Technical writing by technical experts −
Accessibility in the internal documentation of a software development team

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Tässä tutkimuksessa tarkastellaan ohjelmistokehittäjäryhmän sisäisen dokumentaation saavutettavuutta kohdeyrityksessä. Tutkimuksen tavoitteena on kartoittaa kohdeyrityksen sisäisten dokumenttien käyttäjien ja sisällöntuottajien kokemuksia sisäisten dokumenttien käytöstä, tutkia saavutettavuuteen liittyviä ongelmia sekä kehittää ratkaisuja siinä havaittuihin ongelmiin. Tutkimushypoteesit olivat seuraavat: Sisäisten dokumenttien käyttäjillä ja sisällöntuottajilla on hyvin erilaisia tarpeita ja näkemyksiä sisäisestä dokumentaatiosta, eivätkä käyttäjät ja sisällöntuottajat ole yhtä mieltä sisäisen dokumentaation tarpeellisuudesta. Sisäisten dokumenttien käyttäjät ja sisällöntuottajat eivät ole tietoisia toistensa tarpeista eivätkä ole yhtä mieltä siitä, miten sisäistä dokumentointia pitäisi kehittää.

Tutkimus on aineistolähtöinen, ja tutkimuksen aihe ja tutkimuskysymykset on määritelty aineistosta nousseiden huomioiden perusteella. Tutkimuksessa käytetty pääasiallinen aineisto kerättiin ohjelmistokehittäjäryhmän jäseniltä puolistrukturoituja haastatteluja käyttäen (n=26). Toissijaisena aineistona käytettiin materiaalia, joka kerättiin dokumentoinnista ja informaation suunnittelusta vastaavan henkilökunnan kanssa käydyistä keskusteluista.

Tutkimus nojautuu toimintatutkimuksen metodologiaan ja periaatteisiin. Toimintatutkimuksen periaatteiden mukaisesti informantteja kohdeltiin osallistujina, jotka ovat tutkijan kanssa samanarvoisessa asemassa, ja projektin aikana pyrittiin lisäämään kaikkien tutkimukseen osallistuneiden henkilöiden kokonaisvaltaista ymmärrystä tutkimusaiheesta. Tutkimuksessa pyrittiin luomaan keskustelua sisäisen dokumentaation käyttäjien ja sisällöntuottajien välille sekä edistämään osallistujien mahdollisuuksia vaikuttaa sisäisen dokumentoinnin prosessiin työpaikalla.

Tutkimusaineiston perusteella näyttäisi, että sisäisen dokumentaation käyttäjien ja sisällöntuottajien kokemukset sisäisten dokumenttien käytöstä ja niiden saavutettavuudesta ovat suurelta osin negatiivisia. Sisäisten dokumenttien saavutettavuudessa on ongelmia, jotka liittyvät epätarkasti määriteltyihin dokumentoinnin konventioihin, sisällöntuottajien työtapoihin ja dokumentoinnin taitotasoon, dokumentointityökalun toimivuuteen sekä dokumentoinnin hallintaan ja ohjaukseen ohjelmistokehittäjäryhmässä. Teknisen viestinnän tehtäviä ja niiden merkitystä ei tunneta ohjelmistokehittäjäryhmässä tarpeeksi hyvin, ja ryhmä näyttäisi tarvitsevan teknisen kirjoittajan koordinoimaan sisäistä dokumentointia. Sisäisen dokumentoinnin prosessi, sisällöntuottajien dokumentaatioon liittyvät työtehtävät ja informaation suunnittelu täytyisi määritellä uudelleen sisäisen dokumentaation käyttäjien näkökulmasta, ja dokumentoinnin prosessia täytyisi ohjata huolellisesti määritellyn prosessin mukaisesti. Tämän tutkimuksen tulokset vahvistavat aiemmissa tutkimuksissa todettuja puutteita teknisen viestinnän ammattitaidon arvostuksesta yrityksissä ja tieto-organisaatioissa. Tutkimuksen tulokset ovat hyödyllisiä yrityksille, jotka pyrkivät löytämään mahdollisimman toimivan tavan tuottaa saavutettavaa sisäistä dokumentaatiota.

Avainsanat: tekninen viestintä, tekninen kirjoittaminen, saavutettavuus, versionhallinta

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1 Introduction

In this thesis of technical communication, I explore and discuss issues related to the internal documentation of one software development team in a large[1] target company. In the software development team, accessible and clear internal documentation is a crucial part of delivering the software product to the end users, although the internal documents are not directly visible to the end users of the software product. Creating this thesis in co-operation with the target company was possible because of my internship as a technical writer in the company. As I had got some first-hand experience about the internal documentation process during my internship, it seemed clear to me that the process of creating and distributing internal documentation is problematic to the employees of the software development team. In a hectic working environment of a multi-site software company, it may be easy to think that internal documentation is not as important or urgent to develop as software, because internal documentation is not the final product in itself.

1.1 Framework of the study

The need to begin this research project emerged from complaints about the usability of the internal documents that were voiced by end users of the software product the software development team produces. Even though the audience of the internal documents that are discussed in this study are the employees of the target company, the quality of the documents directly affects the successful deployment of the software product, and shows as delays to the end users. The quality of the documentation can have a very direct impact to the end user experience, and maintaining a high quality documentation process would logically be a very business-critical issue to the software development team.

In the context of technical communication, the situation in the field of technical communication and the hardships that technical writers may face in their working environments today was one of the reasons I chose to study internal documentation in a target company. In the working life of technical writers, it can often be difficult for practitioners to empower their co-workers to fully understand the meaning of the documentation work they do (Maher 2011, 368; Ward 2015, 21). It is not uncommon that in a technical writer's working context, documentation is either overlooked entirely, or judged based on a very narrow understanding about documentation and different aspects of textual communication (Virtaluoto 2015, 58; Swarts 2014, 255). Especially in the industry of information and communications technology (ICT), the most crucial decisions that concern documentation are often made by others than documentation experts (Guren 2015, 11; Virtaluoto 2015, 36) as outsourcing and off-shoring are becoming more and more frequent

1 A large company or organization has more than 150 people working for it (Korhonen 2012, ix).

phenomena in technical communication jobs (Virtaluoto 2015, 41). In understaffed technical writing teams, there may simply be no resources for coordination work, as all available resources are used for writing. In a situation like this, consequences of outsourcing, off-shoring and layoffs can lead to a situation where employees with the most experience in technical documentation are not allowed to make decisions about the information architecture or the publication method of the documents.

Concerning the scope of this study, during the development of the software product the software developers, technical writers, project managers and other knowledge workers of the software development team have many other pressing matters besides documentation on their hands at all times. The highly complex software product that the software development team produces demand a high level of expertise to produce and a large amount of maintenance work even after a product release is complete. From the point of view of the developers, who are not documentation experts, creating good internal documentation may even be viewed as the "necessary evil" during the product's creation cycle. Balancing the pressure from multiple projects and other working duties with documentation-related tasks may cause the internal documentation to be done with a low priority. This may cause that some parts of the documentation process may not be as controlled or clear in practice as they are on paper.

At the beginning of this research project, the issues in the internal documentation were categorized as usability issues in particular by the developers and project managers of the software development team. However, it soon became clear that the concepts of usability and accessibility were not very clear to the employees who would be participating in this study. Thus, the process of formulating the study questions lead from what appeared to be usability issues to the underlying problems which have more to do with the accessibility of the internal documents and the ways of working in the documentation process, on which I will later elaborate. Consequently, I formulated my study questions so that my main focus is on investigating the accessibility issues in the internal documentation. However, because the fields of usability and accessibility are interconnected and thematically very close to each other, I will also refer to theories of usability and usable design in this study and use background literature from the field of usability design.

The internal documentation that is under study has a dual role in the software development team. Before the software product is finished, different teams of internal employees use the documents in the development process of the product. Using the finished documents is imperative in delivering the software product successfully to the end user. So the accessibility and clarity of the documents have a major impact on the software product's success, even though the documents are not seen by any of the end users at the time of the delivery. However, some of the internal

documents will later be delivered to the end users, so the significance of the internal documentation to the success of the product and customer satisfaction will grow in the future. Even though the documentation under study is not a solid part of the finished product, the product cannot be made functional without the internal documents. In the software development team, the internal documentation and the software product that is described in the documentation are inseparable and they are always developed simultaneously.

To summarize, the broader topics of this thesis are usability, accessibility and the role of technical documentation in the workplace. According to Ward (2015, 21), usability of software products in the computer industry is currently largely discussed in the leading organizations and manufacturers of software. Software components and technologies are becoming more and more easily available to anyone who wishes to develop and sell software products. As a result of the abundance of possibilities and the increased availability of technologies, software products and solutions are beginning to resemble one another. In the wake of this trend, large companies and organizations, which are considered to be more rigid and stiff when reacting to changes in the market than for example start-up companies, are starting to realize that promoting usability and focusing on customer satisfaction is the only way to make a difference in the market with a given product (Ward 2015, 21). For products that are otherwise very similar, usability, accessibility and good design can be the only differentiating features, which makes them valuable business assets.

The focus in the computerized marketplace is turning from studying and improving only the performance and features of the devices towards studying the meaning of end user satisfaction, and this shows in the decision-making processes of software companies (Ward 2015). In software companies, documentation and information design are seen more and more as the truly valuable makers of customer satisfaction that they are (Smart and Whiting 2002, 157). It is typical that software products are designed in specialized “silos”, which means that different parts of a software product are designed by dedicated and highly specialized teams that are placed in a rigid, hierarchical organization and isolated from each other (Koch 2004, 9; Smart and Whiting, 160). Making a change towards collaboration between developers, user interface designers and technical writers to provide a unified information structure is not simple or easy (Smart and Whiting 2002, 159) and it requires co-operation over the boundaries of organizational hierarchies. Making decisions about the usability and accessibility of documentation is closely linked to recognizing the value of technical documentation and information design in the development team, and using power inside the target company's decision-making processes. In this study, I will discuss the attitude documentation and information tasks are often met with, as well as the role of technical writers and content creators in the workplace based on my results.

My research method in this study is action research. Because of this data-driven and iterative research method, my research topics were not clear-cut at the beginning of the research as was just suggested. The topics and study questions arose from the data and the problems that were discovered from it, and they became clearer and narrowed down as the study progressed. From the start, I wished to study the internal documentation process from up close and have meaningful dialogue with both the employees who add content to the documents or otherwise modify them (henceforth **content creators**) and the employees who either use or test the documentation during the development or the deployment of the software product (henceforth **users**). Using action research as a research method enabled me to stay flexible enough for the study questions to fit the data, and not the other way around. Since the data gathering took place during working hours in the office and during the continuous development of the product, it was absolutely necessary for me to remain on a grassroots level and be easily approachable in order to refrain from needlessly increasing the workload of the participants. In accordance with the principles of action research, the subjects of this study are not passive targets that are merely observed. The subjects of this study are treated as participants and equal makers of meaning, who contribute to the increase of common understanding about the study questions (Dick 2002).

The interviewees in this study are employees from a software development team and several sub-teams with different areas of expertise. What the interviewees have in common is that they all need to either access or take part in creating content for the internal documentation, which is produced by the software development team that is in the focus of this study. My study questions are formulated from the point of view of the internal documentation of the software development team. My aim in all discussions and interviews was not only to collect information, but also to distribute it to parties who might have been unaware of each other before in the internal documentation process, and to increase discussion and encourage reflection among the participants.

The target company is a major organization that specializes in producing both hardware and software-based networking solutions. The target company has multiple internal sub-organizations and it operates on several sites that are located in over seven different countries. To preserve non-disclosure and to protect the business interests of the target company, the target company is only referred to as “the target company” in this study. Because the data of this study consists of internal documentation and potentially business critical information, I endeavor to be as transparent as possible about protecting the anonymity of the participants and the anonymity of the target company. In this study, unless otherwise specified, the terms “internal documentation” and “internal documents” refer to the internal documentation of one particular software product that is produced in the aforementioned software development team.

1.2 Objectives of the study

During my internship in the target company, I realized that the employees of the software development team were not able to quickly describe the internal documentation process when asked to do so. However, when most of the content creators were experienced enough, it was possible to crawl through the process regardless of its taxing nature each time a new product release is under development (internship experiences 2015). Because of a multitude of factors that I will elaborate on later in this thesis, the content creators had tended to ignore the flaws of the process and "let sleeping dogs lie". The documentation process had then slowly formed into a routine that was based on a very complex and even needlessly difficult procedure. Studying the internal documentation process, both from the users' point of view and the content creators' point of view, and identifying and naming possible improvements to it, came to be the main goals of this study.

Study questions

- What kind of experiences do the users and content creators have on using internal documentation?
- What kind of accessibility problems are there in the internal documentation?
- How could the accessibility problems be solved?

Hypotheses

After collaborating with the users and content creators of the internal documentation during my internship, I was able to form a picture of the internal documentation process. Based on internal discussions with the content creators (2015-2016) and my own experiences in the target company, I came to the following hypotheses:

- The users and content creators of the internal documentation have very different needs concerning the documentation process and differing opinions about the relevance of the documentation.
- The users and content creators are not aware of the needs of each other, and they are not in agreement about what would be the best way to create internal documentation.

In this study, I will collect and analyze the experiences, needs and improvement suggestions from users and content creators of internal documentation. The primary goal of the study is to investigate what kind of procedures could help solve the accessibility problems, and to prepare new documentation procedures and instructions in co-operation with the users and content creators.

The secondary goal of the study is to bring the views of the users and content creators together, and to create meaningful dialogue between different user and content creator groups in the

workplace, and to increase awareness about accessibility and usability issues and how they are related to the documentation process in the software development team. This study is carried out as a part of a larger documentation improvement project in the target company, and it will provide material which will be used in that documentation improvement project.

The possible benefits of making this study are grounded in two domains. On the one hand, employees in the software development team will benefit from the research project and the resulting discussions. During the study, the employees in the development teams and their managers will benefit from the participative research methods as they are able to discuss the documentation process more critically than before and follow the analysis of the results from up close. Gathering experiences and opinions from both the users and the content creators who are situated in different phases of the development process benefits the participants by increasing awareness about the documentation process and informing different user groups about one another. For any company, it is everyone's benefit that the employees are as aware of each other and the needs of different groups during the development process as possible. When accessibility and usability are taken into account early on in the internal documentation process, it is easier for the developers to consider usability and accessibility issues in the end product as well, as painless documentation frees time for more thorough development work and reduces stress. Developing an established process and functioning routines for the internal documentation of the product adds value to the end product and makes the job of both the users and the content creators of the documentation easier.

On the other hand, this study is motivated by the need to spread knowledge about the importance of technical documentation in organizations, and to promote accessible documentation of software products. The study topic is interesting to the fields of technical communication, accessibility and usability, and its results can be used as a reference or as a starting point when solving problems related to internal documentation in a large organization or company. The study is empirical, and the description of the methods that are used or the solutions that are discovered during its course may benefit others who are looking for solutions to similar issues with documentation or communication. This study contributes to “the shared needs and concerns of industry and academy” (Andersen 2014, 143) by discussing and producing data about the practical ways of working and the needs the practitioners have in the field of technical communication. This study is practically relevant because it can be used as a reference in other companies that might have similar problems with their internal or customer documentation.

1.3 The structure of this thesis

In Chapter 2, I will define the key concepts that are used in this study. After that, I will discuss

issues related to the accessibility demands for electronically mediated texts in organizational contexts with the help of standards for web accessibility, and literature from the fields of usability studies and technical communication. At the end of Chapter 2, I will introduce the software development process of the software development team and discuss how creating the internal documentation relates to the software development process in the development team.

In Chapter 3, I will introduce and discuss action research, which is the methodological framework used in this study. I will introduce the basic principles of action research with the help of background literature and discuss the role of administering change in action research. I will compare traditional methods of scientific research with action research, and at the end of the chapter I will discuss action research conducted in organizational settings.

In Chapter 4, I will introduce the methods I used to gather data for this study and the process of formulating the interview questions. I will discuss my data and some of the characteristics of the interviewees.

I will analyze and discuss my findings in Chapter 5. First, I will categorize the interview results and discuss the results from the point of view of each category. Then, I will discuss findings from the point of view of users and content creators respectively. Finally, I will introduce the methods of evaluating the quality of the internal documentation process which are in use in the software development team, and evaluate the maturity of the internal documentation process based on my findings.

In Chapter 6, I will summarize the results of the study and present conclusions based on the data. I will evaluate the research project from the point of view of the participants' feedback, and compare the different actions that were taken during the research project. Finally, I will evaluate my research methods and the interview process from my point of view.

2 Accessible documentation and technical communication

In this chapter, I define the key concepts that I use in this study. I then discuss the usability and accessibility needs that electronically mediated texts pose to the reader with the help of background literature. Finally, I introduce the software development process that is in use in the software development team and discuss how the internal documentation process is related to producing software.

2.1 Key concepts

I discuss various themes such as accessibility, usability, technical communication and software development in this study. Some of the terms I define are tied to the specific context of this study, and others are definitions of more generic terms that are relevant to my study.

- Accessibility
  - Generally, *accessibility* is a principle according to which all services, appliances, and knowledge should be available, usable and understandable to all citizens, regardless of their abilities, and all citizens should have equal chances to participate in decision-making that involves them (Invalidiliitto 2015). The broad term of accessibility has many kinds of adaptations and sub-categories. In this study, I discuss accessibility from the point of view of online services and online texts because this sub-category of accessibility is the most apt for my data. I will apply the World Wide Web Consortium's[2] (W3C) definition of web accessibility when I discuss the accessibility and issues in my data. The W3C definition for web accessibility states that "the Web is fundamentally designed to work for all people, whatever their hardware, software, language, culture, location, or physical or mental ability" in order to "provide equal access and equal opportunity to people with diverse abilities" (Lawton et al. 2015). Applying this definition to the internal documentation of the software development team is justified because the documentation is electronically mediated and fragmented across several mediums and formats, and users of the internal documentation face similar issues as users of web-based applications when they browse and search for relevant material.
- Content management system
  - A *content management system* (CMS) is a software tool that is created and maintained for the purpose of archiving and tracking documents, files, tables, or other (digital) artifacts that are often related to the development or maintenance of a (digital) product or

2 The World Wide Web Consortium is an international community that develops Web standards in collaboration with member organizations and the public (Berners-Lee 2016).

service in an organization or business. A CMS can be configured to provide permission-based access to its data to users on different levels. Content management systems can also be known as enterprise content management (ECM) in an organizational context. A content management system does not have a single general definition (Manning 2004) and the properties of a CMS can vary depending on the context and instance. In the software development team, the internal documentation is stored and published in a complex CMS.

- End user
  - In this thesis, I use the term *end user* to generally refer to users of products or documentation that are not internal personnel of a company. In my usage, this term is synonymous to customer.
- Software deployment
  - In this study, I use the term s*oftware deployment* to refer to the activities that are needed to make a software system available or ready for use. In the software development team, software deployment operations can be carried out either by representatives of customer teams (customer support engineers) or other internal personnel. Developing the deployment procedures of a software product and its related services is the main working task of the software development team whose internal documentation is discussed in this study.
- Software development
  - In this study, I use the term *software development* to refer to an iterative or cyclical production process of a software product. In the software development team, software packages are designed and developed in short, repetitive phases, and after each phase the changes are tested and corrected. For the internal documentation, this implies a constantly active documentation process, where older versions of documents are tested and modified, and saved as new versions, which are then made available for the users right after they are ready.
- Subject matter expert
  - In the context of technical documentation, a *subject matter expert* (SME) is the person who verifies the technical accuracy of a given document. Ideally, SMEs work in close co-operation with technical writers and provide the technical writer with the raw subject matter of the document. The information design, the presentation of content, and the linguistic choices are taken care of by the technical writer. SMEs typically review

technical documents before they are published. I do not use this term when discussing my data, but this term is frequently used in studies about technical communication that I cite in this study.

- Technical communication
  - In this study, I use the term *technical communication* to refer to the broader scientific and scholarly contexts that surround the activity of technical documentation, and the studies conducted about technical documentation.
- Technical documentation
  - In this study, I use the term *technical documentation* when I talk about the different areas of work of a technical writer and the best practices related to those areas, i. e. documenting, information design, making decisions about the form and layout of a document, and researching the subject matter and the audience.
- Usability
  - *Usability* is "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction, in a specified context of use" (ISO 9241-11:1998). Nielsen (1993, 25) divides the definition of usability into categories, which state that the usability of a product or a service depends on being easy to learn, efficient to use, easy to remember, having few errors and being subjectively pleasing. Usability is thus not a singular, measurable thing, but instead it consists of many different factors. Some of the usability categories are very closely related to accessibility issues, and there is some overlap between the high-level terms.
- Version control
  - In this study, *version control* refers to the activity of numbering, naming, and archiving the internal documents in a logical and consistent way. Consistent version control of internal documents helps the users to find the correct information more quickly. In this study, version control of the internal documents is related to both the accessibility of the documents, as well as quality criteria that are placed on corporate documents by international standards and quality management systems. Software development companies may wish to attain quality certificates by making their practices and services compliant with international standards of quality management (for example, ISO 9001:2015).

2.2 On usability and accessibility of electronically mediated texts

In this section, I discuss the accessibility and usability demands that electronically mediated texts

pose to the users and the possibilities to publish dynamic content that emerge from the digital medium and certain publication methods of documentation. I also discuss the principles of web accessibility, and how they affect planning electronically mediated documentation. At the end of this section, I briefly introduce the main criteria according to which accessibility of internal documentation is currently ensured in the development team.

When text is published in an electronic format, it is obviously not similar to text on paper, and it becomes electronically mediated text. There are multiple formats for electronically mediated text, which support showing dynamic content in varying degrees. For example, online content published in XML can have animations, hyperlinks, scalable illustrations, and a large selection of interactivity, whereas the PDF format only supports hyperlinks and static graphics. The ways a text relates to other texts with hyperlinks, the possibilities for interactivity, links that point to places within a document, and the ability to search for content inside small and large portions of a database are only some of the considerations that arise when the text is no longer presented in a physical, traditional medium. Developing and publishing digitally mediated documentation that is truly useful and accessible requires careful planning as well as expertise in information design. The differences between traditionally published texts and digitally published texts pose certain demands for digitally mediated text to be accessible.

If a given (software) product is entirely digital, the documentation related to the product can be published in an electronic format for convenience and to save printing costs. Many private and business organizations are rapidly moving towards publishing all their communication exclusively on digital media and platforms to take advantage of the potential savings (Andersen 2014, 116) and the possibilities to reach more customers with the features offered by digital publishing methods (Lamberti 2010, 37–40). Publishing documentation in an electronic format gives an organization the advantage of being able to provide up-to-date content faster, and the possibility to make corrections to documents according to the needs of the users with less delays. However, depending on the complexity of the product (for example, a single application for a smartphone vs. a service that contains several pieces of software from multiple vendors), publishing the documentation digitally can mean extra work for the user. The user may have to learn to use a documentation portal or other electronic publication method in addition to learning to use the product itself. Sometimes the instructions are integrated into the software product, which minimizes the trouble the users have to go through when they wish to access documentation, but if the product is very complex, software-integrated instructions may not be possible or feasible to produce. These issues are examples of accessibility demands that the user faces because of digitally mediated texts.

When documentation is published in a separate online portal, the documentation is typically

created with desktop publishing software and published in a database that only the users of the product or service can access. The database can contain “live” documentation sets that are updated continually on a need basis, or as static repositories of text files are updated only when the product is updated. “Live” documentation can be published in dynamic online formats, such as XML (Extensible Markup Language), whereas static text files are published in static formats, such as PDF (Portable Document Format). In development team for example, the internal documentation is created with a word processor and stored and published directly in a content management system (CMS) as static Word files.

When considering accessibility of documentation in more detail, I will contrast my findings from the data against current views about defining tasks in digitally mediated instructional texts and against ways to acknowledge the audience when creating instructional texts for software products. For example, Swarts (2014) puts the traditionally used model of task-based writing under question in digitally mediated instructional texts. Swarts (2014, 255) points out that writing instructions for premeditated and limited tasks with known, clear-cut contexts does not correspond the user's context, and is not necessarily even possible in the instructions of modern software programs. Cooper (1999, 165) advocates the use of carefully defined user personas as a way to identify the needs of the readers in his book about goal-oriented design and warns software companies against programmer-lead interaction design when deciding about the product's interactive features (Cooper 1999, 117). Cooper's (1999, 165) notions about getting to know the users thoroughly before beginning the development of a product are applicable to planning a documentation process. In the scope of my study, the content creators are not writing for their colleagues close by, but instead they have a wide audience located in many different countries to whom the product is delivered.

According to Swarts (2004, 76), users conceptualize and use instructional texts as tools that help them achieve their goals. As stated above, the accessibility issues of these digitally mediated tools are different from the accessibility issues of traditional texts. As mentioned in section 2.2, according to the W3C definition of Web accessibility a website, web technology or tool is designed well when it is accessible to people with diverse range of hearing, movement, sight, and cognitive ability (Lawton et al. 2014). In this study, accessibility of the internal documents means the ways the users are able to reach the documents from the location they use it from, and the ways they can make sure that the document they are reading is the correct one. To the users, accessibility also means the availability of the documents that may be linked to the documents a user is using that are needed for a given task. For example, a document should support multiple kinds of learning strategies, and the structure of the document should be designed to help the user to find relevant information (Ganier 2004, 21; Purho 2000, 2). Similarly, according to Smart and Whiting (2002,

120), documentation should be designed by thoroughly analyzing the needs and the learning strategies of the users. Based on their data collected from a case company, Smart and Whiting (2002, 131) state that users of user assistance services have different learning styles, typically little time for formal learning or training, and they do not care if their methods are inefficient. Both Ganier (2004) and Smart and Whiting (2002) state that users with differing learning styles should be taken into account when planning documentation, and the information formats that are used should match the ones the users of a given product or service find most intuitive and helpful. Knowing the user, and modeling the information according to the users' needs is considered to be one of the key elements of information design (Redish 2000, 163) as well as one of a technical writer's key competences (for example, Jayaprakash 2007, 130; Budinski 2001, 55).

Designing good documentation can be viewed from a larger perspective, so that instead of thinking about the quality of documentation, the focus is moved to planning usable and accessible information structures. Based on their results, Smart and Whiting (2002, 158) recommend taking the entire user experience into account when planning the informative aspects of a software product. Good documentation, or rather accessible information structures, can only emerge if all information sources that are potentially relevant for the user (such as software-integrated cues, UI texts, error messages and so on) are equally taken into account when planning a software product. Technical writers can not be the party that is solely responsible for informed and happy users. Instead of focusing heavily on documentation at the end of the development cycle, the value of good information design and early user-inclusion should be recognized in the early stages of development of a software product (Cooper 1999). In an ideal situation, experts from user interface design, technical communication and software development share information and work in co-operation with the users, and plan the entire information structure of a given product and the user assistance material related to the product so that all aspects that guide the user forward serve the users' needs (Smart and Whiting 2002, 161).

International standards (ISOs) also pose demands for processes and practices and for accessibility of documentation. Certain ISOs can be used as guidelines for planning and improving the quality of various business processes in organizations. In the software development team, quality management is planned according to ISO 9001:2015. This standard specifies the documentation that an organization must have about its quality management processes. According to this standard, documented information about quality management in a company should be “available and suitable for use, where and when it is needed”, and include appropriate “identification and description (e.g. a title, date, author, or reference number)” (ISO 9001:2015, 9). The internal documents in the development team are linked to the releases of the software product,

and each document must unambiguously match the product version it was written for. Consistent version control enables the users to find the documents easily and quickly, and helps the content creators to update and maintain documentation in older releases efficiently.

2.3 Software development and documentation

In this section, I describe the software development cycle and introduce the internal documentation process in the software development team. The internal documentation is created simultaneously with the development of the software product. Because my methods are heavily data-driven and my study questions strongly relate to the needs of the software development team, I will introduce some of the characteristics of the data already here and discuss the state of the internal documentation process as I saw it at the beginning of this study.

In the software development team, the internal documentation is largely created by the developers. In addition to the developers, there are two technical writers in the software development team that are mostly allocated to tasks related to the internal documentation. Most of the content is produced by the developers, and the technical writers edit and check the documents as thoroughly as they can between other tasks they have in customer documentation[3].

At the beginning of the software development cycle, first drafts of the documents are outlined based on the specifications for the software product that is going to be developed. The documents are then updated sporadically during the development cycle, either by developers or technical writers, depending on who is available for work at the time and which area of the software product the update concerns. These updates to the documents are coordinated or planned little or not at all, and any co-operation between the technical writers and the developers usually happens in spontaneous, unplanned sessions that are not recurring.

The documents are first used by teams of resilience testers[4] in early phases of the iterative software development cycle. At this point, much of the content is not ready yet, and neither is the software product. There are often conflicts between teams about how to handle the discrepancies between the gradual progress of the software product and the document (internal discussion 1 with project manager 2015). The development of the software product and the documents that describe the deployment process are typically not synchronized, which causes problems for the team members who need to access the software with the help of the document, but who do not have the same expertise as the developers. This discrepancy hints at the problems in the internal documentation process: The first users of the documents (the resilience testers) would need to

3 Customer documentation refers to documentation that is delivered to the end users of the software product that the software development team produces.
4 A resilience tester tests the software product according to the instructions (the internal documents), and attempts to simulate possible failures in the product and then reports them to the developers.

access the documents in order to proceed with their work, even though the documents are not ready. This is why the users would need to be more aware of the documentation process as a whole and understand the needs and the document creation schedule that the content creators have.

When the development cycle passes a given checkpoint, the documents are reviewed by the developers, and systems performance engineers[5] use the documents to verify the software product. After some further comments and corrections from the systems performance testing teams, the documents are updated while the software product is finalized. At the end of the development cycle, the documents are collected and published to a final location in the content management system, where they are accessed and used by customer support engineers[6].

After the software development cycle is complete, the documents are stored for maintenance in the final location in the CMS. Maintenance updates can be done by developers or technical writers. The maintenance work done to internal documents is not very carefully coordinated or planned, especially in the case of older versions of the software product. This can cause employees with little to none documentation expertise to modify documents that have already been completed and published in an off-hand manner, which in turn can cause accessibility problems for the final users of the documents.

Despite the fact that the internal documents are multi-authored by several people with different areas of expertise, the documentation process has not been planned or outlined so that it would take into account the issues and special needs of multi-authoring documents. For example, it is not always possible for a content creator to see who updated an internal document before them, or to find out why a version is missing from the version history of the CMS that is in use in the software development team. There are no established communication channels or regular meetings in place that would act as a channel between the technical writers and the developers, or between the members of the software development team and other teams that need to access the internal documents. These themes are closely related to the data and my conclusions about the data, and I will discuss them in more detail in Chapters 4 and 5.

5 A systems performance engineer ensures that a software product is able to perform the tasks that have been designed to be included in the finished version.

6 Customer support engineers perform software deployment operations according to the instructions in the internal documents. In the scope of this study, customer support engineers work in the same location as the end users of the software product.

3 Action research as a methodology

In this chapter, I introduce and discuss definitions for action research and briefly introduce its basic principles. I discuss my reasoning on why I came to choose action research as my methodology in this study. In the final section, I discuss the role of administering change in action research, conducting action research in an organizational setting, and using action research to study and administer social change.

3.1 Basic principles of action research

Action research can be shortly defined as qualitative research that aims to solve practical problems, and to administer change in a particular situation (Denscombe 2014, 122; Dick 2002). Action research as a methodology can be used for research purposes in varying fields of science, such as social sciences (e.g., Somekh 2005), pedagogy (e.g., Zuber-Skerritt 2002), and business education (e.g., McDonnell et al. 2014). Somekh (2005, 6) discusses action research from the point of view of social sciences and defines the methodology as a series of flexible cycles. The main phases of recurring research activities that are the most relevant to my study are the following (Somekh 2005, 6):

- the collection of data about the topic of investigation
- the analysis and interpretation of the collected data
- the planning of action strategies to bring out positive changes
- the evaluation of the changes that were brought out

In other words, action research is a data-driven, iterative process, where the researcher's work begins with collecting and analyzing data, builds on the results and analyses gathered from the previous cycles of research activities, and aims for a solution or improvement to a particular problem that is present in the data. Action research is practically oriented: The goal of an action research project is usually not to produce results that can be directly generalized, but to find answers or recommendations to particular problems that can be very case-specific.

In addition to the iterative nature of action research and its general aspiration towards bringing about positive change, collaboration between the researcher and the study subjects is widely considered to be a central characteristic in the methodology (for example Somekh 2005, 7; McNiff 2000, 217; Dick 2002). McNiff (2000, 217, my emphasis) even goes on to state that “action research **has** to be participative”, even though some researchers consider collaborative action research to be a sub-variant of action research (for example, Zuber-Skerritt 2002). Collaboration in action research means that the study subjects of a given research project are treated as active

participants and meaning-makers in the study, and they are equal to the researcher in position and status (Somekh 2005, 3). The idea of test subjects participating in a research project as active meaning-makers is similar to the idea of participation that is present in some of the methods of modern usability testing and design, such as participatory design (Ovaska et al. 2005, 7). The principles of participation in usability design, which connects to the theme of usability in this study, are similar to the principles of action research. I think that to be able to solve and to better understand accessibility issues in a body of documentation that has multiple authors (content creators) as well as readers (users) demands a methodology that enables each study subject to participate firsthand in the discussion.

According to the assumptions that underlay traditional scientific research methods, the observer or researcher must be without delusions in the research situation, all phenomena that are under study are real and tangible, and the results of a scientific study can always be generalized on and repeated in other settings (Ovaska et al. 2005, 13). According to Somekh (2005, 28), generalizations are not the goal in action research, or even in social research in general. She argues for a social science methodology that works for the agency of its subjects and aims to improve social practices. Somekh cites Giddens, who states that "the uncovering of generalizations is not the be-all and end-all of social theory" (Giddens 1984, cited in Somekh 2005, 28). Somekh (2005, 28) then goes on to argue for the position of action research as an agent for powerful social action, and as a utilitarian enabler of positive knowledge transformation among its participants.

Unlike traditional research methods, action research acknowledges the humanity and the individuality of the researcher and does not claim absolute clarity of observations or arguments that are made about the study topic. Instead, the researcher is defined as a meaning-making individual, inevitably burdened with their own views and prejudices (Somekh 2005, 8). Action research strives to take into account and openly address the humanity of the researcher as well as the participants when conducting research and it endeavors to increase the researchers and the participants' holistic understanding about the study subject or particular problem. Action research can draw influences and knowledge from many areas of sciences (Somekh 2005, 8).

To sum up, action research differs from the research methodologies of natural sciences in two notable factors. First, action research endeavors to bring theory and practice together instead of observing them as separate, clear-cut entities. This principle is clearly a part of every action research project as the iterative cycles of action and reflection. Second, instead of supposedly objective, quantitative and generalizable results, action research endeavors to produce qualitative results that are specialized to solve a particular problem, and to increase the subjective knowledge of all participants in the research about the study subject.

As a researcher, I am fond of the idea of producing usable results for a particular problem, so that the participants of a research project are able to see the whole process of the research and not just the results. I strongly feel that it is beneficial to the participants of a research project that social processes in the project are made as as transparent as possible and that the participants are enabled to be in direct dialogue with each other. Using the methodology of action research allowed me to conduct research in this way in this study.

Looking at research methods from a wider point of view, I think that transparent and participative research methods can take popularizing science and scientific research in a good direction. Based on my experiences in this research project, immediate involvement of the participants in a research project seems to be a more powerful way of positively affecting opinions about scientific research than merely presenting simplified descriptions of scientific projects in the media, or only publishing the results instead of the process. Because of the participative methods and openness between the participants, action research allows the participants to discuss the study subject both with each other and with the researcher and to see it evolve during the process. Ideally, the participants know the research methods as thoroughly as the researcher and are able to ask questions about the progress of the research. Because of this, there may be less pressure towards the researcher to produce results of a given kind and the researcher is not as isolated from their study subjects and data as they might be when using a traditional methods of empirical research. The researcher both observes and engages with participants and is not limited by the confines of supposed objectivity.

3.2 Conducting action research in a large organization

Action research lends itself well to research conducted in organizational settings. Research topics in organizational settings can be varied and are often unique, which fits in with the methodology of action research. Conducting action research in organizations is closely related to sociology, and focuses on the social aspects of decision-making, learning, and the division of the positions of power in organizations (McNiff 2000, 97).

Action research in organizations, like action research in general, is concerned with actively promoting better practices and administering positive change. Somekh (2005, 27) discusses the principles of knowledge generation and the nature of action in action research, and states that the methods of action research enable researchers to go “beyond describing, analysing and theorizing social practices” and to instead reconstruct and transform those practices. Using methods of action research in organizational settings advocates close study of power structures, social norms, and hierarchies that can be very stiff and difficult to change inside an organization (McNiff 2000, 96).

Action research in organizations has different foci from action research in general. Action research in organizations focuses on themes of power play in the workplace and improving the methods of management and work, and aims for increased awareness of the power structures in a workplace or organization and the possibilities for employees to make decisions for themselves (McNiff 2000, 55).

Of course, action research that leans heavily on influencing the participants from within natural (as opposed to contrived) social situations (Somekh 2005, 7) is not without its limitations. The individuals that comprise the "collaborative partnership of participants and researchers" (Somekh 2005, 7) largely define the shape of a given action research project. The extent to which this collaborative partnership is willing to communicate and participate is paramount to successfully increasing the awareness of the participants and moving the desired change forward in an action research project.

If the numbers of the participants are great, it is almost impossible for a single researcher to maintain an open and relatively informal social relationship with each and every participant. On the other hand, a team of researchers that work together from a given viewpoint to forward a given agenda may be seen as oppressive or untrustworthy by the participants of the research project. Jacobs (2010, 373) reports about hardships in maintaining truly meaningful participation and warns against conflicting demands that different groups of participants may have in an action research project. He suggests using an external observer as a kind of "coach" to help researchers keep the big picture in their view when conducting large action research projects which demand equal participation from both the participants and the researchers (Jacobs 2010, 383). The size of the participant group, the availability of the researchers, and the social immediacy that action research demands from the participants pose challenges for any action research project, mine included.

From the point of view of technical communication as a niche field of work stuck between harsh business realities, such as single-minded decision-making at the cost of the user, and a loss of agency and coordination (Virtaluoto 2014, 16;Guren 2015, 11) it seemed apt for me to study accessibility of documentation in an organization with the methods of action research. I will further discuss technical communication and using power in the workplace in Chapter 5.

3.3 Action research and administering change

Administering change and affecting the mindset of a study group have been under animated discussion in the field of action research for several decades. *Overcoming Resistance to Change* (Coch and French 1948) introduces an early example of a participative research project that focuses on administering change. Coch and French (1948, 512) studied the frequently changing working

conditions of workers in a sewing plant, and they proceeded in their research with the basic assumption that individuals inherently resist to any changes in their working environment. Coch and French (1948, 531) came to the conclusion that individuals are less likely to systematically or inherently resist change when they are given the chance to participate in shaping the changing circumstances, such as taking part in planning changes at the workplace. This idea of the necessity of inclusion and group participation when administering a change either in a group of people, or in a problematic situation, is now a central part of action research.

The underlying assumptions of Coch and French have later been challenged, among others by Dent and Goldberg (1999). The assumption about individuals' inherent resistance to change has caught on widely over the years, and it has been used as a basis for material taught in business schools (Dent and Goldberg 1999, 25). According to Dent and Goldberg (1999, 25), resistance to change is “one of the most widely accepted mental models that drives organizational behaviour”. They challenge the underlying idea of inherent resistance to change in organizations, and propose instead more empowering structures to organizational decision-making. Dent and Goldberg (1999, 36) also suggest that individuals are willing to take part in discussions and planning of changes if they are empowered to do so and are informed about these possibilities in time and transparently inside the organization. They criticize the implications of the term “resistance to change”, as using the term in the first place implies to an extent that the source of a potential problem is not in the change itself, or the way it is communicated, but rather the subordinates who are at the receiving end of the interaction. Dent and Goldberg (1999, 37-38) warn against the possible risk of self-prophecy when talking about “resistance to change” in organizational settings.

Methods of participative research, action research among them, do not operate from the assumption that people would inherently resist change. Rather, modern action research, and especially action research conducted in organizations, strives to promote empowering and transparent decision-making structures, and employees' inclusive participation in research and development activities inside those organizations (McNiff 2000, 3). Enabling and achieving a necessary change inside an organizational setting is one of the goals of this research project, and one of the reasons I chose action research as my methodology. The mental model about “resistance to change” must be rethought before employees can be truly empowered to participate in administering and planning changes for themselves (Dent and Goldberg 1999, 39), and I would argue that action research is one alternative way to empower study subjects in an organizational setting to plan for themselves and participate in research that concerns them.

4 Methods and data

In this chapter, I describe and discuss my data gathering methods, the iterative development of my interview questions based on the data, and characteristics of the data. I attempt to recap and outline the iterative process of how the themes of this research project evolved during the data gathering, and how the development of the interview questions and the gathered data relates to my original study questions. My methods were re-evaluated and developed several times during the research. Because of the data-driven methodology of action research, and the iterative development of the interview process, methods and data are closely linked together in this study, and they are described as a continuous process with partial overlaps.

4.1 The interview process

Data about user experiences and about using documents can be collected by observing participants in real or simulated use situations (see, for example, Sahanen 2014, 30; Jansky and Huang 2009, 269). Even though my objective was to collect data about using documents, I decided to use interviews instead of observation as a method for two reasons. First, having an active conversation and giving each participant opportunities to voice their opinions and concerns would be a better approach than merely drawing conclusions from their document use. In addition to that, drawing conclusions from observational data based solely on my knowledge about accessibility and documentation would not have been sufficient for me as a researcher. Using observational data alone would not have enabled me to understand the background of the participants fully (Ovaska et al. 2005, 69), and it would not have complied with the principle of treating the subjects of the study as participants and makers of meaning who are in an equal position with the researcher, which is one of the key principles of action research (Somekh 2005, 3). I would argue that interviewing the participants and actively engaging in conversation with them has offered both me and the participants better prospects for gaining a comprehensive understanding about the issues in the internal documentation process.

Second, using observation as a data gathering method would not have been possible because of the practical circumstances in the target company. Because the participants are located in various countries around the world, arranging observation sessions for all participants would not have been possible. The interview method I chose for the purposes of this study is a semi-structured interview (di Cicco-Bloom and Crabtree 2006, 315). I used this method with all participants regardless of their location or working experience. In a semi-structured interview, the interviewer uses an "interview guide", which Crabtree and Cohen (2006) define as a "a list of questions and topics that

need to be covered during the conversation, usually in a particular order". A semi-structured interview allows the interviewer to "follow relevant topics that may stray from the interview guide" in order to develop a deeper and more exclusive understanding of the topic of the interview (Crabtree and Cohen, 2006). Using a semi-structured interview is in line with the principles of action research, because the aims of semi-structured interviews and action research are similar. It is important for my study to increase both the researcher's (Crabtree and Cohen 2006) and the participants' (Somekh 2005, 8) awareness of the study subject and to create a space for open discussion.

The interviews took place in 2015 between 30 July and 25 September. Each interview lasted about one hour. Whenever possible, the interviews were held face-to-face with the interviewee, and if that was not possible because of the location of the interviewee, the interview was conducted in a combined call and screen sharing session with the interviewee. All interviewees had a chance to share examples of documents they found problematic or noteworthy. The purpose of the interviews was to collect the problems in the accessibility of the internal documentation from a large group of employees and to provide and discuss suggestions for improvements. I endeavored to make the interviews a two-way process: The interviewees would voice their concerns, opinions and suggestions to me, and I would anonymously share the thoughts and views of previous interviewees as discussion prompts according to the tasks and area of expertise of each interviewee. This way awareness about the internal documentation process would spread as much as possible among the team members, and the interviewees would learn more about the possible bottlenecks and issues other teams may have. The interviews were conducted either in English or in Finnish, in the language each interviewee was most comfortable with. Interviews conducted in Finnish were translated by me for the purposes of this thesis.

The main empirical data of this study consists of 26 interviews. In addition to the interviews, some of the information on which I base my analysis I have received from internal discussions (both face-to-face and via e-mail) which I have had with the participants and project managers in the software development team. At the beginning of each interview, I informed the interviewee about the ethical considerations and the subject of my study, and I closed each interview by giving the interviewee my contact details if further questions or comments should arise. I asked their consent to using the interview results for improving the documentation process internally in the company, and in my thesis. I made clear that no personal data or identifying information of the interviewees will be disclosed to anyone.

The team names of the interviewees were collected as a part of the interview to get a clear picture about the number of different teams involved in the documentation process. Without

disclosing any personal details of the interviewees, these numbers were later communicated to other employees in the company who are a part of the documentation improvement project. With each interview question, I aimed to probe behind the user and content production experience of the interviewees, and if an interviewee seemed to have more to tell about the subject, I would ask a follow-up question and record it in the question sheet during the interview. Because I did not intend to do any close reading of the participants' answers, the interviews were not recorded. Instead I systematically noted down the answers of each participant during the interviews, and took notes of any possible follow-up questions and the resulting discussion. I then wrote up the whole interview based on my notes during the same day the interview took place.

The opinions of participants who work in different teams and influence different parts of the development process have acted as important signposts to where the issues in the internal documentation process might lie. I endeavored to invite interviewees from a wide range of teams to avoid gathering data that would be biased towards only one aspect of the internal documentation process. Because of multiple factors, such as a shortage in employees, and new, still unfamiliar or disliked working methods, the documentation tasks were not described or defined formally in the working roles of most of the interviewees. Under the premise of flexibility, the working tasks of each interviewee were subject to change on a short notice when the interviews took place, and the interviewees were often requested to quickly take over tasks from another colleague on a need basis. These factors were seen as business realities by the interviewees, and I endeavored to take them into account when developing the interview questions.

4.2 From minor usability issues to ways of working and writing

As stated in the Introduction, issues perceived as usability problems in the internal documentation were a starting point for the interview and data gathering process. Based on my experiences and the data from the pilot interviews, my aim in the interviews was less about distinguishing the usability problems in the documents, and more about discovering the “meta-issues”, or the opinions or structures that might be the cause **behind** the usability problems. As collecting exact data about the usability of the documents was not a main priority in the interviews, the possibility that the interviewees did not remember which documents they referred to as examples was not a concern for me in this study. Instead, the opinions the interviewees voiced about the documentation process were a more meaningful factor. Based on this background information about the internal documentation and its relevance, I began the research by investigating the usability issues and inquiring about them during the first round of interviews. As I refined my interview questions, the focus of the study gradually shifted from investigating usability issues to uncovering and analyzing

the possible causes of those issues. Thus, the real issue and focus of this study came to be accessibility.

Already during the first round of the interviews, I received some clear answers to two of my study questions: What kind of experiences the users and content creators have about using internal documentation, and what kind of accessibility problems there are in the internal documentation. The experiences the interviewees shared with me were largely negative, and there clearly are some accessibility issues in the internal documentation. The consequences of the accessibility problems seemed to be clearly known to the interviewees. However, defining the accessibility problems or their causes in detail did not seem straightforward to the interviewees, which is why I decided to focus on finding out the causes during a second interview round.

During the second round of interviews, the focus of the study was shifted towards answering the third study question: How could the accessibility problems be solved. I focused more on investigating the accessibility issues that seemed to slow down both the documentation creation process and the users' access to the documents, and the issues in the ways of working. In addition, the causes of the accessibility problems emerged from the data more clearly. These root causes had come up during the first interview round from the answers of the content creators, and their answers were utilized in the second interview round in discussions with the other interviewees.

4.3 Interview questions

When I chose to use a semi-structured interview as my main method, I was aware of the risks of the method, such as using opinionated questions as a starting point in the interviews (Ovaska et al. 2005, 7). This is why the interview questions were formed in pilot interviews in co-operation with an initial interviewee from each interviewee group. The pilot interviews were held as informal discussions with key participants, where we discussed an initial draft of questions I had prepared and tested how meaningful the interviewee found the questions. The key participants were employees who were fairly well aware of the documentation responsibilities of their area of expertise, and were able to comment on my question choices and the broadness of the topics. Based on the input of the pilot interviews, I then revised the questions into a first version of each question set.

There are two sets of questions that were used to gather the data in this study. I have included two sets of interview questions from the second round of interviews at the end of this thesis as appendices. Appendix 1 consists of the interview questions that are directed at documentation users, and Appendix 2 consists of the interview questions that are directed at content creators. The first set of questions was formed in a pilot interview with an interviewee who sees themselves as a user of

internal documentation, and it was directed at the interviewees who mainly use the internal documents in their work. After the first round of interviews, the question set for documentation users was refined according to the data gathered so far on the 24th of August 2015. The second set of questions was formed similarly to the first set in a pilot interview with an interviewee who sees themselves as a content creator of internal documentation, and it was directed at interviewees who mainly create internal documentation in their work. The second question set was refined according to the data gathered so far on the 31st of August 2015.

The interview questions directed at documentation users are grouped under five categories:

- Background
- Accessibility concerns
- Document content
- Document format
- Improvement ideas

Overall, the questions in the first question set focus on the documents and the ways the users can or cannot access them. The questions in the background category are meant to act as warm-up questions, and to allow the interviewee to approach the subject of documentation from the point of view of their own working tasks. The questions in the accessibility concerns category discuss concrete, hands-on issues related to the tools and services the documentation users need to use to be able to access the documentation.

Even though my focus was not on minutely recording the usability problems in the documents, I chose to include questions that address the usability issues in the content of the documents into the revised question set that was directed at the document users. It was evident from the data collected during the first interview round that most of the interviewees who viewed themselves as documentation users were not aware of the concepts of usability and accessibility, or of the way they are reflected in the use of the internal documents. I chose to include questions about the document content so that the interviewees would get a better understanding about the topic, and to lead them into thinking about the issues they might have had when using the documents. Furthermore, the questions about document content often acted as a kind of introduction to follow-up questions or accessibility topics the interviewees brought up and wanted to elaborate on.

The accessibility issues were sometimes not seen as problems by the interviewees, or at least as problems that would be easy to define or describe. It was clear that merely prompting the interviewees to describe “the accessibility problems in the documents” was not a feasible way to acquire information. Instead, I found that by using questions about document content I could better

speak to the interviewees in terms that they understand, and to lead them to reflect on the documentation process and on their role in it more deeply (which was not a given in the working context of most of the interviewees).

Questions in the document format category were formulated according to the feedback that was gathered about the documentation in the software development team before the interviews began, and they acted as a checklist to see if the previous faults in the documents had been corrected successfully. The feedback was gathered in a documentation improvement project inside the target company before my study took place. I chose to place the open questions that might be more difficult to grasp near the end of the interview, so that the interviewees could get used to the subject before having to provide me direct improvement suggestions.

The interview questions directed at content creators are grouped under three categories:

- Background
- The documentation process
- Ways of working

The questions in the second question set focus on the content creators' description of the documentation process and the ways of working they are accustomed to. With the second question set, I aimed to better understand the picture that the content creators themselves had about the documentation process, and to collect their opinions about the way their concerns were being addressed in the software development team. That is why in addition to requesting the content creators to provide me improvement suggestions to the documentation process, I asked them to describe their role in the documentation process and to name their audience.

The sets of interview questions are rather lengthy and extensive. This is because of two reasons: The working roles of the interviewees are very diverse, and the scope of the issues behind the problems that inspired the study questions is rather broad. As stated above, not all questions concern all interviewees, and the questions marked with a specific working role were asked only if they were relevant to the interviewee. The scope of the questions was kept broad because the interview questions were used to not only gather information about the issues behind the usability problems, but also to ensure that all interviewees would be aware of the internal documentation process and its relevance. Because of this, some of the questions acted more as prompts to discussion than as simple questions, and the resulting discussions often enabled me to glean which parts of the process the interviewee had perhaps previously been unaware of, and to continue the interview with a meaningful prompt question.

As the data gathering progressed, the emerging characteristics of the interviewees placed

demands to use the question sets differently than I had originally intended. The need to modify the semi-structured interview process arose from the roles the interviewees had in the internal documentation process. When I modified the question sets, I added a question to the second set where I directly ask the interviewee whether they see themself as a content creator or as a user of documentation, or both. Some of the interviewees did not fit into either the category of a user or a creator of internal documentation, and had instead a mixed role in the internal documentation process. In these cases, I picked questions from both question sets according to the expertise and the working tasks of that particular interviewee. I will describe the groups of participants that emerged from the data in more detail in section 4.4.

A large selection of questions concerning different sub-topics of the documentation process served two goals of my study. On the one hand, it helped me to form meaningful discussions with the interviewees, and to increase the understanding of the participants about the internal documentation process. On the other hand, collecting data from a broad selection of topics helped me to understand the process better, and to place the internal documentation process in a larger context within the software development cycle that is in use in the software development team. This in turn helped me to evaluate the possible solutions and improvement suggestions better, and to form a sound analysis based on the data.

4.4 Characteristics of the interviewees

All interviewees are employees in the target company, and they are located in seven different countries. During the interview process, three interviewee groups with differing roles in the internal documentation process clearly emerged from the data. When discussing my data, I will use the following terms to refer to the interviewee groups.

- Content creator
    - I use the term *content creator* when I refer to interviewees who either produce or contribute to the content of the internal documents, but who do **not** use the internal documents as a part of the software deployment development process.
- Content creator/user
    - I use the term content *creator/user* when I refer to interviewees who contribute to the content of the internal documents **and** use them as a part of their daily or less frequent tasks that are related to the software deployment development process.
- User
    - I use the term *user* when I refer to interviewees who frequently use the internal documents as a part of their daily or less frequent tasks that are related to the software

deployment development process, but who do **not** contribute to the content.

Chart 1 displays the division of the interviewee groups.

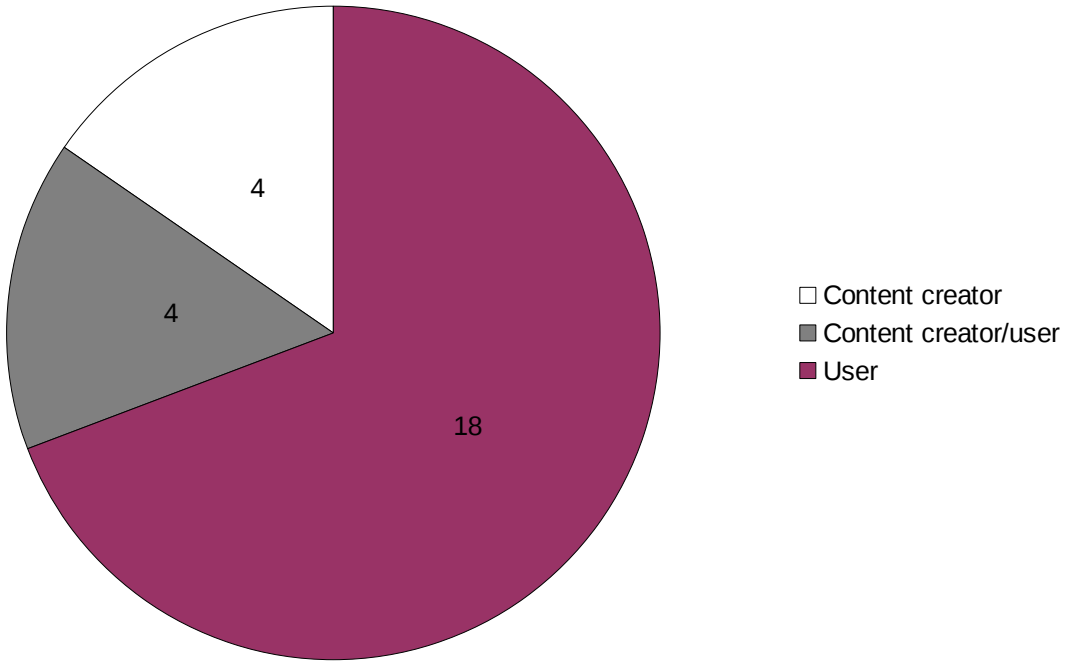

Chart 1: Interviewee groups

The numbers of interviewees that belong to each group mirror reality: There are noticeably more users than there are content creators of internal documentation in the software development team. There are two technical writers among the content creator group. As the interviews progressed it became clear that the reality of the participants was more complex than I had originally thought. Their working tasks can vary noticeably according to the software development schedule and specific periods of product work. There can be, for example, a year's pause in the “user” part of a content creator/user's working role, after which they may resume their work as a user of the documentation. This is instantly reflected on the demands that are placed on the quality of the documentation, because the varying and complex working tasks of the readers make it impossible to rely on the previous knowledge of the readership.

Even though this variance in the roles of the interviewees made it challenging at times to properly address the experience and actual working tasks of the participants during the limited time of the interviews, it did give me the advantage of being able to piece together the needs and responsibilities of different teams that take part in the development process. During the course of the interviews, interviewees with these dual roles proved to be very insightful as I tried to identify the causes of the usability issues that had been previously reported in the documentation.

Interviewees with plenty of working experience but highly varying working tasks showed me the gaps in communication between different teams, and helped me to continue the discussion between the team members. Chart 2 displays the working experience of the interviewees by group.

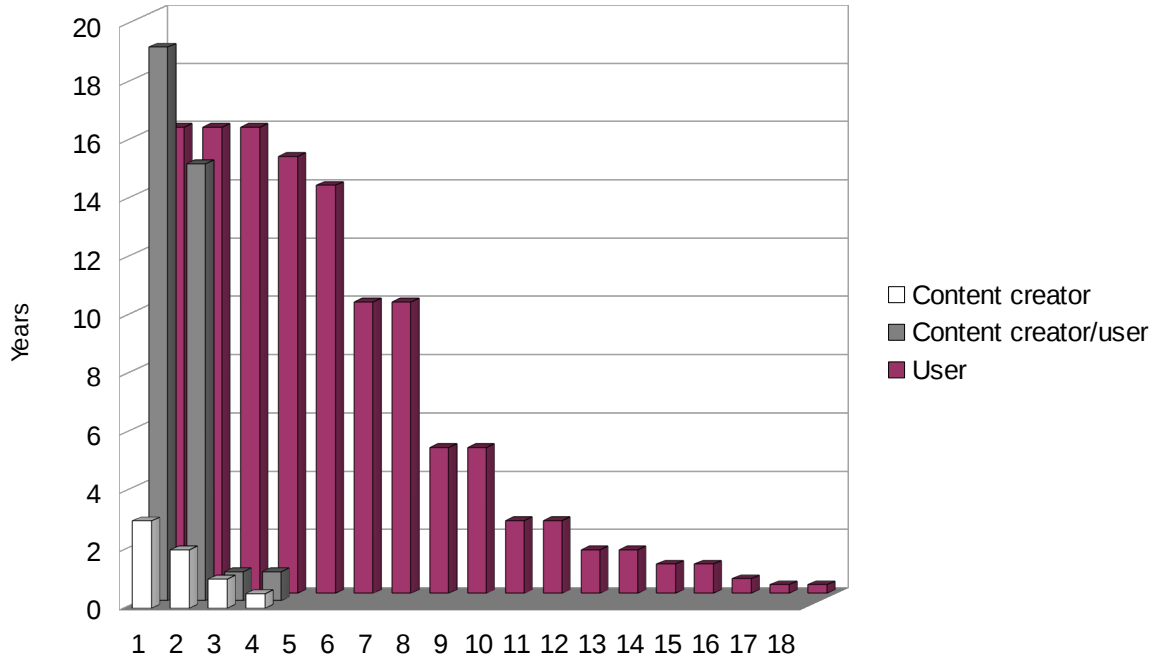

Chart 2: Working experience of the interviewees

As can be seen from Chart 2, a notable characteristic among the interviewees is the time each interviewee has spent working with documentation tasks. There are differences between both interviewee groups and individual interviewees in the experience they have in either using or contributing to internal documentation. Some of the interviewees were very experienced (over 15 years of working experience) while others had only started (less than 6 months of working experience).

5 Bringing the views of users and content creators together

In this chapter, I discuss my results from the interviews and analyze the iterative data gathering process. I present and discuss the interview data and classify it according to the categories the results represent. I first discuss the data from the point of view of the categories, and after that I discuss the data from another point of view, focusing particularly on the differences between the views of users and content creators. Finally, I evaluate the internal documentation process as a whole and compare the process to the Information Process Maturity Model (IPMM) (Hackos 2004).

5.1 Interview results

As I mentioned in Chapter 4, I received some clear answers to the first and second study questions from the first interview round. To summarize, the experiences the interviewees had about the internal documentation were largely negative, and they responded to their experiences by providing me with different kinds of improvement suggestions. In order to answer my third study question, I will now focus on analyzing the improvement suggestions that were gathered from the interviews.

I was able to classify the improvement suggestions gathered from the interview data into three main categories: Suggestions about accessibility, suggestions about usability and suggestions about ways of working and documentation practices. Classifying some of the improvement suggestions was not entirely straightforward. Because the documents are published and tested in an electronically mediated format, I classified the improvement suggestions from the point of view of electronically mediated text. For example, comments and suggestions related to using hyperlinks in the documents were classified as suggestions about accessibility, because the main concern of the interviewees was that the links were often outdated or pointed to locations that inconvenience the user instead of helping them forward with the procedure. Issues related to the information design and the conventions of using hyperlinks in the internal documents could be classified as a usability issue, because hyperlinks in the internal documentation point to other documents that are necessary to complete the procedure that is described in a document.

The total number of improvement suggestions that I received in the interviews was higher than the number of the improvement suggestions I included in this thesis. I included all improvement suggestions that were voiced by more than three interviewees in the data of this thesis. There were some improvement suggestions that were either very case-specific and concerned only the content of certain documents, or which were only mentioned by one interviewee. I left these suggestions out of the data, because they were either not related to my study questions or they did not receive enough positive feedback from other interviewees. Because my aim was not only to

collect but also to distribute information, I discussed and anonymously introduced improvement suggestions and opinions of users to content creators and vice versa during the second interview round. In these discussions, I mapped the popularity of the improvement suggestions that had been collected so far. The number of improvement suggestions and the improvement suggestion categories that are discussed in this thesis are presented in Chart 3.

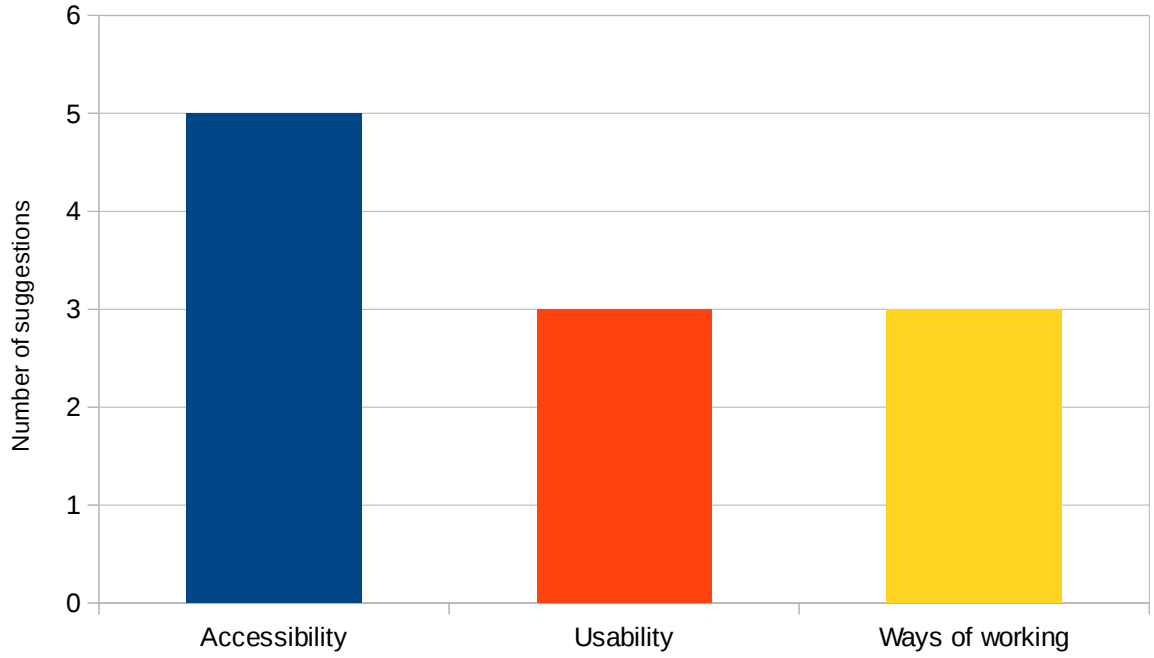

Chart 3: Number of improvement suggestions

Improvement suggestions related to accessibility were the most common category, and the same issues were brought up again and again by 21 out of 26 interviewees in separate interviews. Improvement suggestions and concerns related to accessibility were brought up equally in all interviewee groups. This shows that the problems related to accessibility, or at least their causes, are widely recognized among the interviewees.

Improvement suggestions related to usability were most often brought up by users who had not been working in the target company for a very long time, typically less than two years. Improvement suggestions of this category were brought up by 12 out of 26 interviewees. There were three recurring usability topics that came up in the interviews. The fact that there were so few improvement suggestions related to usability is interesting when it is contrasted against the initial motivation for this study: The usability problems (or, even more broadly, “general issues” with the internal documentation) were the original reason I was contacted regarding this research project. There are probably many causes for this mislabeling of issues, among which are lacking information architecture and a shortage of staff who are competent in both documentation and

coordination in the software development team.

Improvement suggestions related to ways of working were brought up by 14 out of 26 interviewees. These topics were brought up most often by content creators and content creator/users, and they were often discussed in conjunction with the open-ended questions or follow-up questions that arose from the interviewee's own input. The content creators and content creator/users who brought up the issues were often very experienced in their area of expertise and had been working in the target company for over ten years. The improvement suggestions are described in more detail in Chart 4. The x-axis shows the number of interviewees that mentioned a particular improvement suggestion in the interviews.

In sections 5.1.1-5.1.3, I will discuss each improvement suggestion in more detail, and elaborate on the background and previous documentation conventions that have taken place in the development team. The direct quotations used in this thesis have been transcribed word-for-word in the interviews, and where applicable, translated as accurately as possible. Unless otherwise stated, all **emphases** in the direct quotations are the interviewees' own. In my data, I have interpreted a clear rise in the voice level or a deliberate stressing of a given word or phrase in an interviewee's speech as an emphasis. Some interviewees specifically instructed me to write down a given point or sentence in “all caps and with exclamation points” into my notes to bring their point across. I have included only the emphases in the transcriptions that I specifically marked down during the interviews. Any additions or modifications done to ensure non-disclosure in the direct quotations have been marked with [brackets].

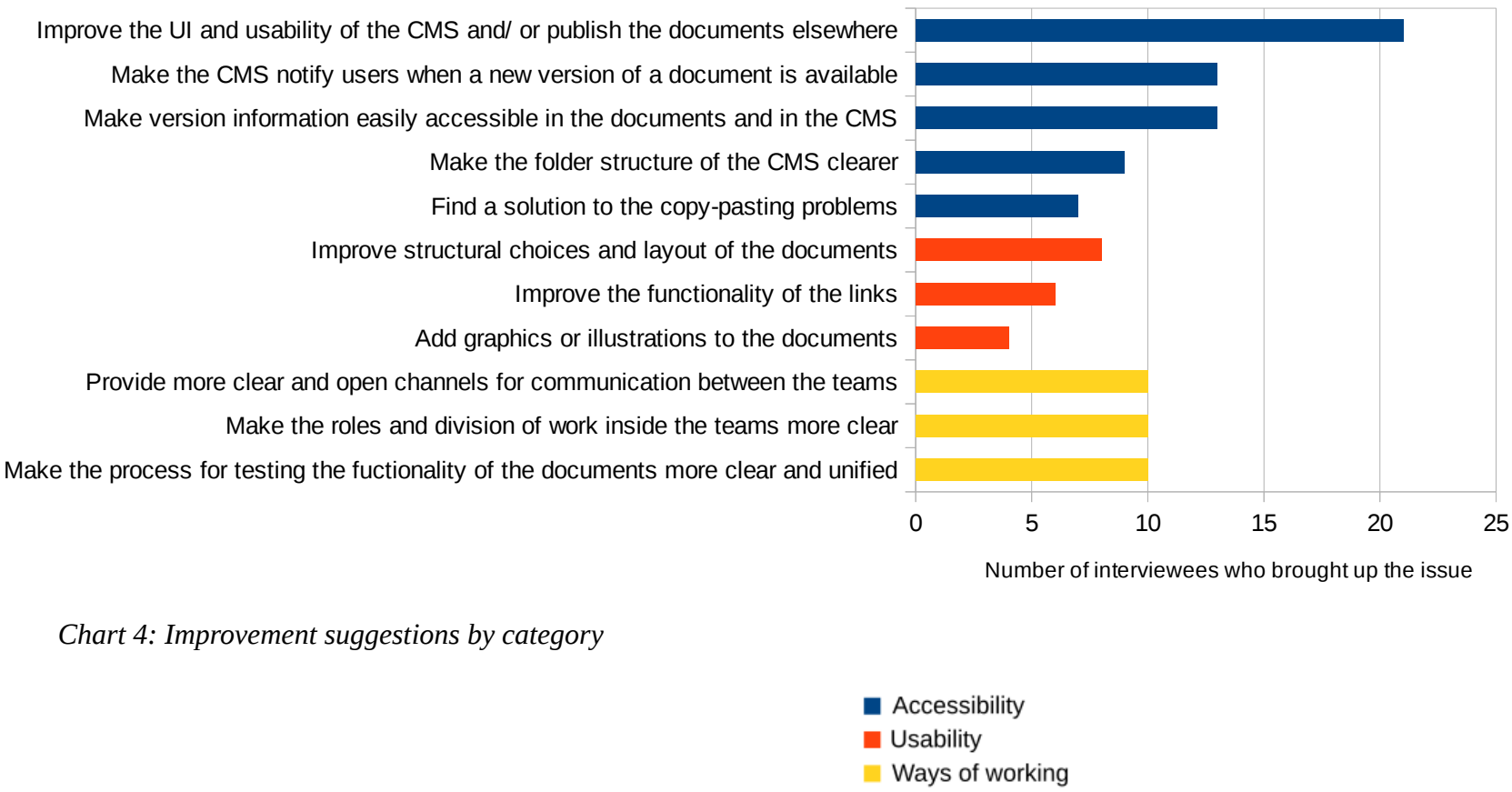

Chart 4: Improvement suggestions by category

5.1.1 Accessibility

The improvement suggestions related to accessibility that were gathered from the interviews are centered around the content management system, conventions (or the lack of them) of marking version information in the documents, the documentation tool that is in use in the development team and the functionality of copy-pasting text from the documents. In this section, I will first discuss improvement suggestions and discussions related to the content management system and document versioning. Then, I will discuss the choice of documentation tools, and the copy-pasting problems that are related to the tool that is in use in the development team.

The content management system

Most of the improvement suggestions in the accessibility category are related to the functions and accessibility of the content management system (CMS) that is used for storing and archiving the internal documents. This piece of software in the documentation creation process caused perhaps most dismay among the interviewees. The content creators are required to use the CMS because of company-wide regulations. The internal documents must be versioned and all of the versions must be stored in the CMS.

Eight of the interviewees described the CMS in a positive tone in the interviews. The interviewees that did reply positively had had a long working experience in the target company (examples from interviewee 12 and interviewee 22), or had had to use the CMS only for opening documents (example from interviewee 13). Below are some examples of positive replies to the interview question “Is the database or content management system easy to navigate and intuitive to use?”:

> (Interviewee 12) It's easy to find the relevant functions, there are not that many functions available. Once you're used to the database, it gets easy and you learn to ignore the unnecessary functionalities.
> (Interviewee 22) If you know the main folder, then yes. If you want to search something, sometimes it's not easy.
> (Interviewee 13) It's easy to download the document and read it. Using it and updating the documents, I'm not so sure about it. For the purpose I use it for, it's fine.

Eighteen interviewees expressed displeasure when asked about working with the CMS. The need for having prior knowledge about the location of documents to be able to use the CMS was brought up repeatedly in the answers (examples from interviewees 4, 5, and 14). Some interviewees were uncertain about the real causes of the accessibility problems of the CMS (example from interviewee 14), while others expressed their displeasure very openly (example from interviewee 21). Below are some examples of negative replies to the interview question “Is the database or content management

system easy to navigate and intuitive to use?”:

> (Interviewee 4) NO, no, no. If you know where the folder is, then it is possible to navigate in that folder, otherwise it is very confusing.
> (Interviewee 5) You need direct links to be able to find anything, [the CMS] itself is not navigable. The folder naming conventions and the structure is very confusing. Searching from [the CMS] takes time significantly. [The CMS] is a legacy service from a previous company, and it looks the part!
> (Interviewee 14) Not really. It's hard to pin down what's wrong though. If you have to find something from somewhere else [than the location you are used to], it may get difficult. The folder structure helps if you know where you have to look.
> (Interviewee 21) The tool itself is shit. It's not possible to download multiple files, or a whole folder. It's very slow. You can search for things and find them, but otherwise it's pretty bad. It's a complete waste of time and money to keep developing or even using it in my opinion.

The content management system that is in use in the software development team has originally been developed for storing past versions or revisions of documents or files (internal discussion 1 with content management system maintenance personnel, 2015). In the development team, the internal documentation is both stored **and** published in folders that are located inside the content management system. This causes many complications during the life cycle of the documents, because the documents are multi-authored and they are used by different audiences during several phases of the software development process. Because of this, a large number of people need to have the necessary permissions to view, own, and add content to specific locations in the content management system. Maintaining the permissions takes time and effort, and is handled by an entirely different branch in the target company. There is no direct way of contacting the CMS administration and the replies are often slow, even though the need to obtain the latest version of a document can be very urgent for the users when a document is used when interacting with customers.

After the first interview round, I contacted the maintenance personnel of the CMS and reported some of the findings related to the CMS in order to offer some of the improvement suggestions directly to them. In the resulting discussion with the representative of the CMS team, the main cause of the problems related to the CMS turned out to be the rigidness of the CMS. The users are currently not able to customize the user interface according their needs (internal discussion 1 with CMS maintenance personnel 2015). The CMS could be made more usable if it followed the principles of good user interface design, such as having a chance to cancel a previous action, showing only the necessary information on a screen, and explicitly stating all actions that a user of an application can do on a screen (Cooper 1999, 165). Based on the answers of the interviewees, the design of the CMS could be said to accommodate users to technology, instead of accommodating

technology to the user (Dobrin 2004, 118). The employees who develop the content management system work in an entirely different environment from the users of the CMS, and they do not necessarily realize how widely the users of the CMS actually use the system. In the target company, this content management system is not the main tool for almost any of its users (internal discussion 1 with CMS maintenance personnel 2015). Ideally, the content management system should work as exactly what it is: a tool that helps to accomplish the main task, and not as a complex end in itself which needs to be carefully studied before it can be mastered and used effectively. In co-operation with other technical writers from another team, we managed to negotiate some modifications to the appearance and information design of the folders where the internal documents are developed and published. However, the scope of this study did not include following up the possible improvements of the CMS.

Despite several discussions and negotiations about changing the publication format, the stakeholders could not come to an agreement about moving to a new publication platform for the internal documents. A clear majority of the interviewees (n=21) openly expressed frustration about the target company's actions of resisting the needs of users and systematically lessening the possibilities to modify the necessary tools according to their needs. Very experienced users and content creators who have had over ten years of working experience stated in the interviews that they are used to expecting changes that introduce increasingly complex tools which they are then requested to use when working in the software development team. The participants then prepare for any future changes in mandatory tools accordingly: with apprehension.

Being requested to use a cumbersome and error-prone tool for archiving the documents combined with the scarce resourcing of technical writers can easily lead back to square one: If no change in the tools is achieved, the content creators may simply refuse to use the difficult tools, and use an unofficial versioning system instead. Under pressure from other working duties, the content creators may resort to using some other method of documentation which may be insufficient, and lead to complaints from the users again. The content creators' reluctance to use the content management system stems from the poor performance and complexity of the tool. From the point of view of version information, this has already resulted in information gaps between different teams (example from interviewee 7). Misinformation or information delays about versioning the documents that change daily during the development process can cause serious delays in the software development (example from interviewee 10).

> (Interviewee 7) There is a communication gap between content creators from [team 1] and content creators from [team 2]. There should be an automated system for feedback for changes in documentation, which would force the writers to inform the performance engineers about the changes that are made to software deployment documents. You go

> with what you've got, it is impossible for me to know which version is “the correct” one or if the one I'm reading currently is the right one.
> (Interviewee 10) There are two types of software deployment documents available, and using the wrong one can cause hours of delay in the process.

From a business-oriented perspective, using a content management system and a publication platform which are appropriate for their purposes and coordinating the documentation systematically would increase customer satisfaction, decrease the time and money that are spent on developing the deployment process, and ease the workload of the employees.

Documentation tools

The internal documents in the software development team are written with Microsoft Word. This word processor is not optimal for creating documents that are meant to be frequently modified by multiple authors and stored in an archive under strict version control, because the desktop version of Microsoft Word does not have the possibility for multiple authors to collaborate simultaneously[7], and it does not support formatting document output with style sheets that would apply to many documents at once. The reason that this tool is in use in the development team is mostly habit and lack of documentation expertise (internal discussions with senior technical writer 2015; interviewee 23). The internal documentation has not been valued very high in the past in the development team, and previous documentation processes have been designed under obligation and in a hurry (internal discussion 2 with project manager B 2015; interviewee 23).

The unsuitability of the documentation tools shows in the interview results as negative comments about copy-pasting text from the documents. Being able to copy-paste text reliably (so that the characters of the text are not changed into other characters) from the document to an external window is a crucial requirement for the internal documents. During the procedures that are instructed in the documents, commands and snippets of code are copied directly from the document and into a command line interface. If there are character errors when copying text, the work of users is slowed down considerably and it can even hinder the users from accomplishing a task. Most often the reason for the problems has been the incompatibility of the character encoding of the documentation tool with the command line interfaces that are used in the procedures, and content creators have tried to troubleshoot the copy-pasting problems in the past (interviewee 23; interviewee 24; interviewee 26; internal discussions with the senior technical writer 2015).

Seven users had negative comments about copy-pasting text from the documents. Below are some replies to the interview questions “Is the document format optimal to you?” and “How could the documents be made more accessible?”. The answers are all from interviews with users or

7Word Online has this possibility, but the use of the Online version of Word is not allowed for creating internal documents in the target company.

content creator/users.

> (Interviewee 8) Copy-pasting causes problems; word changes characters into different ones. This is a Unicode issue that should be solved.
> (Interviewee 15) When other teams have made edits to a document, the commands are not copy-pastable anymore, and that is a problem. At one point, the commands were converted to text objects. Then you had to double-click it, and only then be able to copy-paste it, and that was definitely going in the worse direction.
> (Interviewee 2) The text is ok, but copy-pasting! The commands **have** to be correct. The characters minus and hyphen, word does not differentiate clearly between them. All commands should be text objects, that would minimize the copy-pasting errors.
> (Interviewee 3) Word documents are not good; copy-pasting is an issue. The official documents should be PDFs, but Word documents are found also in the official database. Converting documents into PDF changes certain symbols into other symbols, which is bad for commands. The virtual environment where the commands are inserted to is not a Microsoft Office or Windows environment, so there is no clear reason to use Word documents from the procedure's point of view.

The answers above show how expertise about using the documentation tool and the familiarity with the documentation process varies from one participant to another (examples from interviewee 8 and interviewee 15). Interviewee 3 clearly has a good general understanding about the root cause of the problem, as they can propose possible alternatives or solutions to the problem and argue for and against each alternative. Interviewee 2 talks about an experimental solution to the problem ("all commands should be text objects"), which has in fact already been tested and deemed unusable in the past. Interviewee 15's answer also demonstrates a major issue in the documentation process: "When other teams have made edits to a document, the commands are not copy-pastable anymore". In the case interviewee 15 refers to, inadvertent changes made by content creators from another team have made a document unusable for users of that document. This incident was not a one-time lapse, and the technical writers of the development team often use a significant amount of their working time to correct or rewrite entire documents to make them accessible again (interviewee 25; interviewee 26; discussions with the senior technical writer 2015). Not all content creators seem to have sufficient knowledge about using the documentation tools they are expected to use. This makes co-operation across teams a chore and slows down the documentation process considerably.

Seven out of eight content creators and content creator/users expressed either negative or somewhat negative opinions about the documentation tool that is in use in the development team. Below are some answers to the interview question "Do you think the tools are optimal for this task, and if not, why?" The answers below are from interviews with content creators and content creator/users.

> (Interviewee 23) The tools are not optimal: The documentation process should be modularized. The writers should have smaller parts they could update separately, and then combine them into a single configuration according to need. Having the needed

> content spread over several word documents forces the user to have all of the documentation at once to be able to perform a single step, and linking between documents is difficult for the user.
> (Interviewee 17) I think Word is OK for **reading** text, not writing.
> (Interviewee 16) Word does its job I think. If I used that for a main task, I would not want to use it, but it's enough when I don't have to do it all the time.
> (Interviewee 15) I have nothing against [the tool]; I understand that some Linux guy might have a problem, but I don't have that problem.

The answers above show that the problematic features of the current documentation tool are evidently acknowledged among the content creators of the documents (examples from interviewee 23 and interviewee 17). However, creating documentation is not the main area of expertise of the content creators, nor is it a top priority task on their task list: “I complete the documentation tasks when I absolutely must, maybe after a few notifications from a technical writer” (Interviewee 23). In addition, interviewee 16's and interviewee 15's answers demonstrate the content creators' attitude towards the documentation tasks as a secondary endeavor. The answer of interviewee 15 also demonstrates the content creators' indifference towards the possible requirements other teams might have for the documents. The members of the development team focus on their own work only, which makes co-operation with other teams and taking their needs into account during the development process difficult. This issue is related to the findings about ways of working, and I will discuss the attitudes of the content creators further in section 5.2.3.

Because the content creators are continuously working with other pressing matters and working duties, the problems in the documentation tasks have not been previously addressed, and no effort has been put into researching for a better documentation tool or even training the content creators about the use of the current tool in the development team (internship experiences 2015). In the development team's management, decisions about changing writing responsibilities are made on tight schedule, and there has been next to no room for getting to know the documentation tool in the typical hectic working schedules of the developers. In the past, the management of the development team has viewed internal documentation as a task that is not very difficult or time-consuming (internal discussions with senior technical writer 2015). None of the members of the management team have formal training in technical documentation or acted as technical writers, and many of them openly stated their lack of knowledge about the documentation process and the technical documentation as a profession (internal discussion with project management team 2015).

The attitude towards the documentation tasks of the content creators and the key stakeholders in the development team is a factor that can crucially affect the quality of the documentation when decisions about the documentation process are made. In her extensive study about technical communication in Finland, Virtaluoto (2015, 50) mentions the “often-reported attitude among

[subject matter experts] that documentation is not important", and links it to her discussion about technical communication being heavily dependent on the community of the workplace or organization where it is practiced. According to Virtaluoto's (2015, 51) interview data, technical writers' access to subject matter experts and the subject matter experts' attitude towards technical communication affects the quality of documentation considerably. In the software development team, the subject matter experts and technical experts **are** the content creators, so the effect their attitude towards the activity is even greater than in Virtaluoto's examples from the field of technical communication.

The range of documentation tools that are available instead of Microsoft Word are not known to the management of the development team, or seen as important enough for an incentive from the management's side. Other tasks are constantly prioritized higher than a manageable and efficient documentation process, so the process has remained error-prone and unequally accessible to the employees for some time. The writing competence and the ways of working that are familiar to the developers have clearly not been considered when the documentation tool was chosen. This can lead to errors and bad quality documentation and further deprecates the attitude towards documentation in the software development team.

5.1.2 Usability

The improvement suggestions related to usability that were gathered from the interviews are centered around improving the functionality of links, adding graphics to the documents, and improving and simplifying the layout and structure of the documents. In this section, I will first discuss the improvement suggestions related to using links and creating meaningful graphics, and then elaborate on the suggestions about the structural choices of the documents. From the point of view of technical documentation, many of the improvement suggestions related to usability seem like attempts to make Word documents behave and appear like modular documentation, but without resorting to modular documentation or switching the documentation tool.

Links

The software deployment and configuration procedures that are documented in the internal documents are complex and lengthy, and the responsibilities of documenting different pieces of software have been divided across different teams on different sites in the target company. Different teams do not do documentation work in co-operation, which has resulted in a loose collection of pieces of instructional and descriptive texts that the users need to pick, choose and combine from each time when a procedure needs to be done. This makes the functionality of the links in the documents a crucial requirement. Below are some answers from users to the question "Do you ever

encounter problems with the links in the documents? eg. do the links point to useful locations, are they ever broken, or otherwise difficult to use?"

> (Interviewee 17) Yes, especially that they point to the wrong locations. At the very early phases, the links have not been updated yet. At that point, the docs are not usable yet, as the software is not done yet, and it should not be used by testers.
> (Interviewee 9) Lately the links have gone directly to the document. The links are always at the end of a document. It would be better that the link was directly in the step where you need it.
> (Interviewee 6) Especially [an instructional document] was very confusing, and it had many references to external documents. Using modular documentation would be very useful in this case. I would like to have self-updating modules instead of endless linking.

As I mentioned in section 2.3, the functionality and design of the links in the internal documents are tied to multiple factors. At the beginning of the software development cycle, the locations of the related documents do not exist yet. Despite this, the documents are already used by resilience testing engineers at that point of the development cycle, and the information about when the documents are first "usable" for them is clearly not transferred to them effectively enough (example from interviewee 17).

Some of the users wished for the links to be placed so that the user comes across a direct link to another location at the point where the link is needed in the procedure (example from interviewee 9). Creating the links so that the user comes across them just when they are needed would comply to good practices in information design. However, because of a shortage in staff with technical documentation competence in the development team, not all of the links in the documents take the user directly to the document, and point instead to the end of a document (internal discussions with senior technical writer 2015). This decision was made to lessen the need for document maintenance and development, so that the content creator would only need to update one link in a document. Because the documentation tool does not support modularity or re-using content, and saving the content creator's efforts was seen as more crucial than document design that would be beneficial to the users, the links in the internal documents are not well designed from the document users' perspective.

Users also expressed displeasure about the excessive use of linking in some of the documents they had used (example from interviewee 6). From the answer of interviewee 6, it can be seen that some of the content creators do have knowledge about alternative ways to handle the documentation tasks. Despite the fact that this knowledge is available in the development team, for example moving to modular documentation is not seen as a feasible or worthy option (internal discussion 1 with project manager B 2015).

Graphics and images

Presenting information with graphics in the documents is not a top priority among the interviewees. Most interviewees seem to perceive graphics as a "nice touch" that could be gladly added to documents, but not as an urgently needed feature or as a significant help that would visualize complex procedures and make them clearer to the users.

Using illustrations to mediate meaning alongside text has clear benefits for users of documents, and it makes acquiring information and understanding large wholes easier and faster for the users (Grosse et al. 2015, 110). Careful planning of the layout and information design are also factors that seriously affect the accessibility of the information content in a document. Informative graphics that present a large amount of information at a glance can be especially helpful if the document requires the user to explore and scan the document for the relevant information before being able to use the document for its main purpose (Ganier 2004, 23). Using mixed formats for mediating information (for example, graphics and text that support each other) is beneficial for most users (Ganier 2004, 21). Below are some answers to the question "What kind of alternate ways to present information would you like to see in the documentation (eg. text, steps, examples, images, screen captures, color-coded commands, OR a quick-reference guide for experienced users)?" The answers below are from all interviewee groups.

> (Interviewee 17) Technical illustrations, a step-by-step chart about the process. An overview of the steps and what is related to what. There is usually no time to implement or hone the documentation, so we have not made images or illustrations.
> (Interviewee 4) Screen captures might be useful in some situations. The commands are straightforward. Some hacks might be useful to have visualized.
> (Interviewee 19) Screen captures would be nice from time to time. Attachments that open from inside the document are not possible to use in Linux.

The workload of the content creators and time pressures are some of the reasons why there are presently very few thought-out graphics in the internal documents (example from interviewee 17). The content creators who are available are requested to focus on producing text instead of graphics in the software development team. Screen captures of the user interfaces of software (example from interviewee 4) and visualizations of complex, manual steps ("hacks") that are kept in the documents only during the development process (example from interviewee 19) were suggested as alternate ways to present information in the internal documents.

Structural choices and layout

The structural choices in the documents received a great deal of criticism as well as improvement suggestions from the interviewees. The users of the internal documents do not always know what a command or script will do, because not all users are familiar with the creation of the deployment

process. This puts especially users that have less working experience in an uneasy position when they are doing a software deployment procedure with the help of a document. Many of the documents are also "bloated", which means that they contain needless information that has once been useful, but is not needed anymore but has still been left in the document. Most common were the wishes to have a single document for a single procedure, to have a "simpler" document structure, and to have descriptive sections that precede the execution of commands (example from interviewee 19).

Goals and subgoals (the states the user is trying to realize), prerequisites of tasks, and problem-solving information that is given when actions are error-prone, are basic components of a procedure (Van der Meij and Gellevij 2004, 6-11). In the internal documents, the issues that received most critique fall into the component categories of goals, subgoals and problem-solving information that is given "just-in-time" (Van der Meij and Gellevij 2004, 11). The procedures that are instructed in the documents are not always done in a graphical user interface where cancellation of actions would be possible, which further emphasizes the importance of describing the outcomes or subgoals (Van der Meij and Gellevij 2004, 5) of commands in detail before a user executes them. Interviewees wished that the outdated content of the document should be removed (examples from interviewee 6 and interviewee 5), and that the information architecture should be redesigned according to present needs (example from interviewee 7). 13 interviewees especially stressed the need to have the version information of the documents clearly visible in a consistent location inside the documents (example from interviewee 1):

> (Interviewee 19) It would be nice to have a description of which parameter means what in a command.
> (Interviewee 7) All of the extra stuff should be left out I think. Only things related to software deployment in the software deployment instructions! Too long documents are no ones benefit, because you miss crucial steps and commands when you skim. I would like to have a list of commands, and nothing else.
> (Interviewee 6) There is some unnecessary info in the software deployment documents. Nice-to-know stuff, that only makes the document longer. The style of the documents varies a lot. Especially [documents from Product A] have very different language, the fonts are different in the commands, there is no standard template.
> (Interviewee 5) Some of the procedures have been explained too thoroughly, and some of the instructions are only links. This is not a usable way to create documents, linking in the middle of documents is not pleasant.
> (Interviewee 1) It is usually necessary to ask the document writer directly where the newest version is or for them to send it via email. Not all document creators use the version history tables consistently; this causes a lot of problems. Draft document locations are not clear or easy to find.

The content creators' attitude towards the users is connected to explicitly describing the procedures in the instructions. It is a common statement among the content creators that the user

"must know" certain things in advance before being able to execute a procedure with an internal document (internal discussions with content creators 2015). Ganier (2004, 18) points to research results according to which reading and navigating procedural instructions is a complex mental process in itself, and that users are likely to find instructions that demand heavy use of their working memory difficult. Users of procedural documents are required to not only implement the information they extract from the document into practice, but also to explore the document for relevant information, and to understand the content (Ganier 2004, 18).

Expecting an inexpert user to be able to understand goals that are only implied or not stated at all increases the cognitive load of the user, and may make following the instructions impossible. Despite this, the vague notion of "you should have already known that", or the supposed expertise of the users, was repeatedly used as an excuse or as an explanation for documentation choices according to the interviewees. One user's answer to the question "Who do you turn to for version information?" illustrates this mindset of prerequisite knowledge that is required from the users (my emphasis):

> (Interviewee 21) I can always ask my colleagues or create a question on the company's internal discussion board, but that is time-consuming. This is somehow not official information which version is the correct one, **it seems to be a matter of experience**.

The level of expertise that is supposedly required from the users of the documents is not entirely clear to the management or to the few technical writers of the team, and it has not been clearly or openly defined anywhere. From the point of view of technical documentation, it bears repeating that one of the key competences of a technical writer is being able to analyze the needs of different audiences of a given document, and to design the information structure of the documents according to those needs (Jayaprakash 2007, 130; Estrin and Elliot 1990, 8). Based on the interview data it would seem that both the users and the content creators would benefit from having a formally trained technical writer who would coordinate or oversee the internal documentation process. Because the writing tasks are viewed as unpleasant and of secondary importance by so many of the content creators, training the content creators in technical documentation skills does not seem like a feasible option.

At the beginning of the research project, there was no clearly defined procedure for creating an internal document, and the documents were created "like they had always been created", which left many users and content creators with less working experience in the dark. This issue is related to the ways of working as well, but it directly affects the decisions that are done about the document structure. Members of the local customer support team arrange trainings for newer users of the internal documentation in order to increase their knowledge and competence about the software

product, but the content of these trainings is not open to the technical writers or to most of the content creators. These training courses are used to carry some the information value that should be carried by the procedural documents, and after the training the users are assumed to have the necessary skills and minute know-how so that they are able to succeed in the software deployment operation procedures with the internal documents. Essentially, in these trainings the users are instructed to understand the complex documents and the way they are stored, and they are expected to later remember the complex procedure and the way the interconnected documents work together. From the point of view of technical documentation, procedural documents should ease the mental load of the user, and offer reference information (such as descriptions of tasks and definitions of terms) that can be checked from the document if necessary, so that the users will not need to remember them by heart (Ganier 2004, 18). In other words, the purpose of good procedural documentation is to store complex information and make it easily accessible so that the user does not have to remember it by heart or learn it thoroughly in advance.

5.1.3 Ways of working

When examined as a whole, the documentation process in the development team and its many information distribution channels seem to be characterized by relying on silent knowledge. This is partly because of the distribution of the working experience of the team members and especially the distribution of the working experience of the users (see Chart 2). Many users who participated in the interviews have worked with the internal documentation for over 10 years, while others only have working experience from less than a year. Furthermore, the very experienced content creator/users are colleagues of the very experienced users, so between these groups, information about the documentation process is mediated informally, and often in such a way that users with less working experience and users who are located on other sites are left out of the exchange.

Insufficient resourcing is another reason for relying so explicitly on silent knowledge in the documentation process. The development team currently has only two fully allocated technical writers, and they have other duties even though they are officially fully allocated to writing and developing internal documents. When there are not enough employees, all parts of the software development process suffer, but as has been previously studied, documentation seems to be where scarce resourcing hits hardest, both in terms of resourcing (Virtaluoto 2015, 49) and authorship (Andersen 2014, 120). Confusion related to the documentation process is fairly typical to technical businesses and organizations that are either transitioning to using technical writers for all documented material, or that still use technical experts to produce the majority of documented material (Hackos 2004, 3). The largest share of documentation responsibilities always seems to fall

to the hands of a single person, who is currently the senior technical writer in the software development team, and has over 15 years of working experience in technical documentation (internal discussions with senior technical writer 2015).

Information regarding the correct locations of the documents and the correct way to version them has converged to the senior technical writer alone, and content creator/users mentioned the senior technical writer as their regular information source with questions related to the documentation process. Below are some replies from content creators and content creator/users to the question “Who do you turn to for more information?”

> (Interviewee 18) I go to someone who knows. Certain things about documentation are known by certain people. The [source for the] layout issues [for example] would be the senior technical writer again.
> (Interviewee 17) I ask the senior technical writer.
> (Interviewee 13) I do ask, but from who? Maybe the person who did the latest modification to the document, or the senior technical writer. Someone from the development team or documentation. I don't think there is a documentation-related support service for software deployment problems.

When the answers of interviewees 18, 17, and 13 are contrasted with answers from users with less working experience, the apparent information gap in the process becomes clearer. When asked “Are the documents relevant for you easy to find?”, interviewee 4, a user with 1,5 years of working experience, answered: “No, the storage place seems to change all the time. I always have to ask someone, it is not possible to find something without prior knowledge for yourself in [the CMS].” The internal documentation process has not been made transparent or accessible enough for newcomers to learn, and instead it has to be internalized by talking to the right employees, which can be very difficult without prior knowledge about the process.

When asked about the attitude of silent knowledge that was mentioned and referred to in the interview answers above, the most experienced members of a local customer support team adamantly claimed that such an attitude does not exist, at least not to the extent that is suggested by employees from other teams. Sharing information unevenly between content creators and customer support teams, who are users of the documents at the end of the development cycle, are reflected in the documentation process so that content creators do not know how detailed the procedures should be. Despite this, members of the local customer support team were not very keen on improving the documents, even when some results and improvement suggestions from the first interview round were presented to them.

Users who have working tasks as resilience testers use the documents at very early phases during the software development cycle, and users who have working tasks as software deployment engineers (most often in a customer support team) use the documents at the very end of the cycle.

These two groups are not very aware of each others working tasks or needs, and it seems that they do not necessarily wish for this situation to change (example from interviewee 24):

> (Interviewee 24) Our documents are also meant to be taken out of the product package and away from the customer once the deployment procedure is completed. Our "customers" are the software deployment engineers, and we look at the process from their point of view.

Interviewee 24 is a content creator, and in the comment above, "our documents" refers to the internal documents, which are not shown to the end users of the software product. Interviewee 24 states that the focus of creating the documents is indeed at the late phase of the development cycle. Interviewee 24's answer demonstrates how the needs of the resilience testers are not met in the internal documents, or even considered during the documentation process.

Most of the content creators and content creator/users are seasoned experts, and the audience for which the content creators write and design documents does not have similar expertise about the subject. When this fact is considered together with the finding that only two of the non-technical writer content creators ranked documentation as their highest priority task, the root causes of the information gaps in the internal documentation process begin to emerge. What is also notable is that the development teams work in isolation from one another, and there is no position of an information architect or a similar role in the documentation process. This means that there is no employee with a responsibility to watch over the documentation as a whole and to plan and steer the documentation process so that the resulting documents would be usable and accessible from the point of view of the procedures the documents describe.

A comment from one content creator describes the mindset of minimal effort well:

> (Interviewee 17) Internal documents, official documents and writing, it's always the very last thing an engineer wants to do. To find the same mindset that the reader has is incredibly hard, and the writing tends to be too technical. That's also why the automation processes are driven so eagerly, because then you don't have to document so many things.

When the software deployment processes are automated, the amount of procedures that need to be documented does indeed decrease. This does not, however, remove or even reduce the need to document the procedure clearly and in an understandable and accessible format. Based on the interview results and my experiences during the research project, I can argue that the issues of sufficient resourcing, relying on silent knowledge and not prioritizing good documentation make co-operation and information sharing between different teams and sites difficult, and noticeably weaken the documentation process and the quality of the documents.

As I interviewed the content creators, the single most common word they used to describe the documentation process and the conventions in their respective teams was "confusion". Many parts

of the documentation process and the locations for information are only available in the conventions and habituated routines of the employees with the most expertise, despite the clear need for having them easily accessible for all deployment engineers and developers in the team. The ability of executing a successful procedure is heavily based on information that is passed along from one employee to the other instead of improving the quality of the procedural documents. Below are some comments about the expectations placed on the software development team:

> (Interviewee 15) The [software development] team is expected to do all kinds of things, compared to that it feels like the amount of people is not enough. But there are so many newcomers, that you can't know what is expected of the team as a whole. It feels like each team is making its own versions of the tools that are used, and then the information does not go forward anymore. Communication would be easier with less people, but then we wouldn't be able to do all that is expected of us.
> (Interviewee 18) I don't think that we are undermanned, well, I'm not that sure. I belong to the team, but I don't do the actual similar work that the team does. It might be up to a one single person if there are enough or too little people. There is always more work than people at the moment, no matter where you go. It's the same in all places.
> (Interviewee 24) It's confusing to have the management to try and shoot at the same problem from so many directions. I would say that we are undermanned. The workload sharing is not clear enough, and there is no time to do the procedure well enough. Multi-site work is also a problem, I would say that the large picture has disappeared from [the view of the] grass-root workers, and we are not sure of who does what and where. We would need a dedicated technical writer for us, and not just someone temporary to look at the language for a bit.

Scarce staffing seems to be a problem in the development team, from the point of view of regular work and documentation (examples from interviewee 15 and interviewee 18). The notion of trying to solve the same problems from many directions at once was repeatedly brought up in content creator and content creator/user interviews. This issue was seen as problematic both in the way the teams develop software tools (example from interviewee 15) and in the way the management of the team makes decisions about solving problems (example from interviewee 24). The division of working tasks is not similar between members of different teams, and not all team members are aware of what other team members are doing (example from interviewee 24). The content creators are swamped with other work and the ways of working are in disarray, which causes confusion and delay in the document creation process and forces them to create each document in a hurry. Based on the interview data and the answers of the users, these issues in the ways of working of the software development team clearly cause misunderstandings and information gaps, and make creating multi-authored documents difficult.

The documentation process of documents that are written in other teams that are located far from the software development team seem to be of no interest to the interviewees, despite the negative comments the quality of these documents have received. The employees in the software

development team have little to no knowledge of the employees who create the content for internal documents on other sites, and it was difficult to get information about whether the documentation process is similar on all sites (internship experiences 2015-2016). This finding depicts the content creators' confusion about the responsibilities related to creating the internal documentation as well as gaps in communication between different teams.

5.2 Views of content creators

The broad theme of ways of working in my data arose almost exclusively from answers to two short questions in content creator and content creator/user interviews. Because the issues related to ways of working came to be such a significant part of my data, I will discuss the interview data from the point of view of the content creators in this section.

The two short questions at the end of the interview ("If you encounter a problem in the documentation creation, who do you turn to for more information?" and "Do you think you are undermanned in your team?") often elicited the most lengthy answers from content creators and content creator/users. In response to these questions, the content creators and content creator/users vividly described the relations of their team members, how their team's and sub-teams' configurations had changed rapidly during the last few years, and how that had affected the ways they work and their mindset. In response to these questions, the content creators and content creator/users also described their attitude towards the internal documentation process and the tasks that are demanded from their team.

Compared to the scope of these questions, the themes in the answers of content creators and content creator/users were rather broad, and in my opinion they clearly show the interviewees' need to discuss the problems in the ways of working in the software development team. In a recent company-wide workplace condition survey that had 2,764 participants, one of the most common open comments was the desire to have "more open and efficient internal communication" (Internal workplace condition survey 2015).

The software development team has experienced several changes in the preferred methods of project work during the last five years. Agile and lean practices[8] have gained wide popularity among large software companies (Korhonen 2012, 4) and some of the practices that fit under the umbrella of agile software development methodologies have been experimented with and attempted to be adopted into regular use in the software development team. When referring to Agile and lean practices, I will use the term *working method* because that is the term that is commonly associated

8 Agile and lean practices are project work methods that aim to enable the employees to respond to changes in a given project as quickly and painlessly as possible, with as little bureaucracy as possible, and without compromising the productivity (Koch 2004, 4-7). Agile in particular is used in the context of software development and improving the ways of developing software (Beck et al. 2001).

with these types of approaches to organized group work.

There are several working methods in use in the target company. The working methods are adjusted and sometimes modified according to the nature of working tasks in each team. For example, Agile practices are not in consistent use among the technical writers in the target company, because most of the documentation work is done near the end of the software development cycle. Agile practices have been developed for software programming, and the activity of programming is vastly different from documentation work. Thus, for example, Agile working methods such as short, daily stand-up meetings (scrum meetings) or working in short periods of two weeks per project or component (sprints) are not consistently present in the daily work of the technical writers in the software development team, while they are used (but only to some extent) by the developers. These inconsistently used working methods were one of the sources for experiences of confusion related to ways of working among the interviewees.

Because the development and writing tasks are divided across several teams that are located in different countries and time zones, one of Agile's main principles is constantly being broken in the software development team. According to Poppendieck and Poppendieck (2007, cited in Korhonen 2012, 3), development of software should take place so that people are physically located in the same room. Studies show that large, distributed teams working in Agile mode, where the employees mainly use calls and various forms of online communication instead of face-to-face contact, are likely to face issues related to communication and trust (Lee and Yong 2010, 209). In the software development team, teams that have similar working tasks can be situated in many working sites, and the communication between the team members that are located on different sites is naturally less frequent and close than the communication of closely situated team members. Dividing a large, mature Agile organization into small parts and managing the parts locally may decrease the performance of the organization when it is viewed as a system (Poppendieck and Poppendieck 2007, cited in Korhonen 2012, 31). In the software development team, the management teams can be spread over different sites, which allows for differing kinds of management styles and ways of working to emerge and be encouraged inside a single team. The distribution and communication from the management team was also a source of confusion among some of the interviewees (examples from interviewee 24 and 17) and based on the interview data, it has clearly had a negative impact on co-operation between different teams:

> (Interviewee 24) Our internal ways of working would need to be improved, the scrum method has worked before. Now in the development team is more spread out and differentiated. Our [definition of a finished product or project] was also clearer then, and it worked and there was a rewarding side to the way we did things. Nowadays we are pretty confused about the tools and which tools we are still using in the software

> deployment, and which ones we should descope. The information given to us has been pretty patchy. I doubt that the project managers know very much [about the large picture] themselves.
> (Interviewee 17) When I came to this team, the starting point was that the development team and the local customer support team did not communicate at all. The document was the only way they communicated, and that is a doomed approach to making documentation that is reader-friendly. There should be better ways of communicating between the readers and the users.

In the software development team, the groups the employees are divided into are assumed to be self-organizing (internal discussion 2 with project manager B 2015) but the concept of "self-organizing" seems not to be clear to the employees. Not all of the team members have been trained to work in Agile mode, or are interested to do so (internal discussion 1 with project manager A 2015), or the ways of working are not clear enough for the team members to follow (example from interviewee 24):

> (Interviewee 24) Our management has not given us a framework about how to work, and our unit has not had an appointed scrum master for a year at least. Sprint working gets buried under urgent issues and [interviewee signals quotation marks with fingers] "real work".

It can be seen from interviewee 24's answer that the concept of self-organizing teams does not hold in the development team and that the developers would need a consistent framework for a working method. It is also notable how interviewee 24 sees an agreed working method ("sprint working" in interviewee 24's answer) as an opposite to "real work" instead of a tool that makes working easier.

5.3 Views of users

The working experience of users seemed to make a difference in the way users answered the interview questions and suggested improvements to the internal documentation. In this section, I discuss the effect of the users' working experience to their interview answers and trends in the ways the internal documents are used.

Users whose working experience with the internal documentation was the shortest among the interviewees (from under one year to three years, see Chart 2) were the most keen to radically change the documentation process. Users with a short working experience suggested improvements that would require noticeably more effort and resources to develop than the development team currently has available. For example, hhe improvement suggestions brought up by the users with a short working experience included replacing the documents with instructional videos or animations, and publishing the documents as interactive checklists the user could utilize while executing a complex task. Users with over ten years of working experience did not propose radical changes to the document format. Improvement suggestions from more experienced users were mostly related

to the content management system and the versioning conventions of the documents. Users with a long working experience (over ten years in this data) did not think it would be very likely that their improvement suggestions would come to effect, or even that their needs would be heard or responded to.

The working tasks of the users vary from time to time, which means that not all of them need to access documentation consistently in their work. The frequencies of how often the users need to access the internal documentation are shown in Chart 5. Note that the number of users in Chart 5 is not the total sum of the users. It was possible for an interviewee to answer with two of the frequencies below (for example, a user might have answered that they need to access the internal documentation weekly, but with long pauses in between).

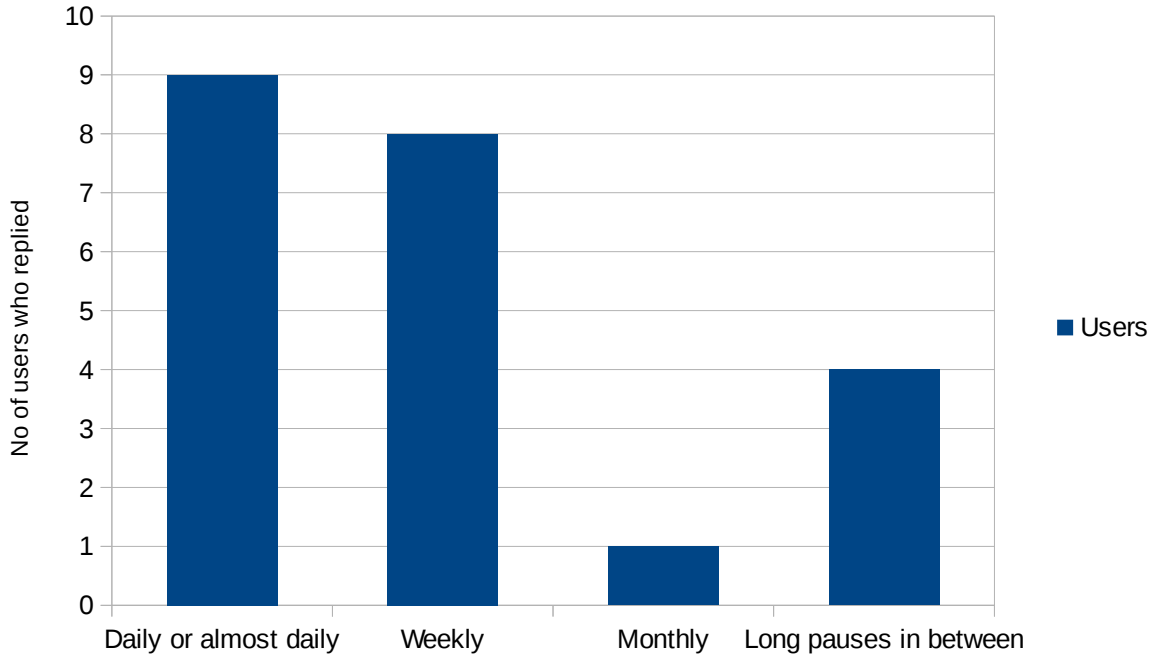

Chart 5: How often users need to access internal documents

As shown in Chart 5, nine out of 18 users need to access the documentation daily, and eight users need to access the documentation weekly. Four users out of 18 reported to have long pauses between working tasks related to internal documentation. It is possible that a user focuses on other tasks for a long time, and has to then re-learn the procedures and conventions related to the internal documentation process (example from interviewee 14).

> (Interviewee 14) I need [the documents] daily when there is a project going on, but I may have months of breaks when I'm not reading the documents at all, and after that I have to get back to them and I need to ask all of the stuff again. Things might change noticeably when I'm away on other work duties, so I'm out of the [software development team's] loop when I get back to the documents.

Interviewee 14's comment further points to the direction that a large part of the internal

documentation process is based on silent knowledge. Since there is no appointed coordinator in the internal documentation process, there seems to be no other way to “get back in the loop” other than asking advice from colleagues here and there. A more transparent and simple documentation and publication process would reduce the users' need to remember the documentation process by heart, save time and working hours of content creators, and benefit users who do not need to work with internal documentation all the time.

In the interviews, some of the users shared alternate grounding and information searching strategies they had developed to cope with using documents that are cumbersome to access and navigate. Swarts (2004, 67) argues that “users ‘ground’ their texts to local use settings by altering the ways in which the texts structure and represent information”. According to Swarts (2004, 79), it is difficult for users and content creators to achieve a common ground when talking about texts. Reviewers of internal documents may have very different means and tools to talk about and conceptualize the content and form of documents than the subject matter experts. The subject matter experts are engineers in Swarts' (2004, 79) example, and they correspond to content creators and content creator/users in my data. Reviewers are the users of the texts in Swarts' (2004, 79) example, and they correspond to users in my data. With the help of Swarts' (2004) terms, I will next discuss the difficulties in “reaching common ground” (Swarts 2004, 79) between the content creators and the users.

Users presented different ways of grounding and accessing the internal documents in the interviews. Some of the ways of grounding texts and accessing information were rather laborious. Two users preferred to turn the electronically mediated text into a static text by printing the document on paper. They felt that they were able to grasp the complex text better and to be able to make modifications and notes to it more easily (example from interviewee 14). This method can take a significant amount of time, since the documents are updated often at the early phases of the development cycle and because the documents can be very long.

> (Interviewee 14) I often print the documents out, and I then write the commands in [to a command line] by hand. That is more reliable than copy-pasting because some of the characters might change. Doing by hand is sometimes as fast as copy-pasting.

Very experienced users are able to circumvent the unreliability of links in the documents by navigating to other documents without clicking the links at all (example from interviewee 12). Interviewee 12's answer is another example of basing the accessibility of the internal documents on silent knowledge. A few users had resorted to novel ways of finding information from the CMS, which was deemed as unsearchable by 21 out of 26 interviewees. Interviewee 8 uses the target company's internal wiki page to look for references to the CMS instead of using the cumbersome

search tool of the CMS itself (example from interviewee 8).

> (Interviewee 12) I rarely use the links, because it is sometimes unreliable where they point to. I only look at the document name and navigate to it otherwise (I already know where they are).
> (Interviewee 8) [The internal documents] should have direct links to the relevant [supporting documents] they refer to. Location information [of the supporting documents] has to be searched from the CMS or the company's internal wiki page. On the internal wiki page, you can find direct links to CMS locations.

In addition, experienced users reported that users in less experienced teams and on sites that are not familiar with the software product have sometimes made their own instructions to complement or replace the internal documents that are made by the development team. Based on the interviewees' answers, it can be said that users have attempted to take "advantage of the affordances of text that allow users to annotate, manipulate, and otherwise tailor information for highly situated uses" (Swarts 2004, 68). The users need to re-create the internal documents so that they suit their needs better, and transform the documents into a more tangible format by printing them out on paper. These facts demonstrate the different methods of grounding texts in my data.

5.4 Evaluating the maturity of internal documentation in the software development team

In this section, I discuss the quality of the internal documentation process in the development team, and present alternatives to the quality measuring method that is in use in the software development team. I present and discuss Cooper's (1999) personas and Hackos's (2004) model for measuring the maturity of information processes and the levels of process maturity she has defined. Finally, I evaluate the maturity of the internal documentation process with the help of Hackos's (2004) model.

In the software development team, the factors that affect the quality of internal documentation are measured against the requirements stated in ISO 9001:2015. This international standard is used to measure the robustness of the internal documentation process, but its use is limited to measuring the process practices and comparing them to the standardized quality measuring process. Different stakeholders in the target company arrange quality audits for documentation procedures of different business areas. In these quality audit sessions, the quality of the documentation process is measured in relation to the planned quality management process (internal documentation audit report 2015). There is no guarantee that any of the auditing personnel have any expertise or experience in documentation or in information design, which does not further finding the accessibility issues in the documents.

From the viewpoint of the project managers of the development team, one crucial condition for attaining a quality certificate is an internal documentation process that has a properly defined

method for version control. However, the guidelines in the quality management standard are sometimes interpreted rather superficially instead of focusing on the accessibility issues of the documents from the user's point of view (internal documentation audit report 2015). Using the ISO alone as a guideline when planning improvements to the quality of internal documentation may improve the documents on paper, but it can leave out the improvements that are needed by the users of the documents. As mentioned above, the ISO is intended as a guide to documenting issues that are related to the quality management process, and not documentation or product development per se. This is why using the quality management standard alone as a guideline for internal documentation is not necessarily the most effective tool for improving the documents from the user's point of view. In other words, sticking to the letter of a quality management standard will result in a good-looking process, but using the ISO alone as a quality measurement tool does not benefit the users of the documents from the point of view of accessibility.

Cooper (1999) proposes a different approach to making products and processes truly useful for the users. According to Cooper (1999, 123), knowing the users of a product and using personas crafted to the likeness of a relevant user group to model the needs of the users is a crucial prerequisite if one wants to design a software product that is accessible and usable and makes its users satisfied. Even though the principles of Cooper's (1999, 165) goal-oriented design are originally developed for creating software products, they could easily be applied to planning good, accurate and accessible (and in this case, electronically mediated) documentation. Past documentation improvements have been focused on details about legal information and information security classifications, but issues with document content have not been systematically analyzed (internal documentation audit report; internal discussion 2 with project manager B 2015). At present, there is no user-oriented system to measure the quality of the internal documentation in the software development team. Cooper's (1999) goal-oriented design principles could be a good starting point for planning an internal documentation process that runs alongside the software development. In practice, this would mean restructuring the internal documentation development of the software development team, and studying the users of the documents so that the documentation process could be designed from their point of view.

Another option to using only ISOs as quality measuring tools is the Information Process Maturity Model (IPMM) (Hackos 2004, 1). This model is based on Hackos's extensive consultation work that she engaged in during the 1980's with various companies that have needed to analyze and improve their communications processes. Using the experience gained from working with technical documentation procedures and processes in companies with varying levels of success in effective information design, Hackos (2004, 2) and her colleagues created a model that defines six levels of

information process maturity an organization can achieve.

The levels of information process maturity are presented below (Hackos 2003, and Hackos 2004, 3-7). Level 0 is defined in Hackos's model (Hackos 2004, 2), but it is not usually counted in when using the model. However, since some of the characteristics that are defined in Level 0 match my data, I will use Level 0 as well in my analysis. After presenting the general descriptions of Hackos's levels, I present my analysis of the documentation process based on the interview data.

Level 0: Oblivious

The main communication goal of an oblivious organization is to get the documentation out as fast as possible, with no regard to the quality. The general attitude towards documentation tasks that often hinders development and improvement work is the idea that “no one reads the manuals anyway”. No one's task is clearly defined in the documentation process.

Level 1: Ad-hoc

In an ad-hoc organization, there is no standardized documentation process for the employees to follow. There are no uniform practices or a clear structure all employees involved in the documentation process would be aware of. Each employee may apply standards and documentation conventions of their own, without the others knowing of them. Subject matter experts are largely in control of the documentation process, and information developers are typically not technical writers or documentation experts.

Level 2: Rudimentary

In a rudimentary organization, there is a defined process for handling communication and documentation, but that process is often met with resistance from the employees, according to Hackos. Level 2 is described as “the awkward transitioning phase” from isolated and scattered information design conventions into unified and common rules that all employees follow. Despite having an agreed information management process in place, the rules and conventions are often abandoned because of deadlines, business pressure and lack of commitment from the employees. In a rudimentary organization, the value of good, consistent documentation is recognized by some individuals, but it is not regarded as a high priority issue equally by all employees.

Level 3: Organized and Repeatable

In an organized and repeatable organization, the majority of the employees conform to the commonly agreed processes, templates and standards of documentation and information design. The value of carefully planning the information structure, having uniform documentation, and assuring the quality of the documentation is recognized by all employees, on the management level

and on the content creator level. In an organized and repeatable organization, the information process works smoothly enough to leave time for planning improvements to old content and benchmarking with other organizations. An organized and repeatable organization has the time to look outward and not just inward when planning and developing the information design and documentation.

Level 4: Managed and Sustainable

In a managed and sustainable organization, the commitment to commonly agreed processes, templates and standards of documentation and information design is so strong that a change in leadership will not affect the quality of the documentation. Managed and sustainable organizations actively strive to minimize bureaucracy and to evaluate the quality of the information process in a regular and controlled way.

Level 5: Optimizing

In an optimizing organization, customer needs are held in special focus, and there is a strong commitment to develop best practices in information design and documentation work. An optimizing organization constantly seeks out better ways to function, and benchmarking other organizations is a regular practice. An optimizing organization strives to improve practices throughout the organization, not just the ones in its own department.

Analysis of the document evaluation

As discussed in Chapter 5 so far, the internal documentation process in the software development team is largely characterized by silent knowledge and general confusion about the division of working tasks and the preferred ways of working. Not all user groups of the documents are taken into account when planning the document structure and planning the publication method of the documents. The internal documents are written and designed largely from the point of view of customer support teams, and users that need to access the documents during earlier phases of the development cycle are not taken properly into account in the documentation process. These characteristics point to levels 0 and 1 in Hackos's IPMM.

In the interviews, the content creators described their views about the internal documentation process by referring to recurring feelings of confusion. Very experienced content creators and content creator/users seem to have an attitude of indifference towards the needs of users. Undefined tasks and ways of working, as well as documentation work being buried under other responsibilities and working tasks that are deemed more important, point to level 0 in the IPMM.

The users listed several known issues in the accessibility of the documentation which had not

been corrected despite of them being known to the content creators. Interviewees also stated that there is little time or resources to properly work on improving the documentation, and content creators expressed the need to have a regularly appointed technical writer for the development team. Multi-site work and problems with communicating with team members across locations was one of the major reasons for the information gaps and delays in the internal documentation process. The lack of time for documentation improvements and the lack of personnel with documentation expertise point to levels 1 and 2 in the IPMM.

Based on the interview data, I would place the internal documentation process in the software development team between levels 1 and 2 in the Information Process Maturity Model. The subject matter experts are largely in control of the process, and not many of the content creators and none of the management personnel have experience in technical documentation. A process for creating the internal documents exists, but the process may be neglected because of pressing deadlines, and not all of the employees are properly aware of the process and conventions of documentation. There is not enough time or resources to continually improve the documentation process in the software development team, and not all employees see the documentation as an important and high-priority task that has its place in a well thought-out development process.

Compared to the ISO 9001:2015, which is currently the only tool that is used to measure the quality of the internal documentation process in the development team, the IPMM measures the quality of information processes from a more holistic point of view. Where the ISO 9001:2015 only looks at the definitions and rules of given processes, the IPMM takes the creators or developers of the information process, their attitudes towards the development work and their ways of working into account as an essential part of the process (Hackos, 2004). Both from the users' and content creators' point of view, and based on the interview data, I would argue evaluating the quality of the internal documentation with a model such as IPMM would be more useful than using only the ISO 9001:2015 as a guideline. Evaluating only the outline of processes does not motivate the employees, and is clearly not beneficial to the users. The underlying problems in the ways of working, resourcing and communication are easily left without attention when they do not emerge in documentation audits, where in principle any possible problems in the documentation process should be caught. I would argue that changing the evaluation of the internal documentation process in a direction that takes both the users' and the content creators' needs into account, such as using either Cooper's (1999) or Hackos's (2004) model, would benefit the software development team.

6 Conclusions

In this chapter, I restate my study questions, summarize the results of the interviews, and discuss how the interview results answered my original hypotheses. I list the improvement actions that were put to action based on the results of the interviews, and discuss the interviewees' opinions about how the research project succeeded, and whether the interviewees felt that the documentation process improved during the project. Finally, I evaluate my research methods and the interview process, and discuss how the research project succeeded.

6.1 Summary of the interview results

In this study, I focused on finding out what kind of experiences the users and content creators have about using internal documentation, what kind of accessibility problems there are in the internal documentation. In addition I endeavored to find solutions to the accessibility problems that emerged from the data.

The first two study questions can be answered based on the interviews. It was clear from the first round of interviews that the experiences the users and content creators have about the internal documentation process are largely negative, and that the problematic areas related to the internal documentation process are well known to the interviewees. The accessibility problems in the internal documentation are shortly summarized below.

The content management system that is used for storing the versions of the internal documents is difficult to access and use. In addition to its actual purpose, the CMS doubles as a publication platform for the internal documents. The CMS is not designed to be used as a publication platform, and publishing the internal documents with the CMS makes the internal documents difficult and sometimes impossible to access. The CMS does not support simple or intuitive ways to search for information, and being able to use the CMS for accessing the internal documents largely depends on silent knowledge.

The internal documents are published so that instructions needed for a single procedure are scattered across several documents and locations inside the CMS. Being able to find all the necessary documents for a single procedure largely depends on silent knowledge or extensive experience from using the CMS.

The content creators' access to and competence in using the documentation tools that are used to create the internal documents is very limited. The conventions of the layout and information design of the internal documents are not clearly defined even though the internal documents are multi-authored. The version control conventions and rules are not known to all content creators or

users. The internal documents are designed in a complex manner: for example, the use of hyperlinks between both different documents and parts of documents is often confusing for the users.

When the focus of the interview questions shifted from the accessibility issues to the ways of working during the second interview round, the root causes of the accessibility issues began to emerge from the data. The problems that emerged are not uncommon in the field of technical communication: As already stated in the Introduction and Chapter 5, unclear ways of working, an unclear division of working responsibilities, and communication gaps between teams are common problems in the context of creating documentation in information organizations.

The answer to the third study question is roughly equal to the main conclusion of this study. Based on the interview data, I can argue that to permanently solve the accessibility problems in the internal documentation process of the software development team, the software development team would need a full-time coordinator with working experience in technical documentation who would manage and coordinate the internal documentation work. At minimum, to be able to begin to tackle the accessibility problems and to produce more readable and accessible documentation, the software development team would need a thorough re-evaluation of working tasks between the team members and the technical writers that currently work for the team.

At the beginning of this study, I hypothesized that the users and content creators of the internal documentation would have very different needs concerning the documentation process and differing opinions about the relevance of the documentation, and that the users and content creators would not be aware of the needs of each other, and they would not be in agreement about what would be the best way to create internal documentation. Neither of these hypotheses turned out to be entirely valid. Based on the results of this study, the users and content creators of internal documentation do indeed have very different needs concerning the documentation process and also the format of the content, but all participants were unanimous about the relevance of the internal documentation. Producing content for the documentation was viewed as an unpleasant or as a low-priority task by some of the content creators, but the need to have the documents available, up-to-date and corresponding the correct software (in some form or other) was not contested in the interviews.

Regarding the second hypothesis, the content creators and the users were not indeed aware of each others' needs as groups, and they largely focus on working tasks inside their own group. However, there were no disagreements between the users and the content creators about the ways of creating the documentation. Instead, the participants unanimously voiced their confusion about the internal documentation process and the software development team's unpredictably shifting working tasks.

I would argue that the results of my study strengthen the assumption that employees in an organization do not inherently resist to change, and that the resistance to change is rather connected to issues in organizational structures and decision-making (Dent and Goldberg 1999, 36). In my study, the issues that seemed to cause resistance to improvement suggestions the most were the lack of documentation expertise, the lacking understanding of the needs of the users of the internal documentation, and developers who are acting as technical writers and information designers. These issues are a consequence of having too few technical writers and employees with experience in information design in the software development team.

6.2 Evaluation of the actions taken during the research project

As a researcher, it is not in my power to facilitate a permanent solution for the software development team, but I was able to act in a project-based documentation improvement group during my research project in the target company. All actions and discussions of this improvement group were done for the purposes of the target company, and none of the participants of the improvement group provided data for this research project. In the documentation improvement group, we endeavored to put some of the improvements that came up in the interviews into practice with technical writers from other teams. In this section, I list and discuss the improvements that were taken into use in the software development team during this research project.

Establish a regular time to discuss and share documentation issues

As the scope of the issues in document accessibility and in the ways of working became clearer, we established a regular time for discussions and planning with the technical writers of the development team and representatives from other teams. In these discussions, we evaluated and analyzed the gathered data and weighed different improvement suggestions that the interviewees had brought up. We tested and piloted some of the improvement suggestions that were given regarding the documentation, and were able to put some of the improvements into practice in the development team. We regularly shared the information that was gathered from the interviews with the management of the software development team, and promoted the severity of the feedback that was received about the internal documents. Improvement suggestions gathered from the interview data were anonymously presented to the project managers of the software development team.

Develop guidelines for writing internal documentation

Guidelines for writing documentation were created and published on the internal wiki portal of the software development team. Together with the technical writers of the software development team, we agreed on clear instructions and conventions for using the documentation tool and content

management system (since it was not possible to change the content management system). We created common templates for naming and versioning the documents, and spread the information in training sessions that were held for the content creators. We also created link lists to help both users and content creators to better find the internal documents that are related to each other.

Define a documentation process according to practices that work best

With the technical writers of the development team, we re-thought the existing process for internal documentation, and updated the process description based on the improvement suggestions to ways of working we had gathered from the interviewees. The documentation process was then published on the internal wiki portal of the software development team. Previously, the process description had not been available to any of the content creators.

Ensure that the documentation tools fit the task

The documentation improvement group produced a new template for creating internal documents, which is intended to replace the old, broken template that is in use in the software development team. The template was tested and trialed by technical writers from several teams, and taken into use in the software development team. The documentation improvement group will endeavor to take the new template in wider use in the target company in the future.

The content creators in the software development team gave very positive feedback about the new document template, and reported that it was easier to use and read than the previous template (internal discussions with content creators 2016). They also gave positive feedback about the new methods of co-operation between the technical writers and the developers, which were defined in the re-thought internal documentation process (internal discussions with content creators 2015).

Ensure that the management understands and supports the documentation tasks

After this research project, it seems that in the management of the software development team the information design and co-ordination of the internal documentation process is still considered to be an issue of lower priority that can supposedly be solved with a short, temporary project. An uninformed attitude towards technical documentation tasks is not untypical in information organizations, as I already stated in the Introduction. However, developing internal documentation and planning good information design is a part of every product that is delivered by the software development team. It is an area that demands continuous improvement and work, just like any other area of the software development process. Based on this research project, I would state that the management of the software development team would need to understand the value that the internal documentation has and be aware of the user groups and their needs to be able to meet the

expectations of the most demanding users of the internal documents.

6.3 Evaluation of the research methods

I chose to use action research as a methodology in this study in order to enable the participants to voice their opinions both to me and to each other, to increase the participants' awareness about the accessibility issues in the internal documentation, and to keep the research project transparent and easily approachable for the participants. I feel that with using action research I managed to include the interviewees to participate in the study well, and I was able to discuss with them both individually and as groups after the interview was completed. Meetings that were arranged between groups of participants that had never discussed the internal documentation process in much detail before were a clear indicator of creating discussion and increasing the participants' awareness of each others' needs.

However, it was not easy to reach employees in the target company that are not directly involved in the internal documentation process with the methods of action research. For example, it was very challenging to reach and properly involve the employees that currently maintain the document template in the limited scope of this study, or to foster an open discussion between the documentation improvement group and the employees responsible for maintaining the template. To advocate a wider-spread change in the internal documentation process, it would have been required to involve the employees who are responsible for maintaining the template in the target company more closely in this research project, and that was not in the scope of this study.

If I had had the chance to do more extensive research in the target company about the internal organizations and co-operation possibilities before beginning the interviews, it might have been easier for me to communicate more effectively with the correct stakeholders. On the other hand, the structures of the internal organizations of the target company change almost constantly, and it is often not clear even to long-term employees who is responsible of the internal documentation process (Internal discussion 2 with project manager B). Because the position of the internal documentation seemed confusing to the members of the software development team when I began the research project, I feel that using action research and allowing the data to guide the formulation of the study questions was the best I could do as a researcher in this project. Based on this research project, and as a single researcher, it would seem that the principles of action research are apt for advocating local change in a relatively small group of participants. As I mentioned in section 3.2, the numbers of the participants place limitations on how much a single researcher can do and effectively communicate in an action research project. Achieving change on a global scale in a larger group of participants would require a team of researchers and more time, so that all

participants in different locations could be included in the research as closely as needed.

From the point of view of gathering the data, I feel that using semi-structured interviews gave me a sufficient picture of the research problems, and enabled me to discuss the study subject from the points of view the interviewees wanted to. However, if I would have to conduct a similar interview process again, I would record the interviews either as video or as voice recordings. I would do this because of two reasons: First, the ways the interviewees stress and emphasize the issues that are important to them are easier to make clear from recorded data. Having recorded data available makes transcribing the interviews easier and more accurate. Second, recording the interviews would considerably lessen the time the researcher has to spend writing down the answers during the interview. Not having to focus on writing everything down during a discussion frees the researcher to listen to the interviewee more closely and does not interrupt the interaction. In this study, it would have also been helpful if I had been able to conduct more test interviews before beginning to collect the data, so that I could have better clarified the themes of the interview questions of the first interview round. That would have helped me to clarify the focus of this research project in an earlier phase. However, because of the working schedules of the interviewees, it was not possible for me to conduct an extensive test interview round. To sum up the evaluation of my research methods, it would seem that the methods I chose for this research project reflect my study subject: They are fit for hectic and rapidly changing situations which are not clear in the beginning.

This study contributes to the literature of technical communication as a case study about internal documentation, but leaves room for further research about the competence of managing technical documentation processes in organizations, the position of technical communication in the hierarchies of a workplace, and the solutions for creating accessible documentation in information organizations. The effect of internal documentation and communication styles of employees on working efficiency could also be viable topics for further study.

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Appendix 1

Interview questions for users

- **These interviews are anonymous, and no information about any personal details will be disclosed to any other parties.**
- **Usability is about giving opinions based on user experiences. Please feel free to speak your mind, personal opinions are okay!**
- **You are free to interrupt me or ask for clarifications at any time.**
- **If you have questions after the interview or you feel that something was not entirely clear, or if you wish to send me examples of documents that you find problematic, feel free to contact me via e-mail.**

Background

- What is your work title or role in tasks related to the documentation process?
- Which team do you belong to?
- Do you see yourself as a user or as a content creator?
- How often do you need to access the internal documentation in your work?
- How many years of experience do you have using internal documentation?
- At which point of the product cycle do you conduct software deployment operations?
- Which documents do you need to access most often?
- **[question for resilience/performance testing engineers]:** Is the environment you deploy the software exactly like the customer environment?
  - Is the hardware configuration similar to the customer setup?
- **[question for product deployment engineers]:** Are the readability/accessibility issues ever a problem in a customer situation?

Accessibility concerns

- Are the documents relevant to you easy to find?
  - If not, could you give an example?
  - Estimate how significantly finding the relevant document from the database/ content management system affects your work time. Do you have to use other means to find the necessary information, eg. maintain a library of bookmarks for yourself?
- Is the database/ content management system easy to navigate and intuitive to use?
  - Open question for accessibility concerns.
- Do you use older versions of the documents and why?
  - How could the older versions of the documents be made more easily accessible?
- When you are reading a document, is it clear to you which version of the document you are using?
  - Can you be certain that the version you are using is the correct one and the procedure will go smoothly with the instructions?
  - If not, where do you turn to for more information about version information?
  - Estimate how significantly ensuring that you are using the correct version of a

document affects your work.
    - Do version control problems cause you double work?
- Do you send the writer comments if the procedure does not run according to your expectations?
- Do you use the release-specific product pages on the company's internal wiki platform for finding information about the internal documents?
    - If not, why?
    - How do you use the company's internal wiki platform? Is it easy to find what you are looking for?
- Do you use the search-functionality of the content management system?
    - If yes, what kinds of things do you search for?
    - Are you aware of any standard procedure about finding the correct documentation for a product version?

Document content

- Are the documents you use self-containing (ie. is one document a sufficient source of information for the task it describes?)
    - If not, which other information sources do you use for the task you are performing?
- Are the procedures that are described in the documents you use unambiguous and easy to understand?
    - If not, could you give an example?
- Are the procedures proportionally designed?
- Is there any superfluous information present in the instructions you use?
    - Is there any information that could be left out (without which the instructions would still be functional)?
- Is the structure (the order of the procedures) logical and does it correspond to the order of tasks in the procedure?
- Is there something missing from the procedures or descriptive information?

Document format

- Is the format of the content optimal to you (currently a Word document)?
    - If not, what kind of alternate ways to present information would you like to see in the documentation (eg. text, steps, examples, images, screen captures, color-coded commands, OR a quick-reference guide for experienced users)?
- Do you ever encounter problems with the links in the documents? eg. do the links point to useful locations, are they ever broken, or otherwise difficult to use?
- Do you ever encounter problems with copy-pasting commands from the documents?

Improvement ideas

- How would you like information and updates about the documents to be distributed?
    - eg. would some sort of system that notifies the readers about the updates made to a given document be useful to you?
- Are there some specific features you would like to use when browsing/accessing the documents?
    - Do you have an alternate database in mind which would be good for storing and distributing the documents?

- What could bring improvements to the quality or accessibility of the documents?
  - Open question for improvement suggestions.

Appendix 2

Interview questions for content creators

- **These interviews are anonymous, and no information about any personal details will be disclosed to any other parties.**
- **Usability is about giving opinions based on user experiences. Please feel free to speak your mind, personal opinions are okay!**
- **You are free to interrupt me or ask for clarifications at any time.**
- **If you have questions after the interview or you feel that something was not entirely clear, or if you wish to send me examples of documents that you find problematic, feel free to contact me via e-mail.**

Background

- What is your work title or role in tasks related to the documentation process?
- Which team do you belong to?
- Do you see yourself as a user or as a content creator?
- How often do you need to access the internal documentation in your work?
- How many years of experience do you have using internal documentation?

The documentation process

- Briefly describe your role in the process of creating a document.
  - Which parties besides you are involved in the document creation?
- How are the different software tools distributed in the instructions?
  - How is the decision made to include/exclude full instructions from other sources, and on what grounds?
- How is the software deployment procedure automated, and how does that show in your work? Is it beneficial to you?
- Which tools do you use to create the document?
  - Do you think the tools are optimal for this task, and why?
  - Do you have a way to verify that copy-pasted material is not changed to different characters in the document when you copy and paste material to the document?
- Who is your main readership?
  - Do you get comments to your documents from the readers during the development process?

Ways of working

- If you encounter a problem in the documentation creation, who do you turn to for more information?
  - Do you think that you are undermanned in your team?
- What is the typical production schedule of a document? Do you know who plans the schedules?

- Is it easy for you to accomplish the documentation tasks appointed to you? If not, why?
- How high would you prioritize creating documentation among your regular tasks?
- What could bring improvements to the document creation process?
  - Open question for improvement suggestions.