knowledge management and collaboration tool must have a clear navigational structure”*

The navigational structure was not good in all the intranets. None of the respondents of the hospital case was content with the navigational structure. They say it is hard to find what you are looking for and some information is posted double on the intranet. The respondents of the municipality and housing corporation case said overall that the navigational structure was ok. Sometimes it was not clear where exactly to find the information, and the information was not always up-to-date, but overall it was ok.

The navigational structure of the collaboration tool was good in the case of the hospital and municipality. The housing corporation did not have a real collaboration tool.

Overall it is important to have a clear navigational structure. Employees are looking in the knowledge base for information they need for their work. Many respondents said it was not clear where to find the information and sometimes information was double on the intranet. Therefore, I suggest that the companies develop a clear navigational structure with the help of tags. It is essential to put for example information about safety and security in the right place. It can help to tag the posts with safety and security tags. If an employee is looking for it via the search option of the intranet they can more easily be found.

All the different intranets had mobile device support. Employees could reach the intranet via the web browser of their mobile phone and iPad. In all the cases there were some problems with the use of this feature. In the cases of the hospital and municipality, the respondents had to use their token to login. This login process was time-consuming and therefore not optimal. Some of the respondents stopped using this feature because it took too much time. In the case of the housing corporation, there were some login troubles. Based on the results, it is not clear if all the employees have these problems.

I suggest that the different organisation look into the development of an application for their intranet. If an employee can easily use the intranet on multiple devices, they will be able to use it more often and share their thoughts and knowledge easily [13]. The application should be easy to use. If the security allows it, it should be possible to stay on. I can imagine that hospital employees are more using the social intranet if, for example, they can quickly enter it during breakfast to see all the updates.

## 5.2 Implementation Process of a Social Intranet

In this chapter, the implementation process of the social intranet is discussed based on the results of the literature review in chapter two and the results of the case studies. During the interview, two questions were asked specifically regarding the implementation process. Another question relates in a certain way to this implementation process. First, the integration of a social intranet into business strategy and company's culture is discussed. Second, focus on competing systems and usability are discussed. Third, preparing managers for the use of a social intranet. Fourth, standardising guidelines and processes are discussed. Fifth and last, the change management of the implementation process is discussed.

### 5.2.1 Integrating Social Intranet into Business Strategy and Culture of the Company

Implementing a social intranet brings different challenges. There are three challenges regarding integrating a social intranet into the business strategy or culture of a company. First, change in working method. Second, knowledge-sharing values of the employees. Third and last, the social media policy of a company [6][23][24].

Looking into the results of the case studies, it can be said that the last challenge was not an issue for all the three companies. In all the cases the social media policy of the company was not used regarding the use of the intranet and more specific the informal use of the intranet.

The second challenge was not mentioned either by any of the respondents. None of the respondents mentioned this issue or gave indications that this was the issue. In the cases of the hospital and municipality were many employees that still do not use the intranet regularly. It still could be an issue for the other employees that there is no willingness of the employees to share knowledge and collaborate [6][23][24]. Comparing this case with the case of the housing corporation, it can be said that all the respondents of the housing corporation are willing to use the intranet and share their knowledge and stories.

Looking deeper into the results of the case studies regarding the first challenge it can be said that the housing corporation did overcome this challenge quickly. All the respondents were aware of the introduction of the new intranet. Furthermore, they were told how to use the new intranet by telling what you are doing and telling what you know via the intranet. In comparison, the other two cases did do nothing regarding this point. The municipality did organise a naming contest but nothing more. Looking at the differences in the use of the intranet, the housing corporation did do a great job. They took down the first two challenges.

Based on this analysis, an example can be taken from the housing corporation. Based on the results, the whole organisation is using the social intranet. Unfortunately, I cannot say if this will also work for the other two organisations. The hospital and municipality are two larger organisations with a lot more employees. Just as mentioned in the previous chapter, a solution to this problem can be the introduction of an incentive structure. The use of incentives can motivate employees using the social intranet in a good way [5][13][25].

### 5.2.2 Focus on Competing Systems and Usability

As said in the previous chapter all the social intranet had good usability. There were hardly any complaints from the respondents about the usability. Therefore, the challenge of the lack of

competence of the employees has been overcome. This challenge is tackled by good usability [6][23][24].

The other challenge, the influence of competing systems is a difficult one. Only one respondent from the hospital reverted to a function in the previous intranet that was better. The search function in the previous intranet was better and gave the possibility to find whatever you needed quickly. In the other cases, there was no reference to previous intranets.

On the other hand, there is influence of competing systems. In all the three cases respondents are using other systems and application because they are easier to use or have more functionalities. The hospital intranet has the functionality of scheduling meetings; instead Outlook is being used. The housing corporation has no functionalities for collaboration and easy document sharing, so respondents are using other systems like Dropbox. The municipality is missing the right collaboration tools. Therefore, respondents are using other applications like Evernote and Wunderlist.

Based on the results I suggest that the organisations will identify all the other applications used by the employees. The hospital and housing corporation can take an example of the municipality. The municipality noticed that they needed more collaboration tools and are now doing a pilot with SharePoint. It is not yet known what this will mean for the intranet.

### 5.2.3 Preparing Managers and Implementing Managerial Tools

All managers from different levels should support the system to improve the use by the employees of the organisation. It is essential to involve managers and show them the right motivation for the system. Measurement tools can help managers measure the effectiveness of the intranet [6][17][20][24].

First, none of the organisation has managerial tools for measuring the use of the intranet. Only the hospital is currently looking into similar tooling. An employee of the hospital that is responsible for the intranet said in a meeting before the case study that they are looking with the developers into some tooling to measure the use of the intranet and do something with all the data.

Based on the case studies there can be said that only the housing corporation prepared their managers. Everybody within the housing corporation is using the intranet regularly. As said before, the housing corporation has less employees than the hospital and municipality, so fewer managers to prepare.

The respondents from the hospital that were using the intranet regularly said that their supervisors stimulated the use of the intranet. Unfortunately, this was not the case for all the respondents of the hospital.

The case of the municipality is an interesting one for this challenge. One of the respondents had a higher function within the organisation. The respondent said that all the managers and supervisor should stimulate and foster the use of the intranet. The opposite was correct according to the other respondents. A reason for this can be the size of the organisation and maybe the small number of respondents, but it can be interesting for the municipality to dig deeper into this.

Based on the results of the case studies and literature review, I suggest that all the organisation should inform managers and supervisors about their role regarding the social intranet. They have an essential role in getting more employees to use the intranet. A managerial tool could be helpful for them.

### 5.2.4 Standardising guidelines and processes

One of the challenges is ensuring the employees do not use the system entirely differently. Guidelines, rules and supporting checklists can help in maintaining the quality of the content and ensuring the intranet is being used as it should be used [23][24].

First, one case needs to be highlighted specifically. The respondents of the housing corporation said that there are no guidelines, rules, and supporting checklists. Before implementation, the organisation decided not to make any rules regarding the use of the intranet. They trust their employees, and they believed in the self-correcting ability of the employees. All the respondents said this worked out and there were no problems regarding the use or employees that use the intranet so differently that it frustrates others. This result is the opposite of the results of the literature review from chapter two. It is not known if the size of the company has an influence on this result. The used literature does not provide any information about this.

The two other cases had one procedure. The employees of the hospital and municipality had to start this procedure if they want to post a news message as general hospital news. The communication department has to approve this message before it is posted. There were no further guidelines and processes that helped with maintaining the quality of content or stimulated the use of the intranet.

Looking deeper into these two specific cases, it can help both organisations to introduce guidelines and checklists regarding the use of the knowledge base. Both knowledge bases had uncleared and ambiguous information in it. To prevent this from happening guidelines and checklist can be entered within the organisations [13].

Guidelines and rules can also help with the groups. Both intranets had a lot of different groups. Some groups were not active anymore. Guidelines can help in cleaning up the intranet and, in the future, keeping it clean. For example, if a group is inactive for three months, a group supervisor gets a notification if the group needs to be archived. The group's supervisor can decide if it needs to be archived, if the supervisor does nothing and the group stays inactive, it can be archived three months later automatically.

Therefore, I suggest that the big organisations should introduce more rules and guidelines regarding the use of the intranet. The organisation should identify the main struggles with the intranet and implement step-by-step the new guidelines and rules based on importance. The housing corporation can keep their way of working like this. If they become more significant or are going to work with groups for collaboration they should also consider some rules for maintaining the intranet.

### 5.2.5 Change Management and Taking Down Prejudices

Change managers can help the employees adjusting to new intranets and showing them the benefits of it. It can be done by organising workshops, discussion sessions and training [6][12][17][25].

None of the organisation organised a lot of workshops, discussions sessions or training regarding the use and acquaintance of the intranet. The housing corporation case did this by integrating the new social intranet in its business processes and company culture. The hospital and municipality did organise after the implementation, according to the respondents, nothing obligated. After a while, the municipality organised a kind of workshop to get more people to use the intranet. This workshop was also not obligated for the employees of the municipality.

In the cases of the municipality and hospital, I suggest appointing a change manager. The appointment of the change manager needs to be done after the intranet has been updated and adjustments have been made regarding the use of the intranet. The change manager will only have effect if all the other steps, of the suggested implementation procedure done in chapter two, have been done. Retaking the steps can help to tackle old frustration from the employees. The change manager can subsequently show how it can easily be used and what all the benefits are comparing to other systems and applications.

## 6. Conclusion, Discussion & Future Work

In this chapter, the conclusion of this study is presented. The contributions to the practice field and the scientific field are presented. Furthermore, the validity of the results is discussed. Finally, the limitations of this study are presented, and recommendations for future work are made.

### 6.1 Results Research Questions

In this section are the answers presented on the research questions that were presented in chapter 1 of this report.

#### 6.1.1 Research Subquestions

##### **SQ 1. What are the success factors of a social intranet?**

*1a. What functionalities should a social intranet have?*

*1b. How can a social intranet be implemented within an organisation?*

The success factors of social intranets consist of two main factors. Namely, the specific functionalities an intranet should have and the particular implementations steps that need to be taken for a successful implementation of the intranet. The functionalities are presented as requirements in table 21. The requirements are divided into two concepts, social media, and knowledge management & collaboration.

Concept	Requirements
<b>Social Media</b>	The social intranet should offer the possibility to create a personal profile for each employee. Personal profile information exists for example of the birthday, phone number, hobbies and skill profile.
	The social intranet should have the possibility to create an idea board and second-hand sales board.
	It should be possible to tag, rate or comment on social intranet posts.
<b>Knowledge Management &amp; Collaboration</b>	Different employees should have various tasks and responsibilities regarding the social intranet to make the general use of the social intranet more effective.
	The managers of the company need to support the social intranet to make it more useful.
	During the development of the Social Intranet, the focus should be on usability.
	The social intranet should provide mobile device support and platform stability.
	The knowledge management and collaboration tool should have a clear navigational structure.
	The knowledge management and collaboration tool should be managed by a moderator to prevent for example outdated content.

Table 15 Overview Functionality Success Factors Social Intranet

The following implementation steps need to be taken for successful implementation of the social intranet according to the literature review. The process is presented by means of a checklist below. The extended version of this checklist can be found at the end of chapter two.

- *Integrate social intranet into the company's business strategy and culture.* This provides support for the new social intranet and will make the final implementation go easier.
- *Focus on competing systems and usability.* The new social intranet should make the work of the employees easier. Otherwise, the employees are less likely to use the new system.
- *Prepare different managers and implementing managerial tools.* If the managers of the company are supporting the social intranet and see the benefits. Their employees are more likely to use the system if their manager also uses and supports it.
- *Appoint a social intranet coordinator.* The coordinator can provide support if problems occur among employees. The coordinator has also the responsibility to keep the intranet up-to-date.
- *Standardized guidelines and processes.* These guidelines and processes help preventing employees from using the system differently. Furthermore, it helps maintaining the quality of the content.
- *Fill the social intranet with enough content.* When the employees are starting to use the new intranet, they will be directly able to see the point of using the intranet.

- *Start change management to show benefits and taking down prejudices.* Change managers can help the employees adjusting to the new intranet and showing them the benefits of it.
- *Step-by-step implementation.* This step-by-step implementation will help the users gradually becoming accustomed to the new intranet.
- *Maintenance and care.* Once the system is fully implemented the company needs to ensure the maintenance and care of the system to develop the system further and ensuring the content will not become outdated.

## **SQ 2. What are the success factors of social intranets in the case studies?**

Looking deeper into the results of the case study it is possible to identify several success factors of social intranets. The success factors of social intranets can be divided into four different groups: *Social Media, Knowledge Management, Collaboration, Implementation*. A summary of these success factors can be found below. In table 22, on the next page, is an overview given of the success factors in the different cases. The colours indicate if the intranet makes use of this success factors. When the colour is green the success factor contributes greatly to the intranet. If the colour is yellow, the success factor contributes to certain extent. And when the colour is red, there is no contribution. All the results can be found in Chapter 4, and more specifically why a case scores better or worse than the other case.

### *Social Media*

The intranets are using social media techniques for different purposes. In every case, the intranet is used to look up colleagues via a face book or personal profile. The users of the intranet of the hospital also use the intranet in to look up specific departments where the colleague is working. Another important aspect of social media technique is communication. Employees use these tools to communicate with each other by posting and reading messages on the timeline of the intranet. Users post a different kind of messages on the intranet. Respondents prefer to read general news post on the intranet to stay up-to-date about the organisation. Another aspect is the possibility to react, like, and tag on social intranet posts. Via these functionalities' employees can interact with each other about the intranet post.

### *Knowledge Management*

The intranets are using knowledge management system (KMS). This system has a supply-side and a demand-side. Via the supply-side users of the intranet can get their information. Via the demand-side users can share their knowledge.

The supply-side looks like a fixed knowledge base in the hospital and municipality case. This base is used by the respondents to gather different kind of information they need for their work.

The demand-side of the KMS is used within in the intranet in three forms. Knowledge is shared via messages on the timeline of the intranet. Knowledge is shared via Wikis in groups. These groups are used for collaboration, and one of the collaboration tools is a Wiki. Lastly, knowledge is stored by users in the fixed knowledge base. Specific users are allowed to put information into this fixed knowledge base.

### *Collaboration*

The intranets of the hospital and municipality can be used for collaboration. Employees can collaborate in so-called groups. These groups can be formed out of different employees from the whole organisation or can be formed by employees from one specific department. The people in these groups can collaborate. Ideally, the groups have collaboration tools like file sharing, file version management, action point overview, project management tools, collaboration possibilities for collaboration in the same document.

### *Implementation*

The success of the intranet is determined by the implementation of the intranet. Based on the results it can be said that it is important to announce the intranet carefully. In the case of the housing corporation all the employees knew why they should use the intranet and how it should be used. The housing corporation announced this using a brochure that was sent by mail to the home address of the employees. Another important aspect that made the intranet of the housing corporation a success is that the supervisors are supporting the use of the intranet. It shows that everybody within the organisation is using it. Therefore, employees are encouraged to keep using the intranet to stay up-to-date.

	Success Factors			
	Social Media	Knowledge Management	Collaboration	Implementation
<b>Municipality</b>	Used to look up colleagues.	Hardly used to look up different kind of information.	Intranet has some collaboration tools, but they are not useful. So, it is not used by the respondents.	Implementation is not done great. Not all the employees are using the intranet regularly. Also, not all the supervisor supports the use of the intranet.
	Only used by respondents for reading and replying on intranet messages. Not used for posting messages.			
<b>Hospital</b>	Used to look up colleagues.	Used to look up different kind of information.	Intranet has some collaboration tools. They are not all used, but some of the respondents use them frequently.	Implementation is not done great. Not all the employees are using the intranet regularly. Also, not all the supervisor supports the use of the intranet.
	Only used for reading intranet messages. Not used replying or posting intranet messaged.			
<b>Housing corporation</b>	Used to look up colleagues.	Intranet does not have a real knowledge management tool. There is only some place for downloads.	Intranet does not have any possibility for collaboration.	Implementation is done great. All the employees of the housing corporation are using the intranet on regular base.
	Used by all the respondents to post intranet messages, reply on messages, and liking messages			

Table 16 Overview Success Factors per Case

### SQ3. What aspects should be used based on success factors of a social intranet from a literature review and case study?

The following aspects should be part of an intranet. Some of the aspects contain the word implementation. This word is added to remark that is it about the implementation of the intranet. More information about the aspect can be found in Chapter 5.

#### *Personal Profile*

The social intranet needs a personal profile. Respondents of the different cases are using the personal profile of their colleagues to look up information like birthdays, phone numbers, and their colleagues specific set of skills. It is essential that the information in the personal profiles is correct and organised. Otherwise, it is not useful for the employees of different organisation to use. More discussion about personal profiles can be found in Chapter 5.

#### *Idea Board*

The idea board should be part of the social intranet. The use of the idea board enables the employees of the organisation to share their ideas about all kinds of topics. It can help to keep the general timeline clean. Employees are sharing their ideas in the idea board. On the other hand, it can enable employees to share their thought more easily. It could be implemented like a traditional idea mailbox. The employees could choose if they want to share their ideas anonym.

#### *Tag, Rate, and Comment on Social Intranet Posts*

The functionality of commenting, tagging and liking social media posts is a core functionality of the intranet and makes the intranet social. Tagging is important to notify colleagues about posts and should give a notification pop-up on a tagged person home screen of the social intranet. Rating and commenting stimulate users to keep using the intranet and start communicating with colleagues. These functionalities enable employees to communicate with all the employees of the organisation and get to know what is happening within the organisation.

To stimulate employees to start using these functionalities the corporation should think about incentives for their employees. Incentives can be rewards in the form of a monetary reward or gamification could be used.

### *Knowledge Management System*

The intranet needs to have a knowledge management system where the organisation and colleagues can share and find knowledge that is needed at work. Employees can quickly find knowledge via the base that they need for their work. A fixed knowledge base can be put in a central place in the intranet. This fixed base can contain information that is relevant for all the employees of the organisation like, the collective labour agreement. It is important that this knowledge base is clear, easy to use, and has no double information.

### *Collaboration Tools*

The intranet should have tools that make it possible to collaborate with colleagues on specific projects or share information among a department. Colleagues should be able to collaborate by the use of the intranet. The intranet should contain collaboration tools like Wiki, file management and being able to collaborate with a colleague at the same time in a document.

It is essential that the collaboration tools of the intranet match the wishes of the employees. Employees are going to use other tools if the tools of the intranet are not satisfying. The respondents of the case study named several other tools like Evernote, Wunderlist, Dropbox, and Asana for collaboration. If the collaboration tools of the intranet meet the wishes of the employees, they are going to use the intranet more regular.

### *Specific Roles Regarding Use of Intranet*

Once an organisation is going to use the social intranet, it should appoint several roles to employees of the organisation. These roles can help to maintain the intranet.

One of the roles can be to keep the data in the fixed knowledge base clean and up-to-date to ensure the ease of use of the database.

Another role can be to stimulate colleagues to use the intranet. One of the employees could organise workshops or check if the use of the intranet needs help. The employee with this role is responsible for stimulating the use of the intranet.

The last role can be a Wiki master. It is essential that each department is sharing department specific information via the Wiki of their group. To keep the data in this Wiki up-to-date a wiki master can be appointed. The Wiki master has the same role as the employee that is responsible for the fixed database but only at another level.

### *Mobile Device Support*

Once an organisation is going to use a social intranet, they should consider investing in a mobile application. Mobile device support stimulates the employees to use the social intranet more. It makes it possible to use the intranet from different locations. For example, an employee can read new posts during breakfast or while travelling by public transport.

### *Implementation – Integrate Social Intranet into Business Strategy and Culture of the Company*

Before an organisation is going to develop or invest in a social intranet, they should think about how to integrate the use of the intranet into its business strategy and culture of the company. In order to optimally use the social intranet, it is important to know upfront why you want to implement a social intranet. The use of the intranet could change the business strategy and the company's culture. If the new social intranet does not match the business strategy and culture of the company, it can be challenging to get the employees to start using it.

### *Implementation – Focus on Competing Systems and Usability*

Before an organisation is going to develop or invest in a social intranet, they should think about the current systems that are used within the organisation. It is essential that all the employees see the usefulness of the newly implemented intranet and they start using it instead of the old systems or alternatives that work better.

Besides, it is also important to think about the usability of the intranet and more specific the navigational structure of the intranet. When employees can use the intranet very easily and can quickly find the information they are more willing to use it on a regular base.

### *Implementation – Preparing Managers*

Just as important as integrating the new intranet into the business strategy and culture of the company is to get the support of the managers. Once the managers and supervisors of the organisation see its

usefulness, they are more willing to use it by themselves. When the managers and supervisors start using the intranet, their employees are directly stimulated and fostered also to start using the intranet.

#### *Implementation - Standardising Guidelines and Processes*

Large organisations who are going to use a social intranet should implement guidelines and processes regarding the use of the intranet. The organisation should identify the main struggles with the intranet and implement step-by-step the new guidelines and rules based on importance. The use of these guidelines and processes should keep the intranet clear and up-to-date and ensure the regular use of the intranet by the employees.

#### *Implementation – Change Management and Taking Down Prejudices*

It is essential to inform the whole organisation about the upcoming social intranet. Employees should be informed about how to use the intranet, but also why they should use the intranet. A change manager could help taking down prejudices from the employees within the organisation. The change manager could organise workshops, discussion sessions, and training, to ensure the regular use of the intranet by the employees.

### 6.1.2 Main Research Question

Based on the results of the research subquestion the following main question has been answered.

*“What are the requirements for a to be developed social intranet, based on the success factors identified in different segments and different social intranets?”*

The requirements of the development of the intranet can be divided into two types of requirements. Functional Requirements (FR) and Implementation Requirements (IR). The FR can be divided between four groups, namely social media, knowledge management, collaboration, and implementation, and a general group. All the requirements can be found in table 23 and 24.

Looking deeper into the results and the requirements it is possible to make several conclusions that need to be considered during the development and implementation of a new intranet. The conclusions are discussed per mentioned group. The implementation of the requirement determines the success of the FR. Therefore, the first five functional requirements are closely related to the IR. In table 25, an overview is given of the interconnections between the different requirements. Two colours are used in the table. The green colour is used when it applies for all the three case studies. The yellow colour is used when it applies for two out of three case studies.

#### *Social Media*

These requirements represent functionalities that are founded on social media technologies.

- FR1 focuses on the personal profile of the social intranet. The personal profiles of employees are used to look up information about colleagues like phone number and working hours. In all the three cases this functionality was used a lot. In all the three cases the respondents had problems with this functionality. Most of the times the information was not up-to-date or even missing. Therefore, I suggest structuring this part with guidelines and processes like mentioned in IR 3. The guidelines should ensure that all the employees fill in their information.
- FR 2 is about the implementation of an idea board for sharing ideas anonymously. In all the three cases it could be beneficial. Employees can easily share their ideas and helping improve for example their working environment or specific procedures. To ensure that this functionality will be used within the existing intranets or to be developed intranet the employees should know how to use it. Therefore, I suggest ensuring a change manager informs all the employees about this functionality and how to use it with guidelines and procedures.
- FR 3 is about the possibility to post on the intranet and for example reply on intranet posts. In the municipality case and housing corporation case, the respondents said that a benefit of the intranet is that they know what is happening within their organisation. Via the intranet messages and posts, they know what their colleagues are doing, and they do not miss any news. In the housing corporation case, everybody was using these functionalities. The reason for this was a great implementation, by the use of some change management activities. Also, the housing corporation ensured the intranet became part of the business strategy and the company's culture before implementation. Therefore, I suggest for new intranets and the intranet of the other two cases that the look into this FR by the use of IR 1 and IR 5. If the municipality and hospital ensure that their

employees know why and how to use these functionalities all the employees can get the main benefits of this FR.

### *Knowledge Management*

This requirement represents the functionalities that are founded on a knowledge management system.

- FR 4 focuses on a fixed knowledge management system. The knowledge base enables employees to find the information they need for their work quickly. The usability of the knowledge base of the hospital and municipality was not that good. Information was not up-to-date, and it was difficult to represent the information explicitly. Therefore, all the three cases should focus on IR 2 and IR 4 for the implementation and update of the knowledge base. The hospital and municipality for updating this functionality and the housing corporation for implementing it.

### *Collaboration Tool*

This requirement represents the functionalities that are based on collaboration tools and a knowledge management tool.

- FR 5 focuses on collaboration tools that are integrated into the social intranet. Respondents want to collaborate, and the intranet should be a useful tool to do it. The housing corporation did not have a collaboration tool. The respondents were using other tools. In the two other cases, the collaboration tools were not that good to collaborate. Only two respondents from the hospital case was using it a lot, mainly because their supervisor were supporting the use of the collaboration tools. Therefore, all three cases should focus on multiple IR. IR 1 should ensure the use of the collaboration tool will be part of the business strategy and the company's culture. Using them should be standard. IR 2 helps taking down the competing systems. The collaboration tools should be as useful as the competing systems. Furthermore, IR 3 should ensure the supervisors, and managers are supporting it and IR 5 should ensure all the end-user know how to use the tools.

### *General*

These requirements represent general functionalities that help the general use of the intranet. Both requirements need to be implemented to make it easier to use the intranet, maintain, and control the intranet. Respondents wanted to use the intranet on their mobile device more often and more straightforward. Therefore, FR 6 should make it possible to use the intranet everywhere at every time quickly. Furthermore, FR 7 should ensure the whole intranet is maintained and controlled better to ensure the usability of the intranet.

No.	Group	Functional Requirement
FR 1.	<b>Social Media</b>	The social intranet shall have a personal profile that only contains clear and necessary information.
FR 2.	<b>Social Media</b>	The social intranet shall have an idea board that can share ideas anonymously.
FR 3.	<b>Social Media</b>	The social intranet shall have the possibility to post intranet posts and tag, rate, and comment on intranet posts.
FR 4.	<b>Knowledge Management</b>	The social intranet shall have a knowledge management system with a fixed knowledge base.
FR 5.	<b>Collaboration and Knowledge Management</b>	The social intranet shall have collaboration tools like document version management, Wiki, and action items overview.
FR 6.	<b>General</b>	The social intranet shall have multiple mobile device support for use on mobile phones and tablets.
FR 7.	<b>General</b>	The social intranet shall have the possibility to appoint different user roles for maintaining and controlling the intranet.

*Table 17 Functional Requirements for Implementation of Social Intranet*

No.	Implementation Requirement
IR 1.	The social intranet should be integrated into the company's business strategy and culture before implementation, in order to provide support for the new social intranet.
IR 2.	During the development and implementation of the social intranet, the focus shall be on competing systems to have the best practices and ensuring its usability for the end-users.
IR 3.	The organisation shall prepare the managers and supervisors to understand the usefulness of the new intranet before implementation of the social intranet.
IR 4.	The social intranet shall function according to several guidelines and processes for keeping the intranet clear and up-to-date.
IR 5.	The organisation shall install before implementation a change manager for organising, for example, training and workshops and taking down prejudices among employees.

Table 18 Implementation Requirements for Implementation of Social Intranet

Functional Requirements	Implementation Requirements				
	IR 1.	IR 2.	IR 3.	IR 4.	IR 5.
FR 1.			X		
FR 2.			X		X
FR 3.	X				X
FR 4.		X		X	
FR 5.	X	X	X		X

Table 19 Inter-connections Functional and Implementation Requirements

## 6.2 Contributions

This study makes several contributions to both the social intranet practice and the scientific field of social software.

The contribution of this study is to control success factors for social intranets known from the literature with experiences from case studies in different domains. This is presented in a more qualified overview of functional requirements and implementation requirements. Furthermore, this overview includes an overview of implementation requirements that could positively influence the implementation of the functional requirements.

Also, this study makes some recommendations regarding the implementation of social intranets in practice. A framework is presented for a step-to-step implementation of a modular social intranet. This frame is presented in Chapter 7. The modular development makes it possible to create a more detailed and variable business case for developing and selling social intranets. Besides, it will be possible to implement the social intranet step-by-step within organisations.

## 6.3 Limitations and Suggestions for Future Work

### 6.3.1 Limitations

The research questions have been answered by the means of a literature study and case study. Based on the results there are several limitations to this study.

*The review papers:* The first limitation of this study is the selection of the reviewed papers. Only 25 papers were used for the literature review and were selected from a search query and self-chosen inclusion and exclusion criteria. It is suggested that the quality relates to the extent to which the study minimised bias and maximises internal and external validity [35]. A possible way to achieve this is to use more papers for the literature review or to check the reliability of the self-chosen inclusion and exclusion criteria. The reliability of these inclusion and exclusion criteria could be ensured by doing, for example, a sensitivity analysis. Another option that is used if a single researcher is doing research is discussing the criteria with their advisor, an expert panel or other researchers [35].

Therefore, it could be that this results in another selection of papers on social intranet, enterprise 2.0 and, enterprise social media that will give additional insights into the topic.

*Lack of papers discussing social media tools:* The second limitation of this study is the lack of papers who discuss social media tools. In the introduction of this paper, the different aspects of a social intranet are highlighted. Some of the aspects mentioned are the social media tools like blogs, and social networking. These social aspects are hardly mentioned in the results of the literature search. Only two papers [9][10] had the focus on the social aspect. Other papers mentioned a lot of social media tools like Wikis and blogs, but with the focus on collaboration and knowledge management. The reason for this is not instantly clear. A possibility could be the thin line between personal social media use, like Twitter and Facebook, and the use of these social media tools for business purposes. By adjusting the self-chosen exclusion criteria some papers were removed from the literature selection because their focus was only on the personal use of social media. Another possibility could be the study selection process. The research into the use query could have been better. Kitchenman & Charters [35] suggest the following in their study about the selection process: "The standard of IT and software engineering abstracts is too poor to rely on when selecting primary studies. You should also review the conclusions". A more thorough selection process for the search query could have resulted in more papers about social media tools.

The lack of more papers on social media tools makes it a limitation to this study. The social aspect can be seen as an essential aspect of the intranet, and therefore more papers could substantiate the success factors of it better.

*Lack of technical substantiation:* Another limitation to this study is the lack of technical substantiation. There is some technical focus in the papers but this is mainly on the usability and mobility aspects of the paper [13]. None of the papers mentioned how to technically implement a social intranet. For example, it is not known what programming language can be useful for developing an internet or what makes the intranet extra secure.

Conducting interviews has also some limitations and pitfalls. The following limitations of conducting interviews can be applied to this study.

*Difficult to generalise results:* It is difficult to generalise the results because small samples were chosen. Small sample size can result in different stories that do not apply for every employee for the organisation. The general rule on sample size for interviews is that when the same stories, themes, issues, and topics are emerging from the interviewees, then a sufficient sample size has been reached [36]. This rule has been applied for the results of the interview. However, it needs to be kept in mind that it could be possible that other results could have come up if other employees were interviewed.

*Prone to bias:* It could be possible that the respondents wanted on a forehand to highlight some specific elements of the intranet during the interview. Responses of the respondents could also be biased due to their stake in the program or for some other reasons [36]. One of the respondents of the municipality had a higher function within the organisation. The respondent might have brought up some answers and topics that might be important for the organisation or outlined the real situation slightly differently.

*The interviewer must be trained in interviewing techniques:* It is essential that the interviewer is trained in effective interview techniques, such as avoiding yes/no and leading questions and keeping their personal opinion in check [36]. During the interviews, I sometimes asked yes and no questions. Moreover, sometimes I gave personal opinions about specific topics to keep the conversation going. This might have influenced the results, but I do not expect that it gave big differences in the results.

*Technical issues:* A technical issue also occurred during one of the interviews. An iPhone recorded all the interviews. During one of the first sessions, I got a call. I declined the call and finished the interview. After the interview, I noticed that the iPhone did not record the whole interview. Furthermore, the whole interview was worked out within an hour after the interview to get as much as possible right information on paper. The rest of the interviews were recorded with the flight modus on to prevent the same problems.

### 6.3.2 Suggestions for Future Work

Options for future work could be the following.

Firstly, the technological aspects of implementing a social intranet can be researched. In this research, there is no substantiation on how to implement a social intranet technically.

Secondly, more research can be done on social media. As said in the discussion less literature has been found on the topic of social media used in social intranets.

Thirdly, research can be done into how a company can ensure that all the employees will use the social intranet. In the municipality and hospital case by far not all the employees are using the social intranet. Gamification or the use of for example a cryptocurrency could be a solution.

Gamification elements in social software can improve users' engagement through extrinsic motivation and therefore lead to a better acceptance of the system [33].

Cryptocurrency and blockchain can be used by the organisation to stimulate the use of the intranet. Employees, who believe that their supervisors are not monitoring their efforts, lose their motivation to contribute to the social intranet fully. They do not see the effect of their usage and the reward they receive. Blockchain technology can facilitate the development of an immutable, transparent, secure application for capturing individuals progress. The effort the employees put into the intranet, by for example sharing knowledge, can earn them an amount in the company's cryptocurrency. Employees do get a reward for the use of the intranet and are more motivated to keep doing this because they earn more crypto coins. The employees can spend the coins in a shop of the company which gives the coins their value [37].

More research can be done into the development of use of new technologies in social intranets.

Looking deeper into the results of the literature review and case study, it is noticeable that the technologies used within social intranets did not develop further in the cases. Web 2.0 technologies are the predecessor of social intranets. The web 2.0 web technologies are implemented and used for intranets, and business processes. Social software is based on the web 2.0 idea and thus on knowledge management, collaboration, and co-creation [6]. Over there years new technologies did not accede the social intranets. Collaborative tools like synchronous instant text messaging and web conferencing did not make their entrance within the social intranets [38]. Companies are using different tooling for this like Slack and Skype.

Another tool that is needed within the social intranets is a tool for collaboration. The functionalities of Trello, a web-based tool that can make it easier, for example, for hospital librarians to collaborate and manage the project within and outside the hospital. Trello is organised as a kind of virtual notice board, where one can place notices for particular tasks and key benchmarks for a different project to create a timeline or to-do list [39].

Functionalities like instant text messaging and Trello, are not part of intranet yet. The hospital intranet had the functionality of sending messages. The participants did not use this functionality. The reason for this is not entirely clear. However, I can imagine if it is organised as Slack, then it could become advantageous as part of the intranet.

Looking into the future two other technologies might become part of new social intranets. One of the technologies is Chatbots. Chatbots are machine agents that serve as natural language user interfaces for data and service providers. Chatbots could serve some purposes, such as customer service, social and emotional support, information, and entertainment. Chatbots can be used to improve the productivity of employees who are using the social intranet [40]. They can help people quickly find what they are looking, by asking the right questions. Chatbots could also help by task management. Users can delegate their task to the chatbot, and the chatbots ensure the task gets to the right colleague and notifies the other colleague about the progress [41]. Based on this information chatbots might be the next new technology for social intranets.

At last, based on the results it can be said that the implementation is an essential factor for the use of the intranet., It is important the intranet is adjusted to the business strategy, and the managers are supporting it. Looking deeper into the results, it is possible to see the difference between the hospital and municipality case compared to the housing corporation case. The housing corporations are smaller than the others, and it is not known what the influence of this on the different implementation steps found during the literature review. Further research could be on the influence of the size of the organisation and the different implementation steps that have to be taken for a successful implementation.

## 7. Recommendations

This scientific research is conducted for Nerds & Company (N&C) an IT company from Enschede. In this chapter, some recommendations will be made for using this document and knowledge about social intranets. First a small introduction is given about N&C then recommendations are made regarding this research.

N&C is founded in 2015. N&C is currently a software company with approximately 40 employees and is designing and developing high-end software, websites, application and campaigns. N&C is founded on the base of strong cultural beliefs. They are proud of their own identity and this is in their opinion the backbone of the organization.

N&C is currently developing all their software from scratch. This means that they don't resell products that they have developed from one company to another company. They do have the ambition to make internally the step from SaaS development to Product SaaS development. To make the step from SaaS development to product SaaS development N&C indicated already two different options. For both options, N&C must be entitled to the intellectual property.

- 1) Internal development of a product based on market analysis and available customers.
- 2) Generate a generic product on request of the customer, hereby seeking multiple customers to sell the product to.

Continuing on this ambition, in Appendix F, an elaboration on multi-tenant SaaS development can be found. In the past, N&C developed multiple social intranets. The social intranets were developed differently, but the design looked pretty similar. The housing corporation of the case study mentioned the same intranets. The intranet from the case study functioned less than the other 'similar' intranet. Therefore, it can be wise for N&C to start developing the new intranet as a SaaS. Improvements to a new intranet can also be used for an older intranet that is used by another organisation.

The intranet should be developed in three different modules that can be connected. There are two reasons for developing the social intranet in three different modules.

The first reason is to give the customer the possibility to start with the base functionalities of a social intranet, like the intranet of the housing corporation. They can start using it and discover if these functionalities are used, and if they want to have more functionalities. N&C on their side can sell the different modules separately.

The second reason is that all the modules need to be of high quality. Employees of the organisation are going to use other tools if they are easier to use and have more functionalities. The different modules will also give the possibility for step-by-step implementation make it, in the end, more maintainable.

As recommendation I created a Modular Implementation Framework for Social Intranets. This framework can be found in figure 8 on page 56. The framework contains two parts, an implementation part and a content part. The content part exists of three modules.

The three modules of the content part are a social module, knowledge management system module, and a collaboration module. The functionalities in these modules have different colours. The colour green refers to the functional requirements presented in the conclusion. The colour orange refers to functionalities that are suggestions by me for becoming part of the new intranet. These suggestions are made based on my insights in this topic. The colour blue refers to functionalities of new technologies that Nerds & Company is already developing or using and might be suitable for intranets. The two big blue rectangles behind three modules refer to technologies that make it possible to improve the general use of the social intranet by employees of a company, more about this in the last section of this chapter.

The first module should be a social module. This module should have functionalities like a face book, possibility to post messages on a timeline, reacting, tagging, and liking these messages, and an idea board where anonym ideas can be shared.

The second module should be a knowledge management system. This system should have a fixed knowledge base that is filled centrally. Also, it should have a possibility to share knowledge between departments, specific groups, and project groups.

The last module should be a toolbox for collaboration. Collaborating via the intranet can be seen as the success factor. If it is possible to collaborate quickly through the use of the intranet, possibly all the employees are going to use it. This toolbox should contain collaboration tools like task management, live collaboration in documents, and document version management.

The left side of the module is the implementation part. This part contains six implementations steps that need to be taken for successful implementation. The first five steps (coloured green) are retrieved from the conclusion of this research. The last step (coloured purple) is an extra implementation step and is added because it focuses on step-by-step implementation and refers to the three different modules of the content part that can be implemented step by step.

No.	Implementation Requirement
<b>IR 1.</b>	The social intranet should be integrated into the company’s business strategy and culture before implementation, in order to provide support for the new social intranet.
<b>IR 2.</b>	During the development and implementation of the social intranet, the focus shall be on competing systems to have the best practices and ensuring its usability for the end-users.
<b>IR 3.</b>	The organisation shall prepare the managers and supervisors to understand the usefulness of the new intranet before implementation of the social intranet.
<b>IR 4.</b>	The social intranet shall function according to several guidelines and processes for keeping the intranet clear and up-to-date.
<b>IR 5.</b>	The organisation shall install before implementation a change manager for organising, for example, training and workshops and taking down prejudices among employees.
<b>E IR.</b>	Step-by-step implementation. Implementing the different modules of the intranet step-by-step.

Table 20 Implementation Recommendations

As further recommendations, I suggest N&C uses the results of this research. The requirements in the conclusion of this research are all essential for a good intranet. Specifically, N&C should focus on the implementation requirement, mentioned in the framework. N&C is a high-end software developer with an eye for the customer. It is vital for the intranet if all the users are willing to use it regularly. Therefore, it is essential that N&C ensures that the to be developed social intranet will fit into the customers business strategy and company culture.

At last, I think N&C can make the difference by looking into the integration of gamification or cryptocurrency into social intranets. N&C has already experience with the use of cryptocurrency to improve the general use of applications by employees of a company. Therefore, I think they should research the support of this technology. At first, I do not think this will directly be the solution for the hospital and municipality case regarding the use of the intranet. Another technology that can be ground-breaking is the use of chatbots. N&C is currently developing a chatbot proposition. I think the use of chatbots can be a gamechanger regarding collaboration in groups. The chatbot can be the virtual assistant that can be the last step for employees only collaborating via the social intranet.

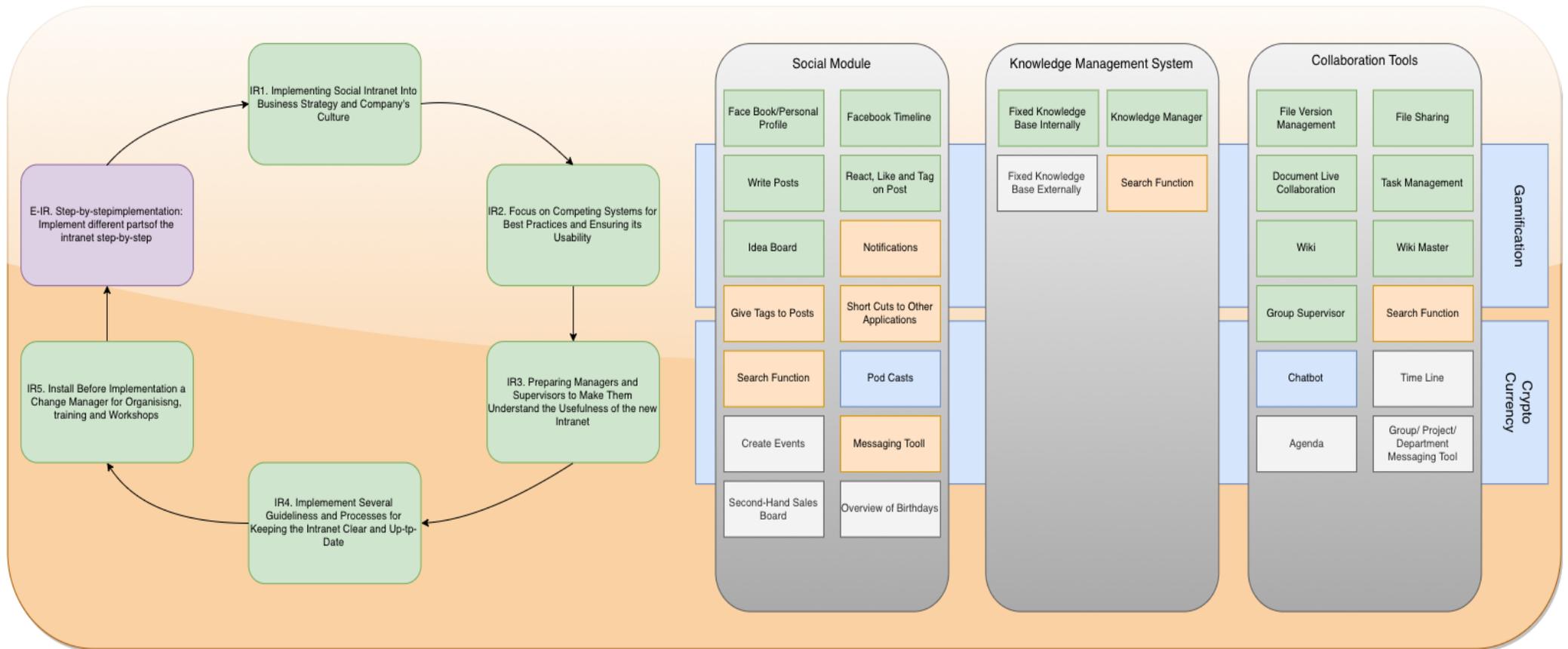


Figure 8 Modular Implementation Framework Social Intranets

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# Appendix A – Literature Selection and First Analysis of Literature

## 1. Selection

The literature selection is done by the use of Elsevier's Scopus, the largest abstract and citation database of peer-reviewed literature. The initial research query existed of two sets of keywords (table 1). The first set exists of *social intranet*, *enterprise 2.0* and *enterprise social media*. This set was created to find information about social intranets. The other two terms were identified as synonyms. The second set exists of *success factors*, *case study*, and *implementation*. This set was created to find information on success factors of the implementation of social intranets researched by conducting case studies. Both sets are connected with the AND operator.

Set name	Part of query
Information on social intranets	("social intranets" or "enterprise 2.0" or "enterprise social media")
	AND
Information on success factors via case studies	("success factors" and "case studies")

Table 21 Research query without inclusion or exclusion criteria

### 1.1 Inclusion Criteria

If a paper does not have one of the following criteria it is removed from the results. The following inclusion criteria are defined:

- ✓ Studies that are written in English
- ✓ Documents that are an article or scientific paper
- ✓ Studies that have one of the following keywords chosen by the authors: Knowledge Management, Enterprise 2.0, Web 2.0, Social Software

### 1.2 Exclusion Criteria

If a paper does have one of the following criteria it is removed from the results. The following exclusion criteria are defined:

- ✓ The paper that is not accessible online free of charge by using the University of Twente credentials
- ✓ Studies that have one of the following keywords chosen by the author: ERP
- ✓ Studies that don't have the main topic of the social intranet, enterprise 2.0 or enterprise social media
- ✓ Studies that have a too specific scope or are too in-depth

## 2. Final Selection

The final selection is done in two steps. An overview of the final selection is given in figure 3.

The first query, which also included the key word "implementation", gave approximately 70 hits. By applying manually, the inclusion and exclusion criteria that could not be applied in Scopus it turned out that there were just a few usable results. Therefore, after the first analysis, the keyword implementation was removed to get more and better results on success factors of social intranets.

Based on the initial literature selection and selected inclusion and exclusion criteria the following search query for Scopus was created.

*("success factors" AND "case study") AND ("social intranet" OR "enterprise 2.0" OR "enterprise social media") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp")) AND (LIMIT-TO (LANGUAGE, "English"))*

This query produced 134 results. By manually applying the inclusion and exclusion criteria that could not be applied in Scopus, it turned out that 25 results were usable for this literature review.

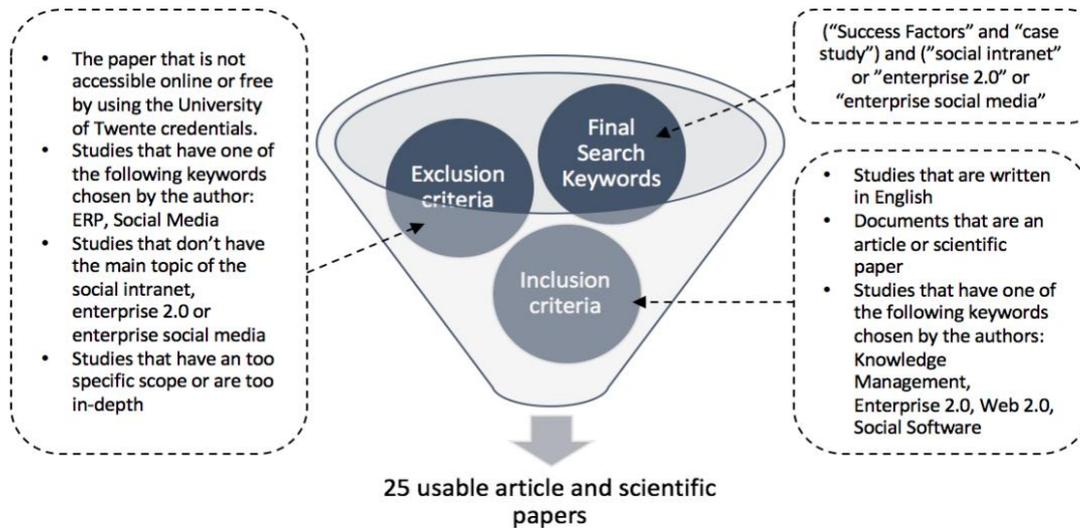


Figure 9 Overview selection process

### 3. Results Analysis

In this chapter, the results of the literature study will be analysed. In the first section, the general results will be analysed, like country, type of source and subject area of the paper. In the second part, a more general in-depth analysis will be done on the keywords and used case studies. In the last part of this chapter, all the papers will be analysed.

#### 3.1 General Results

##### 3.1.1 Country, year, documents by type and documents by subject area

###### Country

The 25 documents retrieved from Scopus are analysed based on their origin. In figure 4 an overview is given of the countries. Scopus indicated a country based on the location of the institution where the conference paper or article has been written.

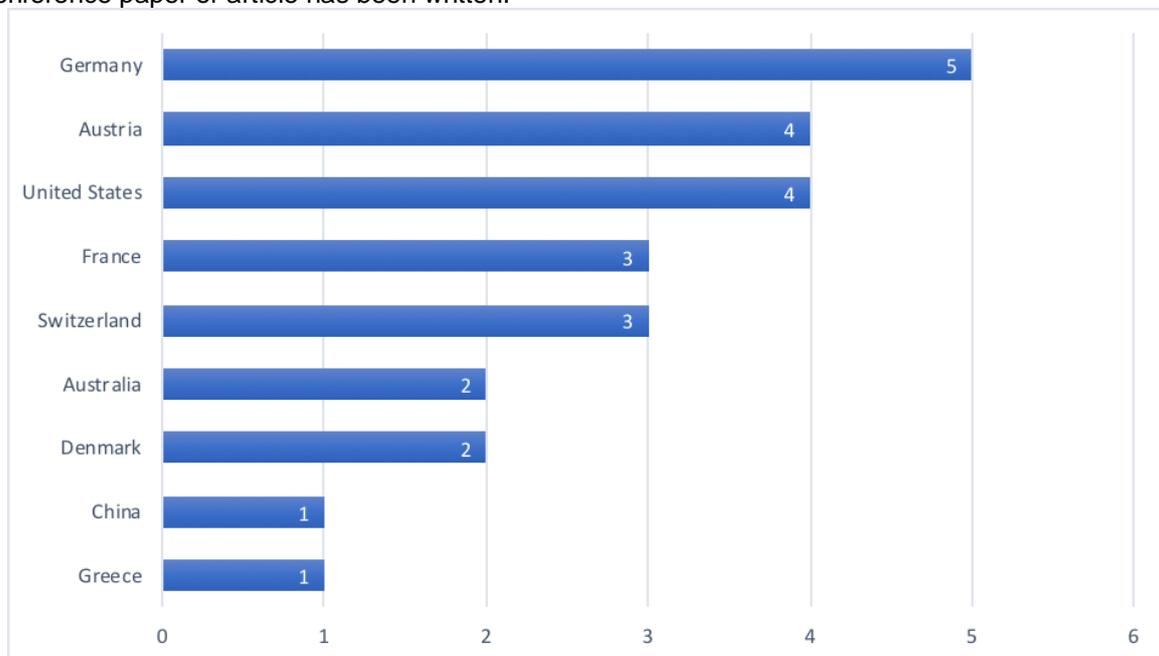


Figure 10. Overview documents by country

###### Year

The documents are also analysed based on their year of publication. The first year a document amongst the results was published is 2010. There are four documents from the last year of

publication, 2017, amongst the results. The peak of publications amongst the document was in 2013 with 6 documents followed by 2011 with 5 documents.

### Documents by type

The documents are also analysed based on their type. 12 documents are classified as an article by Scopus and 13 documents are classified as conference paper by Scopus.

### Documents by subject area

The documents are also analysed based on their subject area. In figure 3 an overview is given of the subject areas. Almost 75% of all the documents are from three categories namely: Computers Science (17 documents), Business, Management and Account (8 papers) and Engineering (5 papers).

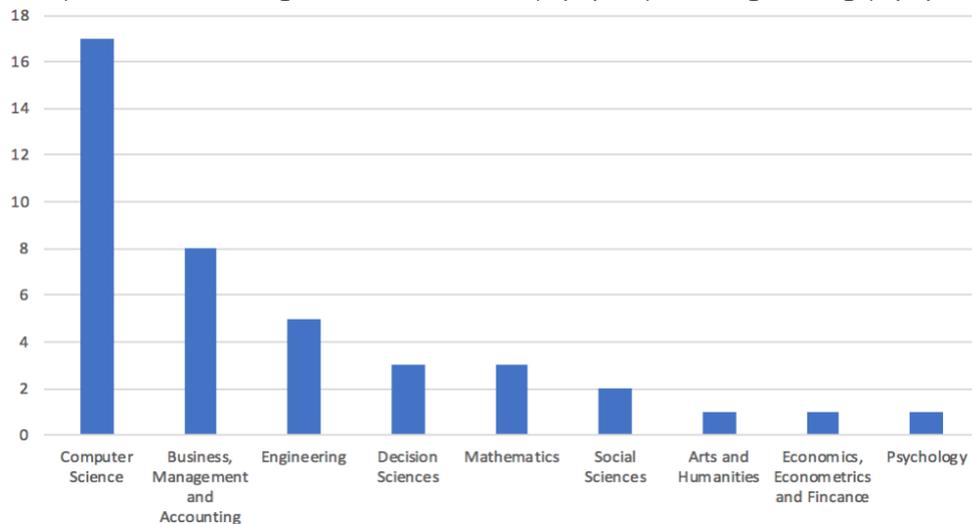


Figure 11. Overview documents by subject area

### 3.1.2 Keywords

The 25 documents retrieved from Scopus were analysed based on the keywords used by the authors and identified by Scopus. The reason for identifying the most used terms is to show that there is not one right term that covers the topic. The keywords used in the search query were analysed. An overview can be found in table 7.

Keyword from search query	Number of times used by authors
Social Intranet	0
Enterprise 2.0	9
Enterprise Social Media	2
Success Factors	6
Case Studies	2

Table 22 Keywords from search query used by author

Not one time the keywords social intranet was used. On the other hand, the word social is used in combination with other words like Social Networking (online) (four times), Social Software (seven times), and Social Technologies (one time).

The term Enterprise 2.0 is used nine times. The second most of all the results after Knowledge Management (thirteen times).

The term Enterprise Social Media was only used two times. But there are some keywords that are similar to Enterprise Social Media, like Enterprise Social Software (one time), Enterprise Social Software (ESS) (one time) and Enterprise Software (one time).

The term Success Factors was used just one time. The term case studies was used two times (one-time case study and one-time case study analysis). Based on an analysis of the results more than two papers have conducted a case study for their study

## Appendix B. Interview Framework Wilson

Activity	Comments/questions	Approximate Time
<b>Introduction</b>	Brief the respondent. Introduce self. Explain goals of interview. Review interview method, use of data, confidentiality, and so on.	10 min
<b>Structured Topics</b>	Topic 1: Background Question 1a Probe 1 Probe 2 Probe 3 Topic 2: Context of Work Question 2a Probe 1 Probe 2 Question 2b Probe1 Topic 3: Use of Product Question 3a Probe 1 Topic <i>N</i> : <i>Additional topics</i>	40 min
<b>General questions and open dialogue with respondent</b>		30 min
<b>Closing comments and completion of any paper work (receipts, final questionnaire, etc.)</b>		10 min

Table 23 Rough Outline of a Semi-Structured Interview Guide [32]

# Appendix C. Strengths and Weaknesses Structured, Semi-Structured Interviews and Focus Groups.

<b>Semi-structured Interviews</b>	
<b>Strengths</b>	<b>Weaknesses</b>
They may uncover previously unknown issues	It may cause an “interviewer effect” where the background of the employee influence how much information people are willing to reveal.
Addressing complex topics through probes and clarification	Some training and experience are required
Ensuring that particular points are covered with each respondent and also allow users and interviewers to raise additional concerns and issues	Interviewers can give cues that might guide the respondent into a particular answer
Providing a mechanism for redirecting conversations that digress too far from the main topic	Consistency is required.
Providing some flexibility for interviewers and also allows some broad comparisons across interviews	Mixture of quantitative and qualitative data that result can be time-consuming to analyse
Requires less training time than unstructured interviews	Findings of semi-structured interviews might be hard to generalise

Table 24 Strengths and Weaknesses Semi-Structured Interviews [32]

<b>Unstructured Interviews</b>	
<b>Strengths</b>	<b>Weaknesses</b>
Provides direct experience with users and stakeholders	Becoming skilled at this interview technique takes time.
Establishing rapport may be easier than semi-structured interviews because they are less formal and more conversational	Analysis and interpretation of the data can be quite time-consuming even for small studies.
Interviewers have more flexibility	Taking notes can be difficult. Digital audio or video recorders are recommended.
Respondents can describe issues in their own words	Unstructured interviews have no set format, so each interview is novel.
They can reveal interviews can reveal unexpected issues	Data are rich but not replicable
They can provide issues in political issues	Large amounts of data may require expensive and complicated qualitative analysis software
They can provide a more relaxed atmosphere	
They can provide important insights for the design into the design of the other techniques.	

Table 25 Strengths and Weaknesses Unstructured Interviews [32]

<b>Focus Group</b>	
<b>Strengths</b>	<b>Weaknesses</b>
It is relatively inexpensive (compared to individual interviews)	The conclusion that can be drawn are limited because the sample may not be representative of the larger population
They produce concentrated amounts of data in a short time	Dominant individuals can skew the results of a focus group
Once used in an early stage, they can product insights and questions from the interactions among different users or customers	Conflicts and power struggles can arise between respondents with strong personalities
The can provide a flexible approach for data collection. There are no strict procedures.	They are often conducted by outside consultant who may not have the domain experience
	Experience is needed with a wide range of group dynamics
	Data from the focus group can be challenging to transcribe if multiple people try to talk at the same time.

Table 26 Strengths and Weaknesses Focus Groups [32]

## Appendix D. Interview Framework

Activity	Comments	Questions	Checkbox Yes/No		Time
<b>Pre-briefing</b>	<i>Brief respondent. Introduce self. Explain goals of the interview.</i>				2 days upfront
<b>Introduction pitch</b>	<i>Repeat briefing and ask if interview can be recorded for working out the interview afterwards.</i>	Can I record the interview for working out the interview afterwards?			5 min
<b>Introduction questions</b>		When did you use the social intranet for the last time?			15 min
		What functionalities of the social intranet do you use often?			
		What functionalities of the social intranet do you never use?			
<b>General questions and open discussion with respondent</b>		What are the benefits for you of the social intranet?			
		What functionalities do not work very well?			
		How was the social network implemented in the organization?			
		What could have been done differently?			
<b>Structured Topics</b>	<i>Topic 1: Functionalities – Social Media</i>	Does social intranet offer a face book and possibility to create a personal profile?			10 min
		Does the social intranet offer an idea board and second-hand sales board?			
		Does the social intranet offer the possibility to tag, rate or comment on social intranet posts?			
	<i>Topic 2: Functionalities – Knowledge management &amp; Collaboration</i>	Is someone responsible for the social intranet? Maintaining it and keeping the available information up-to-date and ensuring the knowledge management and collaboration tool is used in the right way?			
		Does the management support the social intranet?			
		Is the social intranet easy to use?			
		Does the social intranet support mobile device support and platform stability?			
		Is the navigation structure of the social intranet clear?			
<b>Closing comments and completion of interview</b>					5 min

Table 27 English Version of the Interview Framework Social Intranet

Activiteit	Opmerking	Vragen	Check box Ja/Nee	Tijd
<b>Briefing vooraf</b>	<i>Ligt de deelnemer in. Jezelf voorstellen. Doelen van het interview uitleggen.</i>			2 dagen van tevoren
<b>Introductie pitch</b>	<i>Herhaal de briefing en vraag of je het interview mag opnemen voor de uitwerking ervan.</i>	Mag ik het interview opnemen om het na afloop uit te kunnen werken?		5 min
<b>Introductie vragen</b>		Wanneer heb je het sociale intranet voor het laatste gebruikt? Wat zijn de functionaliteiten van het sociale intranet die je vaak gebruikt? Welke functionaliteiten van het sociale intranet gebruik je nooit?		15 min
<b>Algemene vragen en open discussie met deelnemer</b>		Wat zijn de voordelen van het sociale intranet voor jou? Wat zijn functionaliteiten van het sociale intranet die niet goed werken? Hoe is het sociale intranet geïmplementeerd binnen de organisatie? Wat zou anders gedaan kunnen zijn?		
<b>Vaste onderwerpen</b>	<i>Onderwerp 1: Functionaliteiten – Sociale Media</i>	Biedt het sociale intranet en smoeien boek en de mogelijkheid om een persoonlijk profiel aan te maken? Biedt het sociale intranet een prikbord en een ideeën bord? Biedt het sociale intranet de mogelijkheid om te liken, reageren en collega's te taggen?		10 min
	<i>Onderwerp 2: Functionaliteiten – Knowledge management &amp; samenwerking</i>	Is er iemand verantwoordelijk voor het sociale intranet? Om het te onderhouden en informatie up-to-date te houden en te zorgen dat het op de juiste manier gebruikt wordt? Ondersteunt het management het sociale intranet? Is het sociale intranet makkelijk te gebruiken? Kan je het sociale intranet op verschillende devices, zoals je telefoon, gebruiken? Is de navigatie structuur van het sociale intranet duidelijk?		
<b>Afsluiting van het interview</b>				5 min

Table 28 Translated Version Interview Framework

# Appendix E. Results Case Studies

In this section the results of the fixed interview topics of all the cases are presented. First, the functionalities that are used often and less are presented. Second, more specific topics are presented. In the first column of each table the topics are shown, the second column of each the specific interview results, and in the last column number of times, it is mentioned by the respondents. In the second part of each section, the specific topics are presented.

## 1. Municipality

*Functionalities that are used often and less*

Topics	Interview Results	No. times mentioned
<b>Functionalities that are used often</b>	<b>Looking up colleagues</b> – Almost all the respondents use the social intranet for looking up information about colleagues. Respondents search for colleagues based on their names and look for information like birthdays, phone numbers, presence, working location, and using the face book for looking up the picture of a colleague. One respondent looks up colleagues based on their specialities: <i>“Sometimes I need information about a certain topic like asbestos. Then I search for asbestos in the intranet, and if the colleagues have filled this in as a speciality these colleagues pop up as a result, and I can get in contact with these colleagues.”</i>	4 out of 5
	<b>Reading intranet posts</b> – All the respondents read the different intranet post. Posts are read with general municipality information, new posts, and information from groups where respondents are a member of. The reading of the posts is stimulated by the notifications the respondents get. These notifications show among other things the most liked post.	5 out of 5
	<b>Replying on intranet posts</b> – Almost all the respondents are reacting on intranet posts. Respondents reply with different reasons, among other things they reply to give compliments, start discussions or help colleagues with their problem or questions. One respondent helped colleagues with their new desk chairs: <i>“I had problems with the new desk chairs, and I found out where to get additional materials for them. I saw on the intranet that a colleague had similar problems, so I replied to what my colleague had to do. In the end, it turned out that more employees were helped with my reply.”</i>	4 out of 5
<b>Functionalities that are used less</b>	<b>Social Aspect</b> – None of the respondents is using the intranet for personal and informal goals. One of the respondents said that work and private life must remain separate; <i>“A second-hand sales board should not be part of a social intranet, it is too personal. Personal initiatives for charities can be presented on the social intranet, because it is for charities and the municipality should stimulate this.”</i>	5 out of 5
	<b>Group collaboration</b> – Groups are hardly used within the municipality for collaboration. Some groups are focussed on sharing information by the use of Wikis, but not collaboration. The reason for this is that fundamental collaboration tools are missing. One of the respondents is even using other tools: <i>“With some project groups, we are using Wunderlist for keeping a list and sharing documents. I know that many colleagues are also using Evernote for collaboration.”</i> Another respondent says that it is not useful for specific functions: <i>“In the function of my colleagues and I it is not useful, we are working on an island. We communicate with each other and do not have to work together with groups on the intranet.”</i>	2 out of 5
	<b>Knowledge base</b> – Respondents are hardly using the knowledge base. One respondent has the responsibility to put information in the knowledge base about the department the respondent is working. The respondent says that it is difficult to put clear information online: <i>“It is difficult to write clear posts for the knowledge base because it is not possible to use different font styles and sizes.”</i>	2 out of 5

Table 29 Overview of functionalities that are used often and less by the municipality respondents

### Specific Topics

Topics	Interview Results	No. Times Mentioned
<b>Implementation</b>	<b>How it was implemented</b> – Almost all the respondents said that the implementation of the intranet was done ok. The new intranet was announced by the organisation and there was even a contest for coming up with the new name of the intranet. Some employees of municipality became ambassadors and helped developing and introducing the new intranet.	4 out of 5
	<b>Training</b> – Almost all the respondents said that there were some training and workshops organised after the social intranet was implemented. Furthermore, there is a YouTube instruction video available for the functionalities of the Social Intranet. After a while, some new workshops were organised to get more people to use the intranet.	4 out of 5
<b>Functionalities</b>	<b>Face book</b> – Almost all the respondents filled in their face book. Only one employee did not fill in everything. Some respondents filled in their knowledge and skills in the personal profile. This can be useful to look up specific colleagues with specific knowledge.	4 out of 5
	<b>Second-hand sales board</b> – Only one respondent is actively using the second-hand sales board. Two others only check it for fun.	1 out of 5
	<b>Idea board</b> – Only one respondent used the social intranet as an idea board. Posting questions and polls are possible. In this section, it is also possible to mark questions and ideas. The other respondents did not know if there was a specific idea board. Some said that it could be useful to have a traditional idea mailbox.	1 out of 5
	<b>Posting/Tagging/liking/reacting</b> – Only two respondents are posting messages. One respondent is doing this because it is work related. 4 out of 5 are reacting and liking different posts. 3 out of 5 are tagging other colleagues and are being tagged.	-
	<b>Responsibility</b> – Almost all of the respondents knew that the communication department is responsible for the intranet. Sometimes it is not known who is responsible for a group, most of the times this is the group manager. Furthermore, there is only one process regarding the use of the intranet; if an employee wants to post something in the municipality news bulletin, the employee has to ask permission via the communication department.	4 out of 5
	<b>Support</b> – Only one respondent said that supervisors should have a supportive attitude regarding the social intranet. The others said that their supervisor is not using the intranet and it does not matter if employees are using it or not.	1 out of 5
	<b>Ease of use</b> – All the respondents said it is easy to use the intranet and that it is very intuitive.	5 out of 5
	<b>Devices</b> – All the respondents know it can be used on multiple devices. Only two are using it on their iPad or Telephone. The main reason for not using it on another device is the difficulties with the login process with a token. The use of this token is time intensive and therefore not an easier solution than a laptop.	2 out of 5
<b>Navigational structure</b> – Three out of five respondents said the navigational structure is fine. Two others said it is unsorted and takes time to find easily what you are looking for.	3 out of 5	

Table 30 Overview of specific topics of the municipality

## 2. Hospital

### Functionalities that are used often and less

Topics	Interview Results	No. times mentioned
<b>Functionalities that are used often</b>	<b>Looking up colleagues and departments</b> – All the respondents use the intranet for looking up information about colleagues. The information can be about their telephone number or the location they are working.	5 out of 5
	<b>Use of the knowledge base</b> – Almost all the respondents use the knowledge base of the intranet. The knowledge base is used for looking up meeting reports, manuals and specific procedures. Only one respondent used the intranet just for looking up pay dates.	4 out of 5

	<b>Reading intranet posts</b> – All the respondents use the intranet to check new posts. 4 out of 5 use it for reading general news post about the hospital. These posts are posted via the communication department. None of the respondents is explicitly looking for other posts posted by colleagues on the intranet. Almost all the respondents said the following about new post on the intranet: <i>“I think the general news post about the hospital should have a prominent central place in the intranet. These messages are more important for the employees than messages about another car damage or lost key”</i> .	5 out of 5
	<b>Using groups for collaboration</b> – All the respondents are using groups to collaborate with colleagues. Groups are being used to communicate general (no medical) information about patients and sharing documents like presentations and minutes. The respondent said: <i>“We share personal information about the patient via the group, like if a patient is married for 40 years we give the patient a bouquet of flowers.”</i> One respondent only used the group to inform about the implementation of a new software system in a specific department.	5 out of 5
	<b>Application home page</b> – The intranets has several shortcuts on the home page that direct the user to the corresponding app on the system. Respondents use these shortcuts to go to their salary administration, hour registration or room reservation. Only one respondent uses the old short cuts in the Windows browser instead.	4 out of 5
<b>Functionalities that are used less</b>	<b>Posting messages</b> – Only one respondent is posting messages on the intranet. The respondent is doing this because it is supporting the function of the respondent.	1 out of 5
	<b>Sending messages</b> – The intranet has the possibility so send messages to a colleague. None of the respondents is using this function. The respondents are using their e-mail for this.	0 out of 5
	<b>Specific parts group collaboration</b> – Groups that are used for collaboration have several tools that support this. Any of the respondents do not use two tools. None of the respondents is using the possibility to <i>schedule meetings</i> or is using <i>pages</i> , the Wiki function for groups. One of the respondents said the following: <i>“I do not know why we can schedule meetings via groups. All the employees use an Outlook calendar, so it is easy to schedule meetings via Outlook.”</i> There is not directly a known reason why the pages are not used.	0 out of 5

Table 31 Overview of functionalities that are used often and less by the hospital respondents

### Specific Topics

Topics	Interview Results	No. Times Mentioned
<b>Implementation</b>	<b>How it was implemented</b> – Only two respondents remembered how it was implemented. It was an abrupt implementation without any announcement. One respondent did not know anymore how it was implemented. The other two respondents did not work at the hospital during the implementation.	2 out of 5
	<b>Support during implementation</b> – Two respondents have asked the communication department for assistance. The employees of this department helped them with their questions and explained the use of the intranet in more detail. The other respondents know that the communication department is responsible for the intranet.	2 out of 5
	<b>Training</b> – During the implementation, there was minor training. One respondent had a specific administrator training. This training was during the implementation phase, so the intranet was not fully implemented yet, and therefore the instruction was not that useful. The two respondents who started working in the hospital while the intranet was implemented did not receive any training or specific introduction. They only had the standard tutorial from the intranet. One respondent said the following about the possibility of a training: <i>“I got a training for working with sensitive personal patient data. It could have been a possibility to spent the last 10 minutes of this training introducing the intranet to the employees. There was time left and could have been helpful.”</i>	2 out of 5
<b>Functionalities</b>	<b>Face book</b> – Almost all the respondents filled in their face book. Only one employee did not upload a personal photograph. None of the	4 out of 5

	respondents filled in their work experience and skills on the personal profile.	
	<b>Second-hand sales board</b> – All the respondents know about the second-hand sales board. None of the employees is using it. One respondent is just looking into it to have laugh. Three others say about it that it should not be in the intranet, because it is to personal and people should only use the intranet for work.	0 out of 5
	<b>Idea board</b> – None of the respondents knows if there is an idea board. Four of the respondents said that the intranet is used for posting car damage incurred at the parking, theft of personal items and lost and found.	0 out of 5
	<b>Posting/Tagging/liking/reacting</b> – Only one respondent is posting messages on the intranet. This respondent replies and also likes posts on the intranet. One respondent only responds to messages if it about something the respondent is knowing. One person likes posts on the intranet and nobody is tagging other colleagues in posts.	-
	<b>Responsibility</b> – Only one respondent has no idea who is responsible for the intranet. The other respondents say that the communication department is responsible for the general part of the intranet. And the team leaders are responsible for the groups on the intranet. Furthermore, it seems that specific departments are responsible for their part in the knowledge base.	4 out of 5
	<b>Support</b> – Two of the respondents say that they are supported by their supervisor in the use of the intranet. Their supervisor wants them to use the group of their department and is posting messages and document in this group. The other respondents say that their supervisor is not really looking into the intranet, and therefore they are hardly using it.	2 out of 5
	<b>Ease of use</b> – Three respondents say the intranet is easy to use and pretty intuitive. The other two say it is not that easy to use and it still does not feel natural when they are using it.	3 out of 5
	<b>Devices</b> – Only one respondent does not know if the intranet can be used on other devices. Two of the respondents say that they use the intranet on their iPad or mobile phone sometimes.	2 out of 5
	<b>Navigational structure</b> – All the respondents are saying the navigational structure of the knowledge base is terrible. It is hard to find what you are looking for and some information is posted double on the intranet. On the other hand, the navigational structure of the social part is more logic. The shortcuts of the application are easily found and respondents know where to look if they are looking for information about a colleague.	0 out of 5

Table 32 Overview of the specific topics of the hospital

### 3. Housing Corporation

Functionalities that are used often and less

Topics	Interview Results	No. times mentioned
<b>Functionalities that are used often</b>	<b>Posting and reading messages</b> – All the respondents are using the intranet to write and read posts on the intranet. One of the respondents said the following: <i>“We are encouraged by our supervisor and colleagues to post about our working activities and other work-related news. It is also allowed to post jokes or personal information on the internet. All the employees are doing this, and that makes it a handy tool.”</i>	5 out of 5
	<b>Looking up colleagues</b> – Almost all the respondents use the intranet often to look up information about their colleagues. One is using it for telephone numbers, and another is using it for working hours of colleagues that work part-time. One respondent that is not using this function and said the following: <i>“All the telephone number of my colleagues can be found in Hipper via our smartphone. Therefore, I do not need to use the intranet for this.”</i>	3 out of 5
	<b>Downloading documents</b> – Three employees are using the download function of the intranet. This area of the intranet is a kind of knowledge base. Where different documents can be found like collective labour agreement, hr-documents and mileage declarations. One respondent is using it as follows: <i>“Colleagues can download documents for changes that</i>	3 out of 5

	<i>I do have to make to the system, like personnel changes. They fill in what I have to change and send it to me. This works perfectly”.</i>	
<b>Functionalities that are used less</b>	<b>Groups for collaboration</b> – Almost all the respondents said that they do not use the groups. The groups do not have any functionality regarding collaboration. It is only used to have an overview of who is participating in a particular group.	4 out of 5
	<b>Second-hand sales board</b> – Only one respondent has used the sales board. This respondent used it to sell old IT hardware from the housing corporation. None of the employees is using, and some even say nobody is using it at all.	4 out of 5
	<b>Team and projects</b> – The intranet has a functionality to look up the respondents of different teams and projects. One respondent specifically said that this function is not being used: <i>“I do not need to use this functionality of the intranet for my function. On the other hand, I also know the information is not up-to-date anymore because several colleagues left.”</i>	1 out of 5

Table 33 Overview of functionalities that are used often and less by the housing corporation respondents

### Specific Topics

<b>Topics Implementation</b>	<b>Interview Results</b>	<b>No. Times Mentioned</b>
	<b>Implementation</b> – All the respondents were content with the implementation. The housing corporation is using the intranet for four years, so it was a while ago. Nobody could think about any problems after the implementation of the intranet. The implementation went very well. A contest introduced the intranet. Employees could suggest the name of the intranet. Many employees participated in the contest, and one team won a free lunch. A week before the implementation all the employees received an information brochure back home. So, it was for everybody clear what they could expect and how to start using the intranet.	5 out of 5
	<b>Training</b> – After the implementation, there was no training or workshop for the employees. There was only a memo about the use of the intranet. The communication department thought the intranet was easy to use and nothing could go wrong in the use of the intranet. This thought was good, and there was no problem at all.	5 out of 5
	<b>No rules</b> – Besides no training, there were also no rules regarding the use of the social intranet. One respondent said the following: <i>“It was a conscious choice that we made not to introduce usage rules. We trusted our employees, if something went wrong they would help or correct each other. Moreover, it turned out that it worked like this”</i>	5 out of 5
<b>Functionalities</b>	<b>Face book</b> – All the respondents filled in their personal information. They all filled in the information that might be needed by colleagues.	5 out of 5
	<b>Second-hand sales board</b> – None of the respondents is using the second-hand sales board. The only one used it for selling hardware from the housing corporation.	5 out of 5
	<b>Idea board</b> – One respondent was sharing ideas on the intranet. The respondent did this in the vitality part of the intranet. The vitality part is about health-related topics. The respondent shared last week an idea for a healthy recipe. The other respondents do not use the intranet for sharing an idea. The opinions are different about if an idea board would work within the organisation. One said everybody is posting socially popular post and will not share ideas that might not be liked by others.	1 out of 5
	<b>Posting, reacting, liking, and tagging</b> – All the respondents are posting, reacting, and liking messages on the intranet. It is not possible to tag each other. One respondent said that tagging in combination with notification could be useful. The intranet is not automatically refreshing during the day. If you could get notifications about new posts and tags, this could help the use of the intranet.	5 out of 5
	<b>Responsibility</b> – All the respondents knew the communication employee is responsible for the functioning of the social intranet. If there are any problems, they can be addressed to the communication employee. It is not evident among the respondent who is responsible for keeping up-to-date the available information. Some say it is the	5 out of 5

	responsibility of the person that posted the information other say it the communication or staff employee.	
	<b>Support from the management</b> – Almost all the respondents said that they are supported and motivated by the management in the use of the intranet. The management themselves are posting on the intranet and relying to others posts.	4 out of 5
	<b>Ease of use</b> – All the respondents said it is easy to use. One had some problems with the use of the intranet.	5 out of 5
	<b>Other devices</b> – Only one respondent is still using the intranet on an iPad. Another respondent said that craftsmen are using the intranet on their mobile phone. Another respondent is done trying to use the intranet by mobile phone. Because every time the respondent wanted to use it a new password had to be used.	2 out of 5
	<b>Navigational structure</b> – Three of the respondents said it has a clear navigational structure. One said that sometimes not all the information is shown that is needed to know what you are downloading. Another said that the intranet missed categories for all the posted messages. By the use of categories, it could become easier to find relevant information.	3 out of 5

*Table 34 Overview of the specific topics of the housing corporation*

# Appendix F. Multi-Tenant SaaS Development

## 1. Multi-tenant SaaS Development

SaaS applications are often designed to be multi-tenant, meaning that an application is shared among many customer organisations, the so-called tenants. SaaS means providing services of remote access to software. It focusses on dividing ownership and responsibility of software from its usage. The use of SaaS has several benefits some of the benefits are listed below [42][43][44].

- Increase cost efficiency
- Lack of necessity of installing any software on a workstation belonging to a system user.
- On-line access to the system from any location by computer with an Internet connection.
- Optimising resource allocation.

On the other hand, there is also a problem with a SaaS solution. A SaaS typically leads to one-size-fits-all offerings that, once successful, have become very difficult to change without causing service disruptions for the subscribed tenant organisations and their end users. Furthermore, there could be a lack of customization flexibility. To meet the unique requirements of the different tenants, the application must be highly configurable and customisable [43][45].

Companies often choose a SaaS solution because SaaS service provides, installs, runs and maintain all the required software and hardware. Tenants only have to access it through the internet. Tariq et al. (2014) write in their paper that a large number of organisations consider SaaS as important. Statistics show that hiring a software save 45% of the customer's savings and cut out 63% of its IT expenses [44].

In this chapter, the development of a SaaS application will be outlined. First, information about the development of SaaS requirements will be presented. Second, information about SaaS architecture will be presented. At last, solutions for multi-tenant SaaS application will be discussed.

### 1.1 SaaS Requirements

The development of SaaS application brings new requirements that have never been experienced before in software evolution. The difference between traditional software applications and SaaS application gives rise to a different direction of requirements. By example, scalability, service level agreement compliance (SLA), multi-tenancy support and security. If you want to develop a SaaS to be better in quality, you have to focus on these key requirements to be considered and discussed at early stages [44].

Tariq et al. (2014) researched the requirement engineering process for SaaS cloud environment. In their problem statement they state the following: "*SaaS vendors need to address a significant number of non-functional application concerns that are essential for the success of the service*". Examples of these concerns are metadata management, multitenancy, tenant customisation and configuration, scalability and other concerns. In their research, they looked into what requirements should get priority during requirement engineering of SaaS.

They identified mostly non-functional requirements. These requirements were engineered by the use of three major stakeholders that are users of cloud services. The stakeholders were SaaS users, SaaS Provider/ Cloud user and Cloud provider. The following requirements were identified, and the requirement engineering process should include detail information about all these requirements [44].

- **Architecture requirements:** One a multitenancy SaaS application is developed it adds complexity in data resorting and upgrades so the architecture should permit restoring data of one user without effecting other's data and minimum interruptions during upgrades. Typical architectural requirements are: *security, privacy, high availability and customizability, varying levels of SLA, stateless, fault tolerant, comprehensive redundancy and uptime and fail over strategies, API requirements and integration with legacy elements.*
- **Operations/Behavioural Requirements:** Examples of these requirements are: *easy customization and extension of UIs, data and business processes, User experiences, design requirements, security and privacy of functionality or transactions, availability, data migration and data locality management.*
- **Management requirements:** Examples of these requirements are: *centralized reporting and monitoring of service levels, usage and billing, hosting/ user and tenant management,*

*monitoring and auditing tools reporting, SLA management, bug fixes and upgrades with minimal disruption in service, patch management and process management.*

- **Technical/Implementation Requirements:** Examples of these requirements are: *Recruitment, role changes, customer/SLA/technical support, migration of data, cost of operating SaaS solution, delivering services, upkeep and maintenance, administering and upgrades, administrative cost, quality assurance and control, transferable skills and better testing.*
- **Quality of Services (QoS):** Examples of these requirements are: *uptime requirements for high availability and fault tolerance, redundancy, performance, interoperability, scalability, high availability, adoptability and usability requirements.*
- **Security and privacy requirements:** Examples of these requirements are: *customer acceptance and adaption/trust, audited data security controls, device and user authentication and access control, code reinforcing and reviewing.*
- **Compliance requirements:** Examples of these requirements are: *service related protocols, regulatory compliance, licensing requirements and compliance focus should be addressed to meet application compliance.*

Other requirements that need to be considered are requirements on identifying the number of concurrent users accessing the system, the volume of data that is required to process the functionality, network bandwidth and expected a delay in response while processing massive load functionality [44].

Besides the requirements as mentioned earlier, research is also done into the change of existing user-based requirements engineering into appropriate service-based requirements engineering. The motivation for this was the lack of a standard that has been designed specifically for SaaS. Cloud service providers need to be involved for SaaS. Because they will be providing, for example, the computing infrastructure, software development management.

They added to the Framework a new subprocess. This subprocess was suggested to perform a cloud assessment. In the following table, the complete CMMI Level 2 REQM checklist of the framework is presented [44].

The requirements mentioned in table 30 may overlap regarding categories and users of SaaS. To develop a SaaS, it is essential to take account for the previously mentioned requirements and the development process. Two types of requirements have to be taken in to account. General SaaS requirements and specific application requirements.

On the other side, there are also requirements from the tenant's perspective. What should be the requirements of choosing a right SaaS as a tenant? The following five requirements are the most important once a tenant should consider in choosing a SaaS solution [42].

- **Data security:** It is extremely important to check data security procedures and mechanisms that are guaranteed by the provided in order to prevent losing them or possibility of acquiring them by a rival company.
- **SLA warranty:** It is a contract in which service provides guarantees specific level of service provision. So, what is in this contract and does it provide enough guarantees.
- **Possibility of data export and ways of access to archival data:** Companies may want to migrate from SaaS systems. So, in what way does the SaaS system have a possibility of exporting data into new systems.
- **Possibility of data import:** It should be check whether in case of decision approving the transfer to SaaS model import of already owned data is possible.
- **Parameters reporting:** Because SaaS is based on a remote access to "own" data it is crucial of mentioned earlier SLA contract to include exactly defined efficiency parameters which should be accessible for easily performed controls and clearly reported by provider.

CMMI L2 Process Evaluation Checklist for REQM	
Obtain an Understanding of Requirements	Document the requirements
	Identify the stakeholders
	Distribute the requirements for review
	Allow time for adequate review
	Encourage feedback
Perform Cloud Assessment	Assess cloud architecture for initial requirements identified
	Make decision for public or private cloud
	Identify suitable cloud service provider
	Asses the cost of using cloud
	Document the cloud requirements
Obtain commitment to requirements	Identify appropriate approver groups
	Incorporate feedback
	Set a time limit
	Ensure that commitment allows for future change
	Seek signatures
Manager Requirement Changes	Know that requirements will change
	Control with baselines
	Honor your customer's needs
	Asses proposed changes
	Incorporate changes in an orderly manner
Maintain Bidirectional traceability of Requirements	Trace to plan
	Trace to anticipate
	Trace to know
Identify Inconsistencies Between Project Work and Requirements	Harmony with plans
	Harmony with work products

Table 35 Enhanced CMMI Level 2 REQM checklist [44]

## 1.2 SaaS Architecture

SaaS software applications have their type of architecture. SaaS architecture is classified by Microsoft in 4 maturity levels using several key attributes of the SaaS: configurability, scalability and multitenant efficiency [46].

- **Level 1 – The Ad-Hoc/Custom:** Every customer has its own modified version of a hosted application and is solely responsible to run their own instances of an application on the servers of the host.
- **Level 2 – Configurable:** SaaS offers greater flexibility. Customers are provided with the metadata which is configurable by the user and this enables many customers to use separate cases of similar application codes.
- **Level 3 – Configurable & multitenant-efficient:** At this level there are lacks of scalability but multi-tenancy makes way for the single program instance for servers each customer.
- **Level 4 – Scalable, configurable and multitenant-efficient:** The company fully controls the SaaS and the capacity of the system can be varied according to the demand and no changes have to be made in application software architecture.

Now we know the different maturity levels we look deeper into the SaaS architecture.

Tiware, Kumar, & Mishra (2013) researched the implementation of SaaS Multitenancy in cloud computing. They looked into the SaaS architecture. Tenants can use SaaS services through a web browser. The main focus of a SaaS multitenant architecture is to serve each client in a single instance. To do this, the software web portal is implemented, and a separate database is created [47].

The SaaS software's architecture exists out of three layers. The first layer is the *presentation layer*. This layer provides an interface for clients in order to access the portal application. The layer contains the following elements: *Web forms, skins, containers, module user controls*. The second layer is the *business logic layer*. This layer exposes many services to core modules. Examples of these services are: *localisation, caching, exception management, event logging, personalisation, search and installation & upgrades*. The last layer is the *data access layer*. This layer gives data services to the business logic layer. The layer uses the Provider Model to allow SaaS multi-tenant to

support a wide array of data stores. The layer exists out of two elements: *data provider API* and *Implementation of data provider API* [47].

Now the different layers of the SaaS software architecture are clear. We can look into the responsibilities of a SaaS platform. According to them, the responsibilities are *tenancy partitioning, scaling, monitoring & metering, distributed services, event log, and scheduling*.

A SaaS platform has six responsibilities. To achieve multitenancy and provide different services for different tenants three separate routines could be attained: *by utilising a database, utilising virtualisation, or through a physical partition*. The data from the different tenants will be stored in a database. There are several approaches for management of the data in a cloud. 1) Maintaining and storing separate database for tenant's data to maintain data isolation. 2) Maintain multiple tenants within the same database with each tenant having a set of tables. 3) Maintaining a same database and tables within to facilitate multiple tenant's data at a time [47].

Based on the above-mentioned findings Tiware et al. (2013) created a general architecture for effectively representing multi-tenancy in a cloud environment. In figure 11 is this architecture presented.

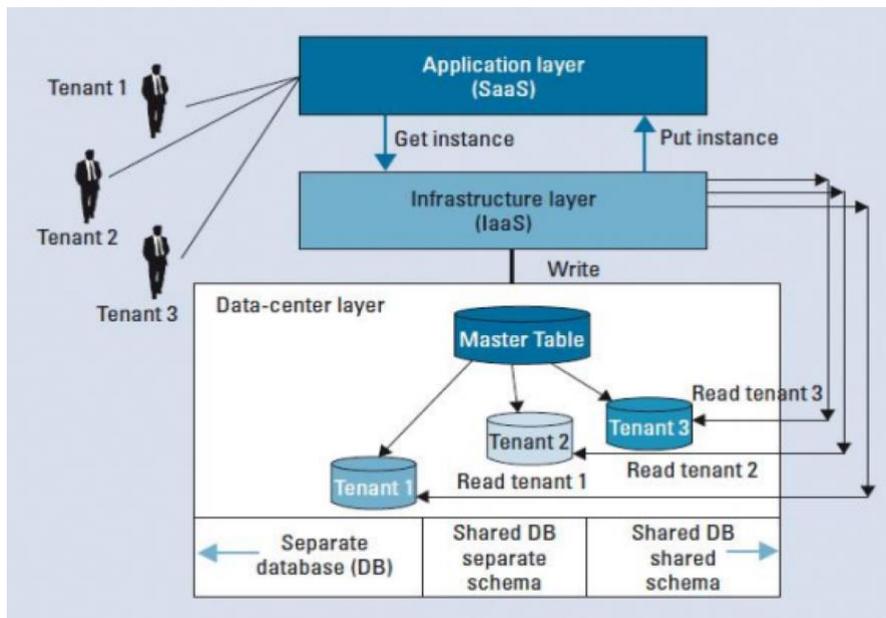


Figure 12 Cloud Computing: Managing Multitenant Data [47].

In the overview, three different layers can be identified. The first layer is the application layer existing out of three layers, the presentation layer, the business logic layer and the data access layer. The next layer is the infrastructure layer (IaaS). In this layer, one stack of software is dedicated to a specific tenant, deploying stacks for each tenant's account. The hardware requirements are dependent. The last layer, the data cent layer should provide the highest level of security within the cloud. Depending on the choice of data management all the different tables are implemented. In the example, there is a master table in a separate database that is connected to separate tenant databases.

Now it is known how a SaaS architecture works, what the responsibilities are and how multitenancy can be achieved we can look deeper into it. By digging deeper into a way of enhancing cloud SaaS development with Model Driven Architecture (MDA). MDA is a software development approach where the models are used as original artefacts throughout the process of software development. This approach is used to minimise the time, cost and efforts in application development and to enhance the return on investment. According to them the strength of MDA lies in the fact that it is based on widely used industry standards for visualising, storing and exchanging software designs and models. The models in MDA can be abstracted at three different levels [48].

1. **Computation Independent Model (CIM):** A CIM is a software independent business domain model that bridges the gap between business experts and system experts. So, it would specify the computation independent view of the system and it would capture the requirements of the system in a vocabulary.
2. **Platform Independent Model (PIM):** A PIM specifies the functionality of the system independent of the technology that would be used for its implementation. So, it would specify

the system at the next lower level of abstraction. It would capture a platform independent view focusing on the operation of the system while hiding the platform specific details.

3. **Platform Specific Model (PSM):** A PSM specifies the system in terms of implementation construct that are specific. So, it would focus on the details of use of a particular platform, thereby providing a platform specific view of the system.

The key to the success of MDA lies in automated or semi-automated model-to-model and model-to-code transformations. A transformation definition is a set of transformation rules that together describe how a model in the source language can be transformed into a model in the target language. A Cloud SaaS is a service model whereby the provider's applications running on a cloud infrastructure are offered to the consumer as a service. Because of this, it is more appropriate to model the cloud software applications at a high level of abstraction. An MDA-based development of Cloud SaaS would facilitate defining these services in a technology independent manner and would play a significant role in improving their quality making them more robust, flexible and agile [48].

#### *Example of a SaaS*

The development of a SaaS can be explained by an example of an Online Hotel Reservation System (OHRS). Sharma & Sood (2011) developed the CIM, PIM and PSM for the OHRS. They used UML to model various aspects of the system for the MDA approach.

First, they created, as part of the CIM, a Use Case diagram and Activity diagram to model the functional requirements of the system. In the ideal situation, the requirements model should be enough to produce the required system. In actual practice, the requirements model needs to be refined further into a computational model that a generator can process.

After the CIM is created, the PIM will be developed in the second step. The PIM of a system may be represented using a UML class diagram which exhibits classes and relationships among them. The PIM describes the attributes and operations in a manner that is entirely independent of any programming language or operating system.

At last, A PSM is developed. A PSM describes the technology specific details for the target platform. One or more PSMs can be derived from a single PIM using automated transformation tools. The PIM is transformed into a relational model depicted in an Entity-Relationship diagram.

### 1.3 Multi-tenant SaaS Application Solutions

Multi-tenant SaaS application also brings some challenges. One of these challenges is the approach for gradual dynamic upgrades. Once a multitenant SaaS application is a long-running service that must adhere to high availability among other quality requirements. Because the SaaS can be shared among many tenants, application-wide dynamic upgrades in one time are no longer feasible. This could evolve for all tenant's unacceptable service disruption, cause a violation of many tenant SLAs and eventually incur the loss of revenue and more. The alternative option is a gradual evolution approach. This approach is performed on a tenant-per-tenant basis. Four requirements can be identified for this approach. Three of these requirements are optimisation problems [43].

1. **Tenant Upgrade Isolation:** A tenant-by-tenant gradual evolution approach must isolate tenant scopes from each other. Once there is an upgrade for several tenants, the other tenants will not notice this.
2. **Support for Service Continuity:** A dynamic evolution of a multitenant SaaS application with minimal impact on its service continuity is challenging when the set of permitted upgrades is not limited.
3. **Stakeholder Control:** The upgrade support should be adaptable to different kinds of upgrades and sufficiently flexible and customizable to enable an expected behaviour of the application throughout the upgrade process.
4. **High automation:** The economies-of-scale effects of multitenant SaaS applications motivate putting more effort in development in order to reduce operation costs.

Specific upgrade strategies and a middleware solution can be provided for implementing the requirements. Via the mechanism of tenant configurations, tenants on the same SaaS deployment can be serviced with different service versions and thereby upgraded independently. The flexibility to apply a specific upgrade strategy for one tenant while using another strategy for a different tenant is an example of an optimisation that aims at maximal service continuity. Depending on the upgrade itself, the role of the SaaS developer, who understand the SaaS, is in charge of providing alternative upgrade strategies that score well in-service continuity and are reusable for all tenants [43].

Another challenge that can occur is how efficiently custom-made extensions can be integrated and managed. Truyen et al. (2012) showed in their paper that by using a context-oriented programming (COP) model, cross-tier tenant-specific software variations could be easily integrated into the single-version application code base.

First, they set out a list of important requirements for specific customisation based on a simple customisation scenario [45].

1. **Tenant specific software variations:** The SaaS development team should have simple way to manage the different tenant-specific variations as separate units of deployment that can be selectively bound to the core architecture of the application.
2. **Configuration facility:** Tenant administrators should have the possibility to select what software variations should be enabled for them. This should also allow to specify specific configuration parameters. These configuration data should be stores in the datastore of the SaaS under a specific tenant ID.
3. **Run-time activation of tenant-specific variations:** Run-time support is needed to provide support for activating software variations on a per tenant basis or even per user basis.

The results of their study showed that COP is a powerful customisation mechanism that allows to integrate and manage tenant-specific software variations within SaaS applications efficiently. COP achieves high customisation flexibility in comparison to other dependency injection frameworks without cause any performance overhead [45].