Designing for Learning in Enterprise Software

An explorative case study investigating admin user needs for learning, instruction, and information retrieval.

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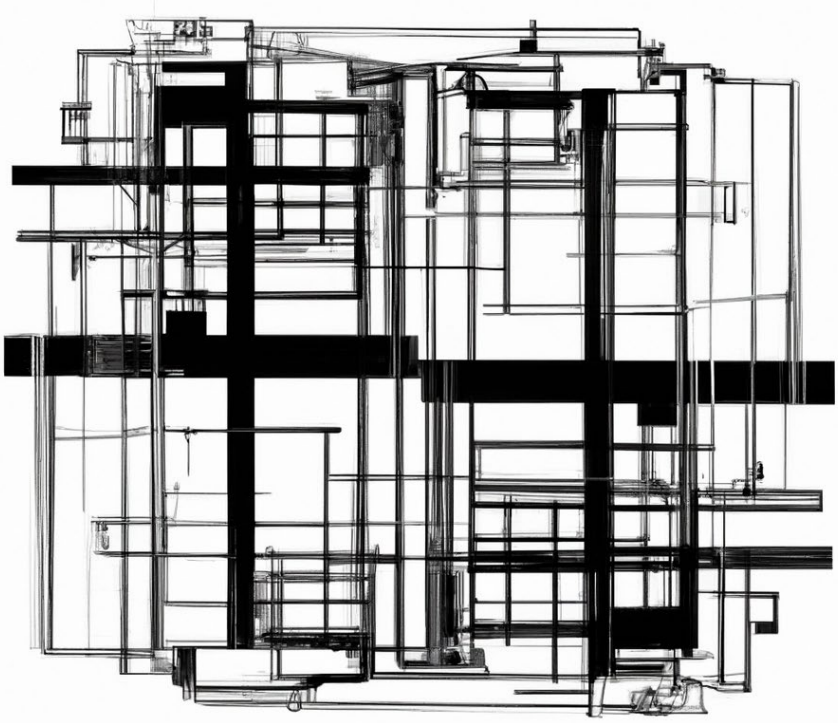

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Abstract

Enterprise software plays a vital role in an organization's path to operational excellence and competitiveness. Whether or not the company is able to reap the rewards of the enterprise software depends largely on the extent to which the software is adopted effectively, meaning used with a high level of proficiency by its users. Working from the assumption that poor employee training is the main driver for organizations' enterprise software not reaching its full potential. This study aims to identify and understand the needs of admin users with regard to learning, instruction, and information retrieval in enterprise software. With the focus being on the needs of admin users, the theoretical framework will primarily cover what is known about human learning and information retrieval and how this can be applied to software and digital solutions. The data was collected using ten semi-structured qualitative interviews with admin users responsible for their organization's configuration of a Swedish enterprise software.

In short, the study found that admin users need a solution that is able to identify and adapt to users with different levels of knowledge and goals for their learning. Admin users with strategic learning goals of achieving a conceptual understanding of design and business knowledge need a solution that facilitates their intrinsic motivation and self-directed learning through a transferable learning experience that adapts its support to their evolving level of knowledge. These users also need access to smaller communities that are segmented to fit their industry, their way of working with the software, and their level of motivation for learning. Admin users with primarily procedural learning goals need a solution that offers accessible worked examples, evaluates software configurations as well as offers accessible video-based instructions and access to conversational support. If the insights of this study are applied effectively to enterprise software, it will enable more effective and enjoyable work and, subsequently, higher economic development and human well-being.

Keywords

Enterprise software, Employee Training, Admin Users, Learning, Instruction, Information retrieval, User-Centered Design, Innovation

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1. Introduction

Digitalization is many years in the making and impacts most if not all, aspects of our everyday lives. In business, digitalization has revolutionized the way many organizations operate, making it easier to manage and streamline business processes, and if done right, it has the potential to drive innovation and revenue growth (Hill, Le Cam, Menon & Tedards, 2022). Digitalization has also made cross-border communications and transactions more affordable and accessible for businesses of all sizes. This has resulted in increased competition from new and unexpected sources around the world, which subsequently has put more pressure on companies to improve and innovate to remain competitive (Manyika, Lund, Bughin, Woetzel, Stamenov & Dhingra, 2016).

In order for organizations to remain competitive in the digital era, they need to evolve with it. To evolve and make use of digital technologies, they need to understand the changing needs and expectations of their customers and provide them with seamless experiences. A digitally mature organization should proactively anticipate and solve customer problems and provide customized experiences to stand out from competitors (Hill et al., 2022). There is a strong consensus among business professionals that the adoption of new digital technologies is necessary if a company wishes to remain competitive in the long run, with 97% of respondents in a 2022 survey either agreeing or strongly agreeing that “companies won’t remain competitive unless they embark on a digital transformation.” (Hill et al., 2022).

A core part of any company's digital transformation is its operational backbone, meaning the business and technology capabilities that ensure the efficiency, scalability, reliability, quality, and predictability of the company's core business (Ross, Sebastian, Beath, Mocker, Moloney & Fonstad, 2016). The most common elements of an operational backbone are the software or technology platforms that house vital information, make transactions smooth and easy to understand, and standardize back-office services (Ross et al., 2016). Enterprise software, in other words, plays a vital role in an organization's path to operational excellence and digital transformation-induced competitiveness (Alt, Leimeister, Priemuth, Sachse, Urbach & Wunderlich, 2020; Pombriant, 2021). Enterprise software has the potential to automate tasks, streamline operations, and provide real-time insights for better decision-making. It can be used to improve communication, collaboration, and data security, which are all necessary for businesses to thrive in the digital world (Alt et al., 2020). Whether or not a company is able to reap the rewards of its enterprise software depends largely on the extent to which the software is adopted effectively, meaning used with a high level of proficiency by its users (Neochange, Sandhill, tsia, 2009).

1.1. Problem Discussion

Research has shown, however, that a lot of organizations use software that is not well-liked by their employees, with 66% of respondents in a 2021 study reporting that they prefer activities such as cleaning their bathroom over using their organization's software systems (Pombriant, 2021). The “State of Software Happiness Report 2019” shows that while 24% of respondents have considered leaving their job as a consequence of the software that they use, 95% of respondents still believe that software can make them more productive at work (Decker, 2019). This suggests that employees' unhappiness with the software they use does not necessarily stem from a disbelief in the value of it.

Even though the low levels of effective user adoption and overall dissatisfaction with enterprise software undoubtedly have several explanations, depending on the software itself and its application. A lack of knowledge and understanding is likely to be a main contributor because of the level of complexity that enterprise software typically has (Raess, 2019; Rettig, 2007; Wheatley, 2000). A paper by Peters, Calvo & Ryan (2018) argues for the value of the psychological needs of competence, autonomy, and relatedness in digital experiences (Peters, Calvo & Ryan, 2018). It is likely that the complexity of enterprise software generates dissatisfaction by diminishing the employee's feelings of competence. Thwarted feelings of competence can, according to Peters et al. (2018), result in decreased motivation for and engagement in activities in the digital environment as well as decreased well-being through feelings of helplessness, anxiety, and frustration (Peters et al., 2018). Understanding one's company's software and how to use it, in other words, is potentially crucial for an employee's satisfaction with the software and their subsequent effective adoption of it. Additionally, Wheatley (2000) argues that the main driver for organizations' enterprise software not reaching its full potential is poor employee training (Wheatley, 2000). Combining the arguments of user dissatisfaction and the value of training and effective user adoption leads to a hypothesis that one can increase users' satisfaction and effective adoption of enterprise software by increasing the quality of the training that they are given in relation to it.

Enterprise software introduces an additional level of complexity in that the end product that end-users use most often is a result of work done both by the company developing the software and by employees from the company implementing it (Raess, 2019). Under optimal circumstances, the development happens in collaboration between the two parties. But in many cases, the customer ends up telling the software company what they want without actively participating in or understanding the implementation (Raess, 2019). This often results in a situation where maintenance and development of the software configuration become less and less over time, presumably because of the administering employee's lack of understanding of the software and their configuration (Raess, 2019, Rettig, 2007). This lack of understanding and subsequent low levels of maintenance and development over time leads to a situation where the software is less likely to be kept up to date with the organization's changing needs (Rettig, 2007). This suggests that there is a need for the user with administering responsibilities to have a higher level of understanding of the software and that their knowledge is the main determinant of how effective and adaptable the software is going to be over the long term (Anonymous Alpha manager, personal communication, March 17). This makes the case that facilitating the level of knowledge and understanding of these administering users has the potential to be beneficial for the long-term effectiveness of enterprise software as well as for the effective adoption and work satisfaction of end users.

Even if the original ways of learning and understanding software still exist, such as printed manuals, and peer-to-peer help and support centers, much of the enterprise software industry is trending toward more interactive, automated, and pedagogical learning solutions to manage employee training (Anonymous Alpha manager, personal communication, December 15, 2022; Giannakos, Mikalef, Pappas, 2022). Given the trend towards interactive, automated, and pedagogical learning solutions and the value of knowledge for both the ongoing development and the level of effective adoption of enterprise software. A study into the needs of administering users of enterprise software when it comes to learning, instruction, and information retrieval has the potential to bring value to organizations as well as society as a whole by facilitating employee effectiveness and work satisfaction.

1.2. Purpose

This study aims to identify and understand the needs of administering (admin) users responsible for their organization's enterprise software, with regard to learning, instruction, and information retrieval. Reaching this aim will fulfill this study´s larger purpose of generating insights for better solutions for learning, instruction, and information retrieval in enterprise software that will enable more effective and enjoyable work and, subsequently, higher economic development and human well-being.

On a smaller scale, these insights should also serve as the inspiration phase of a larger development process for a solution for learning, instruction, and information retrieval in a Swedish enterprise software platform.
These aims will be sought to be reached by answering the research question:

1.2.1. Research Question

What admin user needs are crucial to consider in the development of a solution for learning, instruction, and information retrieval in enterprise software?"

1.3. Delimitation

As this project is an explorative study intended to constitute the inspiration phase of a larger design process, the aim is in itself open-ended and wide (IDEO, 2015). The researcher did, however, try to limit the scope of the project where it was possible. The research is limited to interviews with administrating users, i.e., the main person responsible for developing and administrating the software in each company interviewed. Even if many of the individuals interviewed also worked operationally in the software, they are unlikely to struggle with the same problems as the individuals who are exclusively end users. The decision to only include admin users in the study rather than also including end-users was made due to the nature of how the software is developed. A great deal of the end users' experience rests on the shoulders of the administrating users, as they are responsible for the company's configuration of the software. Understanding and adhering to the needs of the administrating users, in other words, were deemed to be most likely to result in the highest degree of value for the users of the platform and the organization as a whole. Additionally, admin users were presumed to be more likely to have the knowledge and interest necessary for a productive in-depth interview. Time and resource constraints were also a factor, as the number of interviews with admin users could not be reduced to make time for interviews with end-users without the reliability of the findings suffering.

The study was also delimited in terms of the depth of research. If time restraints had not been an issue, the research would have included theoretical sampling rather than generic sampling. Meaning that additional rounds of sampling and interviews would have been conducted in order to understand the theoretical findings more deeply (Bell & Bryman, 2019). As the topic of this research was decided on in October 2022, before the AI craze started with the launch of Open AIs ChatGPT on November 30th, AI was not taken into the initial planning phase and research proposal (OpenAI, n.d.). Because of this fact and the subsequent resource and planning restraints, AI will only be covered briefly in this thesis. AI is, however, likely to play an important role in a final solution that fulfills the needs uncovered in this study.

1.4. Context of the Case Study

This research was conducted in collaboration with a mid-sized organization planning to develop a learning platform for the enterprise software that they are selling to their customers. The study consisted of ten semi-structured qualitative interviews with admin users from organizations using the software. The case study company, henceforth referred to as company Alpha offers a software solution to its close to 300 customers and 250.000 plus registered users. Alpha defines its solution as a management systems platform that offers an all-in-one experience with tools for the management of documents, workflows, processes, projects, and strategies. Defining what a management system platform is for the purpose of transferability turned out to be a challenge as the researcher did not find such a definition on the web. This turned out to be a wider problem in the space of enterprise software solutions, where terms such as business management software, enterprise software, enterprise application software, and enterprise management software are used to describe any combination of a range of different software tools, such as tools for; Accounting, Project Management, File Management, Business Intelligence, Inventory Management, Enterprise Resource Planning, Customer Relationship Management, and Content Management (Amazon, n.d.; Canes, 2023; ServiceNow, n.d.). Among the functions mentioned, the Alpha software could be argued to cover tools for Project Management, File Management, Business intelligence, Content Management as well as Enterprise Resource Planning (ERP) to a certain extent. Due to the lack of search results for the company's own term and the wider split in terminology in the space at large, this study will use the term Enterprise software to encompass the aforementioned terms and to acknowledge that the users of the Alpha software are not just businesses but also governmental and nonprofit organizations. Regardless of what terms are used, the Alpha software offers an all-in-one experience with modules for the management of documents, workflows, processes, projects, and strategies. The document management module helps employees of an organization to find and collaborate on relevant documents. It has features like graphic navigation, subscriptions, and dynamic views for easier document administration. It handles document formats such as forms, templates, policies, and instructions and has integrated social functionality for updates and improvements. It has a search function, document viewing technology, and templates for a uniform structure. The module also has workflows for document reviewal and approval (Company Alpha, 2023).

The workflow feature is a business process management solution that automates, quality assures, and speeds up administrative processes. It supports various workflows such as claims, deviations, accidents, improvement suggestions, CAPA (Corrective and Preventive Action), assignments, or ITIL (Information Technology Infrastructure Library) cases. The module offers process owners and executives an overview of ongoing workflows, status, and responsibility with reporting, analysis, and statistics features. The process module is used for modeling and sharing business processes, which allows linking processes with documents and applications to create graphical navigation. The module offers functionality such as process modeling, linking, publishing, exporting, and creating a complete picture of processes. The project management module manages project portfolios, resources, and documents. It offers planning and control features and an overview of project portfolios and their status, economy, and progress. Its features, web interface, and technical platform make it suitable for use in different industries and sectors. The module allows project managers to create status reports automatically, share documents, communicate, and collaborate with other project members. The strategy module is intended to enable organizations to create a link between their strategic work and daily operations. It offers a range of performance

management tools such as; Strategy Modelling, which is used to break down the company's vision into specific objectives and metrics for easy tracking; a Strategy Dashboard that provides an overview of company goals and their progress; and a KPI management function which allows for easy monitoring of operations (Company Alpha, 2023).

Alpha has customers within a wide variety of sectors, such as Energy and Environment, Life science, Public sector, Health and Social care, and Manufacturing (Company Alpha, 2023). Many Alpha customers are trying to achieve and maintain certifications within areas such as environment, quality, or information security. These certifications put high requirements on the traceability and security of the software, which is met by, for example, providing employees with information based on their role and access. Additionally, having such a wide range of customers from different industries means that the software needs to be adaptable to several different situations and ways of operating. The modules are therefore built with a fully customizable design to give each customer a system design that meets their specific organizational needs Anonymous Alpha manager, personal communication, March 17, 2023). Typically, the initial setup process happens in collaboration between Alpha and the customer, with a set of employees from the customer being trained in using and configuring the software. The goal of the training is that one or more admin users at the customer will be able to use, make changes to their configuration, and develop it over time as their needs and the market change. In case the training was not enough, or they need support with something different, customers have access to a user manual, an incomprehensive selection of supporting documents, and customer support through chat and video calls (Anonymous Alpha manager, personal communication, March 17, 2023).

1.5. Disposition

This thesis consists of six chapters, as shown in Figure 1. The thesis starts with an introductory chapter that provides a background, problem discussion, purpose, research question, delimitations, and the context of the study. The introduction is followed by the theoretical framework covering the theories used in this study and how they relate to each other. After the theoretical framework follows the methodology, which explains the research design and covers how the project was conducted. The fifth chapter covers the empirical findings of the study as well as the analysis of those findings. This thesis ends with a conclusion where the research question is answered, the implications of the findings are reflected upon, and recommendations for future research are given.

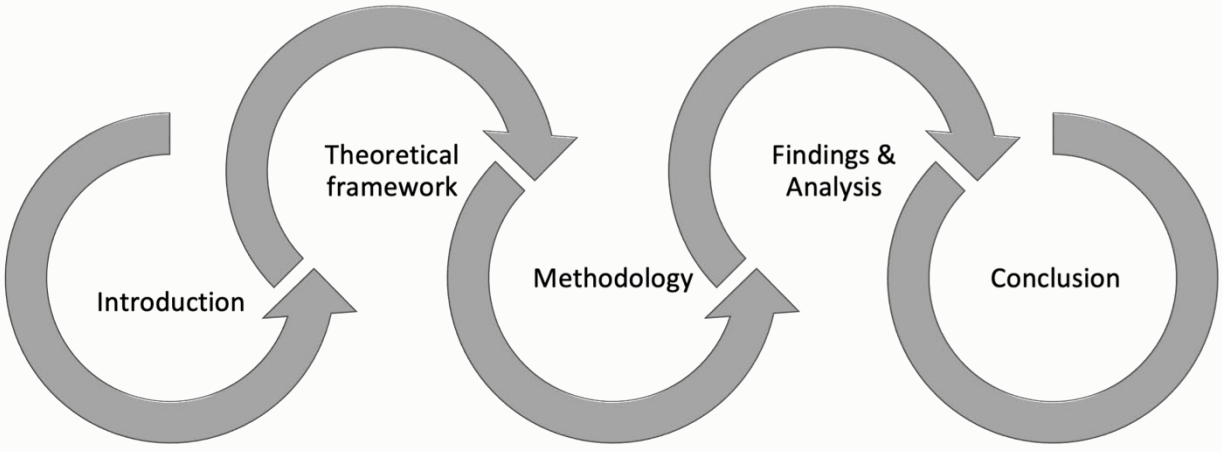

Figure 1 shows the different chapters of this thesis.

2. Theoretical Framework

As this study aims to identify and understand the needs of administering (admin) users responsible for their organization's enterprise software with regard to learning, instruction, and information retrieval, it can be seen to be situated in the cross-section between learning and user-centered design. The focus is, in other words, on the user rather than the software that they use. With this in mind, the theoretical framework was developed to primarily cover what is known about human learning and information retrieval and, secondarily, how this can be applied to software and solutions for online learning. Because of the impact that usability factors have on information retrieval and overall user retention and satisfaction in e-learning solutions, this chapter will also include a section covering best practices for user-centered interface design (Ejdys, 2021; Nielsen, 2020; Siemens, 2004; Vlasenko, Lovianova, Volkov, Sitak, Chumak, Krasnoshchok, Bohdanova, and Semerikov, 2022).

2.1. Enterprise Software & Learning

Enterprise software is an umbrella term encompassing a number of different business software tools, such as tools for; Accounting, Project Management, File Management, Business Intelligence, Inventory Management, Enterprise Resource Planning, Customer Relationship Management, and Content Management (Amazon, n.d.; Canes, 2023; ServiceNow, n.d.). Enterprise software has the potential to benefit organizations in a variety of ways, from automating tasks and streamlining operations to providing real-time insights for better decision-making. It can be used to improve communication, collaboration, and data security, which are all necessary for businesses to thrive in the digital world (Alt et al., 2020). Enterprise software helps large corporations solve complex problems and are typically designed to handle a variety of operations with speed and scale. Due to the complexity of these systems, most corporations outsource their development to software providers before deploying them in-house (Florida Tech, 2022). Enterprise software is generally more complex than consumer software. Consumer software is typically designed for a single use case, while enterprise software is designed to accommodate multiple use cases across industries, processes, and countries. Enterprise software is typically built to encompass entire companies and resemble existing processes (Raess, 2019). To reach this level of accommodation, enterprise software is often co-developed and -implemented by the customer and the software provider. It is common for co-development projects to become one-sided, with customers only communicating their requirements and needs to the software company. This can lead to difficulties in managing the product in the long term (Raess, 2019). The complexity and customization that enterprise software often require can create barriers to change through higher costs and increased risks associated with making changes (Rettig, 2007). The management of an organization typically wants to be able to make changes to their software as their needs and the market change. And as the complexity increases, so do the requirements on the knowledge of the people responsible for administering it (Rettig, 2007).

According to Wheatley (2000), there are also reasons to believe that adequate training might be the deciding factor if enterprise software gives the desired results. He advocates that employees need to be provided with a good understanding of why new software is being implemented and how it relates to the business processes, instead of mainly being shown how the software works, in order to achieve success. He also states that training should occur earlier in the implementation cycle and be tailored around the company's processes in order

to avoid poor results (Wheatley, 2000). Effective adoption has been shown to be considered the main driver for enterprise software success (Neochange, Sandhill, tsia, 2009). This research works from the assumption that providing a user with training, instruction, and information can increase the users' effective adoption of software by increasing their intrinsic motivation by facilitating the user's feelings of competence when using the software (Peters, Calvo & Ryan, 2018).

2.2. Learning Technology

The use of technology solutions for learning is gaining more and more attention in academia and business, and there is a growing trend toward incorporating e-learning solutions into organizational practices (Giannakos et al., 2022). As technology has evolved, so has its applicability and adaptability to different approaches and subjects of learning. Beginning with early drills and practice exercises for predictable behaviors to the interactive, automated collaborative solutions of today, which enable constructivist approaches to learning (Duolingo, 2023; Giannakos et al., 2022; Peters, 2014).

Even if early learning technologies still are relevant and cost-effective tools for certain learning objectives, technology has now co-evolved to influence and incorporate other branches of the learning sciences (Peters, 2014). Technology now enables designers to decrease cognitive load with multi-media content and facilitate constructivist learning by allowing users to complete various training tasks at their own pace and collaborate with others to share knowledge. (Clark & Mayer, 2016; Giannakos et al., 2022; Squires, 1999). The Connectivist theory of learning was created as a response to the shift in information accessibility brought about by the internet and the changes to learning and information search that followed (Siemens, 2004). In the following four subchapters, four branches of learning theory will be covered, i.e., Behaviourism, Cognitivism, Constructuvism, and Connectivism (Siemens, 2004). The research area of learning sciences is vast, and these four theories were picked as they were deemed to represent four important and distinct areas of the research field, which encompasses many of the theories which ended up being influential in this study (Peters, 2014).

Technological advancements and changes to the space of learning, instruction, and information search did not slow down during the time of writing of this thesis. One could argue that the field is standing on the doorstep of its next big transformation as this thesis is being written. Advancements in AI technology are already enabling new ways of learning and searching for information, and it is still too early to see what the true implications will be (Duolingo, 2023; The Economist, 2023). One development is that Large Language Model (LLM) developers now offer pre-trained LLMs that can be fine-tuned or trained for specific tasks, such as answering questions and providing information from a specific organization's database (Dilmegani, 2023, The Economist, 2023). It is also likely that AI-powered chatbots will take over the world of search by offering a more useful way of searching for information, understanding, or figuring something out (The Economist, 2023). AI technology is already being used for learning by companies such as Duolingo. With Open AIs GPT-4, learners on Duolingo can converse with the app in niche subjects and have a free-flowing conversation. The company recently added two new AI-powered features; Roleplay, an AI conversation partner, and Explain My Answer, a feature that provides feedback on users' mistakes (Duolingo, 2023).

2.3. Behaviorism & Motivation for Learning

The very beginnings of learning theory can be traced back to Behaviorism. Behaviorism emerged in the late 19th century and was based on the belief that the scientific method should be applied to the study and practice of learning and teaching. Behaviorism acted from the assumptions that only observable overt actions, i.e., behavior, could be studied and measured empirically. The inner workings of the mind were deemed too abstract to be considered. Early contributors to the field were Ivan Pavlov, with his classical conditioning, and Edward Thorndike, with his operant conditioning and the Law of Effect, which states that behaviors associated with pleasure are more likely to be repeated. Burrhus Skinner further developed the idea of operant conditioning and relied on reinforcement and punishment, with a focus on positive reinforcement (Peters 2014).

2.3.1. Self-Determination Theory

Behaviorism remains one of the most widely applied learning strategies to this day. In online learning, the effects of reinforcement and punishment can be seen in small ways, such as through the color choice and wording of a congratulatory message when completing a task in a learning platform. Gamification in learning also heavily depends on rewards, using badges, points, levels, and leaderboards as positive reinforcements. However, critics argue that relying solely on external motivators, such as badges and points, may not be the most effective way to motivate learners, as it does not tap into their intrinsic motivation for learning (Peters, 2014). Motivation is key to learning, and there is reason to believe that intrinsic motivation is more effective for learning (Peters, 2012; Ryan & Deci, 2017). Ryan and Deci (2017) argue that intrinsic motivation is likely the main driving force behind human learning throughout life, rather than externally imposed learning and instruction (Ryan & Deci, 2017). Research has also shown a positive relationship between intrinsic motivation and academic performance (Froiland & Worrell, 2016; Taylor, Jungert, Mageau, Schattke, Dedic, Rosenfield, & Koestner, 2014).

Self Determination Theory (SDT) makes a clear distinction between internally derived intrinsic motivation and externally derived extrinsic motivation. SDT defines intrinsic motivation as the motivation that an individual has naturally without the need for any outside pressures or rewards. An individual has a natural tendency to push oneself, look for new information, and learn. According to SDT, intrinsic motivation may only exist for an activity when the person thinks it to be challenging, aesthetically valuable, or novel, i.e., new and exciting (Ryan & Deci, 2000). However, the theory argues that intrinsic motivation requires supportive conditions to thrive. SDT argues that for healthy development to occur, individuals must have support for their basic psychological needs, namely autonomy, competence, and relatedness. Autonomy refers to a sense of initiative and ownership, competence to the feeling of mastery, and relatedness to a sense of belonging and connection. In the context of learning content, SDT focuses on whether or not these basic needs are being met or frustrated. Any hindrance to these needs is seen as detrimental to motivation and well-being (Ryan & Deci, 2020).

Peters, Calvo, and Ryan argue in a 2018 paper that these three needs need to be taken into account when designing digital experiences. They argue that if the basic needs are taken into account, it can lead to increased engagement and motivation, better learning outcomes, better overall psychological need satisfaction, as well as individual and societal well-being (Peters et al., 2018). Peters et al. (2018) also suggest that feelings of competence and, subsequently, motivation for and engagement in activities in digital environments can be increased by

providing opportunities for learning and optimal challenge. The paper referenced a study conducted by Chen and Jang (2010), which tested the value of fostering the three basic needs in online learning and found it to have a mediating effect on self-determination, i.e., motivation (Chen & Jang, 2010). In this project, the notion that facilitation of intrinsic sources of motivation, i.e., feelings of competence, autonomy, and relatedness, can be beneficial to learning and motivation for learning will influence analysis and the formation of insight statements.

2.4. Cognitivist Theory

The absence of visual evidence of mental processes does not diminish their significance. In the 1950s, the limitations of behaviorism in explaining human behavior that originates from within the mind rather than just the environment resulted in the emergence of the cognitivist theory. Advocates of cognitivism aimed to improve instructional design for complex behaviors, such as problem-solving and decision-making, which were beyond the scope of behaviorism. (Peters 2014)

2.4.1. The Cognitive Theory of Multimedia Learning

Cognitive Load Theory suggests that there are limits to our short-term memory capacity and how much information we can take in at one time. John Sweller developed the concept of "Cognitive Load," which explores the idea that our working memory can be overwhelmed by too much complex information. To reduce this extraneous cognitive load, experts recommend making instruction simpler, easier to understand, and more organized (Sweller, van Merriënboer, & Paas, 2019). Cognitivism suggests that learning is improved when new information is related to existing knowledge. Schemas, or mental models, are the frameworks we use to structure this knowledge and help us make sense of new information. Schemas are dynamic and can be adapted in light of new information and experiences (Sweller, van Merrienboer, & Paas, 1998). Based on cognitive load theory and findings from the cognitive sciences, the Cognitive Theory of Multimedia Learning was developed (Clark & Mayer, 2016). This theory is based on three assumptions:

- Dual channels - we process visual and auditory information through separate channels. (Clark & Mayer, 2016)
- Limited capacity - we are limited in the amount of information we can take into either channel at once. (Clark & Mayer, 2016)
- Active processing - when we engage in active learning, we do not passively receive information. Instead, we pay attention, organize incoming information, and integrate incoming information with previously held knowledge. (Clark & Mayer, 2016)

We do all this in order to build a mental model of the key parts and relationships of the information we're presented with.

Two different types of performance goals

Clark and Mayer also describe two different types of performance goals which are likely to be of importance to this project, procedural and strategic goals. Procedural goals are reached by teaching step-by-step tasks and are designed to promote near-transfer skills such as software skills. Procedural goals are achieved through directive lessons, which generally follow a structured sequence of "explanation-example-question-feedback" and provide step-by-step guidance for learners who are new to the content and skill (Clark & Mayer, 2016).

Strategic goals, on the other hand, are reached through guided discovery through features such as simulations and games, which engage learners both behaviorally and psychologically by asking them to perform tasks while receiving guidance. The goal is to achieve strategic knowledge which is applicable to tasks requiring problem-solving and adaptability to different situations. These types of lessons require learners to solve problems and learn from their solutions, making them more appropriate for more experienced learners (Clark & Mayer, 2016).

Three different kinds of processing

The theory further suggests that the designer needs to keep three different kinds of processing in mind when designing instructional content.

- Designers should aim to reduce **extraneous processing**, i.e., cognitive processing that is irrelevant to the instructional objective and is caused by poor instructional design. (Clark & Mayer, 2016)
- Designers should aim to streamline **essential processing**, i.e., cognitive processing that is necessary for selecting relevant information and mentally representing the core material. (Clark & Mayer, 2016)
- Designers should facilitate **generative processing**, i.e., cognitive processing that involves organizing and integrating the information in order to promote a deeper understanding of the core material. (Clark & Mayer, 2016)

Mayer and colleagues have formulated ten principles for designers to follow to create the best conditions for cognitive processing for learning. (Clark & Mayer, 2016)

Principles for reducing extraneous processing

There are four main principles for helping the learner reduce extraneous processing, i.e., Coherence, Redundancy, Contiguity, and Worked examples. The Coherence principle suggests that one should seek to limit potentially distracting details, such as unnecessary words, sounds, and pictures, that do not aid the intended learning outcome. The second principle, Redundancy, connects back to the verbal and visual channels and emphasizes that instructional designers should avoid overloading the visual channel by, for example, showing onscreen text when using narration. This principle does, however, not apply when the narration or the caption is short, the narration occurs before the text appears, or if there are no graphics present (Clark & Mayer, 2016). In addition, research by Ozdemir, Izmirli, and Sahin-Izmirli (2016) suggests that the Redundancy principle also does not apply to procedural training for an applied subject, such as learning how to use software through an instructional video. The Contiguity principle suggests that text should be placed close to the image or graphic that it references. The last principle is worked examples, which are step-by-step demonstrations of how to perform a task or solve a problem. Worked examples can be designed to help learners achieve a conceptual understanding of a topic and build procedural as well as strategic skills (Clark & Mayer, 2016). Research has shown that worked examples work especially well for learners with little prior knowledge (Ayres, 2015; Leppink, Broers, Imbos, van der Vleuten, & Berger, 2012).

Principles for streamlining essential processing

The second phase of the learning process comes down to processing and organizing the content learned. There are three principles for simplifying the processing of complex learning material and avoiding what Clark and Mayer (2016) call essential processing overload, i.e.,

the Segmenting, Pre-training, and Modality Principles. The Segmenting principle suggests that instructional designers should divide complex learning content into shorter pieces that the learner has control over (Clark & Mayer, 2016). This principle seems to be applicable to texts as well as video formats (Troop, White, Wilson, & Zeni, 2020). The Pre-training Principle, as the name suggests, aims to offload some of the essential processing from the main section of the lesson by introducing the most important concepts and characteristics in the beginning. The Modality Principle argues for a preference for narration over text-based information to accompany an image or a graph (Clark & Mayer, 2016). However, this principle has been shown to be circumstantial, where written text might be preferred to narration when the learner has control over the content, e.g., if the learner can pause and go back to read the instruction (Inan, Crooks, Cheon, Ari, Flore, Kurucay, & Paniukov, 2015).

Principles for facilitating generative processing.

The third and final phase of the learning process is the stage where the knowledge learned needs to be constructed into a model that fits with the individual's prior knowledge. Clark and Mayer (2016) suggest three main principles for doing this, i.e., Personalization, Multimedia, and Engagement. The personalization principle suggests that e-learning environments should use a conversational style of writing or speaking, polite wording for feedback and advice, and a friendly human voice. The Multimedia Principle suggests that e-learning should include both words and graphics to enhance learning. Words can be presented as printed text or spoken text, while graphics can be static illustrations or dynamic graphics like animation or video. By including both words and graphics in e-learning, learners are more likely to engage in active learning and mentally connect the material to existing knowledge, resulting in deeper learning and better understanding. This principle has been shown to be more influential for novices rather than experts. Experts seem to learn from text with visuals as well as they do from text alone (Clark & Mayer, 2016). Additionally, research has shown that what type of visual is most optimal to use depends on the goal of the content. Static visuals may be more effective in promoting conceptual and strategic understanding, while animated visuals may be better for teaching procedural tasks (Hoffler & Leutner, 2007; Lowe & Schnotz, 2015).

Clark and Mayer (2016) suggest that there are two types of engagement, i.e., behavioral engagement and psychological engagement. Behavioral engagement refers to the actions taken by a learner during a lesson, while psychological engagement involves relevant cognitive processing during learning. Psychological engagement is what leads to generative processing, and instructional designers should focus on methods that promote it, such as requesting learners to teach others through discussions and presenting relevant questions for learners to answer or problems to solve (Clark & Mayer, 2016). The goal of Multimedia Theory is to simplify cognitive processing throughout the learning process in a digital multimedia context (Clark & Mayer, 2016). To be successful in online learning environments, however, students also need to self-regulate their learning (Broadbent & Poon, 2015; Wong, Baars, Davis, Van Der Zee, Houben, & Paas, 2018).

2.4.2. Self-Regulated Learning Theory

With a basis in socio-cognitive theory, Barry Zimmerman developed his model for the Cyclical Phases of Self-regulated learning. Zimmerman's model is not the only model for self-regulated learning, but it is the one that is most widely used and cited (Panadero, 2017). The Cyclical Phases of the self-regulated learning model explain the interrelation of

metacognitive and motivational processes at the individual level. Zimmerman's model has three phases: forethought, performance, and self-reflection (Panadero, 2017).

In the forethought phase

In the initial stage, commonly referred to as the forethought phase, learners analyze the task, set goals, plan how to reach them, and activate learning strategies in relation to their level of motivation. The forethought phase has two key components, task analysis, which includes goal setting and strategic planning, and self-motivational beliefs, which consist of self-efficacy, outcome expectations, task interest, and goal orientation (Panadero, 2017). A case study example given by Cheng and Poon (2016) shows how Codecademy ignites students' intrinsic interest in a task by highlighting the benefits of learning. To foster self-efficacy, Codeacademy users can engage by offering short challenges of about 30 minutes in duration prior to committing to a longer course. These challenges allow users to personalize their learning paths while setting clear and attainable goals throughout the learning journey (Cheng & Poon, 2016).

The performance phase

Throughout the performance phase, learners execute the task, monitor their progress, and use self-control strategies to stay engaged and motivated (Panadero, 2017). In the performance phase, learners' self-observation and self-control of their goals, strategies, and motivation should be facilitated. Cheng and Poon give an example of how the color-changing feature of Duolingo's skill "tree" serves as a visual cue that reminds learners to monitor their self-efficacy by managing their strengths and weaknesses throughout the learning process. (Cheng & Poon, 2016)

The self-reflection phase

In the self-reflection phase, learners evaluate their performance, make attributions about their success or failure, and generate self-reactions that can affect future performances positively or negatively. The feedback obtained from this phase is then utilized in the subsequent SRL cycle. This phase comprises two primary components: self-judgment, which includes self-evaluation and causal attribution, and self-reaction, which involves self-satisfaction, and adaptive and defensive responses (Panadero, 2017). During the self-reflection phase, learners engage in self-evaluation and assess their satisfaction level while using feedback to reinforce or maintain their forethought beliefs. (Cheng & Poon, 2016).

2.5. Constructivist Theory

Although having their origins in Cognitive learning theory, both Multimedia theory and the Self-regulated learning theory incorporate elements of constructivist learning theory, such as the connection to prior knowledge and self-reflection. Constructivists argue that, instead of just absorbing facts, learning is an individual's process of constructing concepts of knowledge based on personal experiences and reflections (Peters, 2014; Squires, 1999). Therefore, knowledge is not an objective reality but rather an individual's interpretation and construction based on their perspectives, experiences, and prior knowledge. Constructivist learning theory speaks to this, with learning experiences that ask learners to describe things in their own terms and build off of existing knowledge. This means not only accumulating new knowledge but also restructuring existing concepts to understand new ones better (Peters, 2014).

According to Squires (1999), the challenge of designing effective learning environments with a constructivist approach is that the structure of the solution should not limit the freedom

necessary for learners to make decisions about their own learning. Constructivist learning environments should provide open-ended and authentic learning opportunities that allow learners to develop knowledge and an understanding that is personally meaningful and transferable. Designers should design for the fact that users may use technology in unexpected or unconventional ways. Designers should also create adaptable solutions that can accommodate users' unique contexts and learning environments (Squires, 1999). The transferability of knowledge is covered in subchapter 2.5.2. and adaptable solutions are covered in subchapter 2.5.1.

Squires (1999) further states that working in peer groups and having discussions can effectively aid users in their learning process (Squires, 1999). This is an area where constructivist theory is being applied effectively today by facilitating group discussion and knowledge-building through tools such as wikis, discussion forums, and chat rooms. These experiences are all based on constructivism, with the teacher's role being to support and guide learners in their self-directed learning experiences (Peters, 2014, Squires, 1999). The social aspect of constructivist learning will be covered in subchapter 2.5.3.

2.5.1. Scaffolding

One of the main names in constructivism is Lev Vygotsky (1978). He developed the concept of the zone of proximal development (ZPD). The ZPD is defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Vygotsky believed that providing appropriate assistance to a student in the ZPD for a task would give them the boost they need to achieve it (Vygotsky, 1978). Vygotsky's notion of the zone of proximal development has been closely connected to the concept of scaffolding. Scaffolding is a dynamic process that involves understanding how learners fail to accomplish a task and adapting subsequent instruction and teaching to support their learning. Computer-based scaffolding can be particularly useful because it provides individualized support without stigmatizing the student who needs help. Scaffolding refers to different methods for helping learners to tackle complex tasks that they are not able to complete without support. This can take many different forms, such as structured tasks, help systems, guided tours, or hints. One common form of scaffolding is to provide an overall structure of a complex task that guides students to individual components of the task at the appropriate moment. Scaffolding has two important roles in supporting learning. The first is to structure tasks for learners, making it easier for them to complete tasks. The second is to problematize learners' performance by explicitly questioning their learning, which can facilitate deeper reflection and greater learning. (Collins & Kapur, 2014)

Quintana et al. (2005) explain that the challenge of software-based scaffolding is that it needs to fade successively as the learner develops a deeper and deeper understanding. It is essential to identify the mechanisms by which software-based scaffolding fades and when it is appropriate for it to do so (Collins & Kapur, 2014; Quintana et al., 2005). Quintana et al. (2005) give a few examples of scaffolding features, i.e., an explicit planning workspace that students have to use before continuing with their work, an unordered task decomposition too, which assists students with breaking down complex tasks into smaller, more manageable parts and support for managing artifacts in ways that helped students focus on their work (Quintana et al. 2005). The authors further argue that the use of scaffolding in software can offer cognitive assistance to learners by immersing them in a more realistic practice setting,

displaying certain aspects of the authentic practice more clearly and explicitly (Quintana et al. 2005).

2.5.2. Experiential Learning & Knowledge Transfer

Quintana et al. (2005) point out that scaffolding in software can be used to create a realistic practice setting. This point connects to what Squires (1999) said about how designers should create adaptable solutions that can accommodate users' unique contexts and learning environments, and Peters (2012) points out that designers should facilitate knowledge transfer by placing the learner in a real-world context. The closer the learning experience is to the real world, the more likely learners will be able to transfer what they've learned (Peters, 2012). The notion that transferability and learning in a real-world context connect closely to the research area of experiential learning.

Building on the constructivist mindset, a set of learning theories and design models have been developed around the premise of learning by doing. Experiential learning is an approach to learning that emphasizes learning through hands-on experiences and reflecting on those experiences (Bates, 2019). There are various design models for experiential learning, including laboratory work, apprenticeship, problem-based learning, case-based learning, project-based learning, inquiry-based learning, and cooperative learning (Bates, 2019). All models for experiential learning involve learners reflecting on their experience and gaining practical expertise and conceptual insight (Bates, 2019). Out of the models listed, two were seen as applicable to the project.

Project-based learning

While emphasizing the need for guiding the student throughout the learning process, project-based learning still allows and requires learners to be autonomous and take responsibility for their learning. Learners are responsible for choosing sub-topics, organizing their work, and deciding on how to conduct their projects. The projects are based on real-world problems, providing students with a sense of ownership and responsibility in their learning. It is essential to ensure that the projects meet two criteria: students must find the work personally meaningful, and it must fulfill an educational purpose. The shortcomings of project-based learning are that it can be time-consuming and may require careful design and monitoring by the instructor to ensure that students stay focused on the key learning objectives. Thus, careful design and monitoring of the process are necessary, and the instructor should actively guide the students through the process (Bates, 2019).

Problem-based learning

Problem-based learning is a group-based approach where the learners are supposed to identify what they know and need to know and how and where to access new information to solve a problem. The openness of the method results in a challenge where assessment needs to be carefully designed to measure problem-solving skills as well as content coverage. Research by Strobel and van Barneveld (2009) has shown that problem-based learning is good for long-term material retention and replicable skills development. Both Problem- and Project-based learning require self-direction and motivation from the learner, and especially Problem-based learning requires the learner to have a certain level of prior knowledge (Bates, 2019).

2.5.3. Online Communities of Practice

Constructivism emphasizes how learning often takes place outside of the mind in collaboration with others. One of the main theories behind this branch of learning theory is the theory of situated learning and communities of practice (Peters, 2014). Situated learning, as described by Lave and Wenger (2005[1991]), is a theory that suggests learning occurs within specific contexts and environments. It involves participating in the social and cultural practices of a community of practice. Mastery of knowledge requires newcomers to move towards full participation in a Community of practice. Communities of practice are groups of people who share a common interest or profession and work collaboratively to enhance their knowledge and skills. These communities have three main components: a shared domain of interest, a shared practice, and a shared repertoire of resources. Members interact with one another to exchange ideas, best practices, and experiences related to their field or area of interest. They may also participate in joint problem-solving activities and work on projects together. Communities of practice can be found in various settings, such as workplaces, professional associations, online forums, and social networks (Lave & Wenger, 2005[1991]).

Knowledge building

Building on the social constructivism of situated learning and communities of practice, Scardamalia and Bereiter (2010) were the first to introduce the concept of knowledge-building in an educational context. Knowledge building shifts the focus away from individual learning and instead emphasizes the importance of collaboration and the creation of new ideas. This is particularly important in our current knowledge-based economy, as it is essential for the development of new tools and innovation (Scardamalia & Bereiter, 2010). Scardamalia and Bereiter (2010) have constructed 12 principles for knowledge sharing, four of which are deemed to be particularly applicable to this project:

The principle of **Community Knowledge** state that the purpose of knowledge building is to produce valuable knowledge for others (Scardamalia & Bereiter, 2010).

The principle of **Democratizing Knowledge** means that everyone is encouraged to take an active role in knowledge creation and innovation, regardless of their prior knowledge or experience (Scardamalia & Bereiter, 2010).

Symmetric Knowledge Advancement states that expertise is shared between and within communities, allowing all groups to benefit from the collective knowledge. Knowledge exchange occurs not just from the more knowledgeable to the less knowledgeable but also from the less knowledgeable to the more knowledgeable. (Scardamalia & Bereiter, 2010)

Concurrent, Embedded, and Transformative Assessment is an integral part of the knowledge-building process. It is used to identify any issues and ensure that the organization's work meets and exceeds the expectations of external assessors. Internal assessment is an ongoing process that is much more thorough and rigorous than external assessment, and it is used to ensure that the community is continuously striving for excellence. (Scardamalia & Bereiter, 2010)

2.6. Connectivism

Connectivism is a learning theory that emphasizes the value of access to knowledge over possession of knowledge. It acknowledges that knowledge is continuously changing and evolving, making it more important to know how to access needed knowledge than to possess

existing knowledge. Connectivism recognizes the shifts in society caused by the introduction of new technologies and tools for learning and how this has altered the way people work and learn (Siemens, 2004).

Connectivism is based on nine core principles. These include the notions that:

- Learning and knowledge rest in a diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in non-human appliances.
- The capacity to know more is more critical than what is currently known.
- Nurturing and maintaining connections are needed to facilitate continual learning.
- The ability to see connections between fields, ideas, and concepts is a core skill.
- Accurate, up-to-date knowledge is the intent of all connectivist learning activities.
- Decision-making is itself a learning process.
- Choosing what to learn and the meaning of incoming information can be seen through the lens of a shifting reality.

These principles offer insight into the way knowledge works in the digital age and the skills needed to navigate this new environment successfully. (Siemens, 2004)

For the theory of Connectivism to work, knowledge and information need to, in fact, be accessible (Siemens, 2004). In addition to being accessible, one could also assume that the information will have to be useful, usable, and understandable for the user. The need for these aspects of design to be taken into account when considering a Connectivist approach to learning is underlined by Siemens's (2004) inclusion of “Design of learning environments” in his implications chapter (Siemens, 2004).

2.7. User-Centered Design

Research has shown that these aspects, i.e., usefulness, usability, and understandability, are also important for user retention and satisfaction in e-learning solutions (Ejdys, 2021; Vlasenko, Lovianova, Volkov, Sitak, Chumak, Krasnoshchok, Bohdanova, and Semerikov, 2022). A study by Ejdys (2021) found that perceived usefulness plays a crucial role in shaping student attitudes toward e-learning and their satisfaction with the process. This highlights the importance of designing e-learning solutions that are useful and efficient. To ensure the successful implementation and acceptance of e-learning, investments in improving the quality and functionality (utility) of e-learning systems and promoting the benefits of e-learning are necessary (Ejdys, 2021). According to Vlasenko et al. (2022), the ease of use (usability) and understanding of the interface for online education is crucial in retaining users. If the interface is difficult to navigate, users will not spend a lot of time figuring out how to use it before leaving. Therefore, educational software should typically be designed to facilitate convenient learning (Vlasenko et al., 2022).

2.7.1. Usability & User Interface Design

Building on Vlasenkos et al. (2022) finding that the usability and understandability of the interface of an online education solution are crucial for it to retain its users, it is reasonable to consider best practices within interface design in this project. Steve Krug (2014) provides advice on best practices for how to design user-friendly websites that are easy to use and understand. His main message is that simplicity and usability are key components of a successful website and that one should prioritize usability over aesthetics. To ensure that

websites are usable, Krug (2014) emphasizes the importance of designing for scanning rather than reading. He also stresses the importance of self-evident design. A website's design should be so intuitive that users can figure out how to use it without having to read instructions or seek help. This is achieved by creating clear and simple navigation, using familiar and consistent design elements, and providing clear and concise labeling for links and buttons (Krug, 2014). This falls in line with what Norman (2004) calls conceptual design, where the conceptual image of how the product should be used is the same for the designer as for the user, without instruction. Norman, however, also stresses that it is acceptable that the use of a product or service is explained once and that the usage then is remembered (Norman, 2004). It is important to take note that these best practices concern websites and products rather than enterprise software specifically and that the added complexity might make true conceptual design more difficult to attain.

Nielsen's 10 Heuristics for interface design

Norman's views of effective design are expanded upon by his colleague Jacob Nielsen (2020) with his ten usability heuristics of user interface design. Nielsen's (2020) 1st heuristic concerns system status. Designers should make sure to provide timely and appropriate feedback to users to ensure that they are aware of the system's status, which builds trust in the product and helps the user make informed decisions. The 2nd heuristic explains how designers should use language, concepts, and conventions that are familiar to the user and create an intuitive experience by presenting information in a natural and logical order. According to the 3rd heuristic, the designer should provide the users with autonomy in the usage of the software by providing the option to exit and pause actions easily. In the 4th heuristic, Nielsen (2020) argues that the designer should seek to follow industry standards and maintain consistency. The 5th heuristic concerns error messages and argues that designers should seek to eliminate error-prone situations or incorporate confirmation options for users before they execute actions that could cause problems. According to the 6th heuristic, designers should reduce the user's cognitive load by keeping all necessary information, actions, and options clearly visible in the interface. In the 7th heuristic, Nielsen (2020) argues that designers should enable flexibility for users of different levels of knowledge and different ways of working by, for example, offering shortcuts for expert users that are not visible to novice users. The 8th heuristic states that designers should focus on the essentials and avoid including information that is rarely used. According to the 9th heuristic, designers should design error messages that make it easy for the user to understand what the problem is and how it can be resolved (Nielsen, 2020).

The 10th and final heuristic concerns help and documentation. Similar to Krug (2014 and Norman (2004), Nielsen argues that the best interfaces don't require help documentation. But in the cases where it is necessary, he argues that it should be done in a user-centric manner and be easy to navigate via a search function. The information provided should be concise and presented as a list of the steps needed. When possible, help and documentation should be provided in the context and at the moment when the user needs it (Nielsen, 2020). Building on the notion that enterprise software generally is more complex than consumer software and that effective training has been proposed as being impactful for its effectiveness, it is reasonable to look at the users of the solution also as learners (Raess, 2019; Wheatley, 2000).

2.7.2. The Difference Between UCD & LCD

Quintana, Shin, Norris, and Soloway (2005) argue for the importance of distinguishing between learner-centered design and user-centered design. The authors note that user-centered design, which assumes users have expertise in a given domain, is not sufficient for

learners who have an incomplete or naive understanding of the activities, tools, and practices in a given domain of study. Learners need tools that address their lack of expertise and help them develop their understanding of the given domain (Quintana et al. 2005).

Quintana et al. (2005) highlight the diversity of learners, who come from different backgrounds, have different learning styles and characteristics, as well as different levels of motivation. In contrast, User-centered design (UCD) assumes a homogenous group of users who share a given expertise or culture. Learner-centered design (LCD) must consider this diversity in background, motivation, development, gender, age, and learning styles (Quintana et al. 2005). Moreover, the authors point out that users are assumed to be deeply involved in their activities and typically have both intrinsic and extrinsic motivations for those activities. In contrast, learners are not always highly motivated to engage in new learning activities or to learn new content. Thus, Learner-Centered design must address ways to initially and continually motivate learners as they work through difficult new material (Quintana et al. 2005). Finally, the authors note that user-centered tools can be designed without considering how those tools may have to change in response to any growth in the users. In contrast, developing a growing understanding is the central goal for learners. Thus Learner-centered software will need to change with the learners, whose understanding will grow and change significantly while using the software, as described in subchapter 2.5.1. (Quintana et al. 2005).

2.8. Integration of the Theoretical Framework

Quintana et al. (2005) argue, in other words, that software designed for learners needs to keep in mind that learners have different levels of knowledge and that this knowledge is likely to grow as they learn more. They also argue that designers need to keep in mind that learners come from different backgrounds, have different goals, different ways of learning as well as different levels and sources of motivation for learning (Quintana et al., 2005). In this subchapter, the aim is to integrate the different theories brought up in the theoretical framework and explain how they fit together and make sense for the project from the perspective of the researcher.

2.8.1. Supporting Different Kinds of Learners

Learners come from different backgrounds, have different levels of knowledge and different goals for their learning (Quintana et al., 2005). The fact that different learners have different goals for their learning means that although desirable from the perspective of Wheatley (2000), reaching a deep conceptual understanding might not be achievable for all users of an e-learning solution. According to Clark and Mayer (2016), there are strategic goals and procedural goals, which can be interpreted as deep conceptual knowledge and more shallow procedural knowledge about, for example, how to use software. Clark and Mayer (2016) suggest that procedural goals can be reached by using step-by-step instructions or worked examples. Worked examples can be effective for procedural as well as strategic skills development but are, in general, more effective for novice learners (Ayres, 2015; Clark & Mayer, 2016; Leppink et al., 2012).

For more experienced, motivated, and self-directed learners, other methods might be more effective for developing deep, conceptual, and transferable knowledge. Clark and Mayer (2016) argue that strategic goals are reached through guided discovery. Guided discovery can be connected to the experiential learning methods of project-based and problem-based learning (Bates, 2019). Both methods center around structuring one's own work to complete a

task and require autonomy and motivation from the learner. Problem-based learning requires a higher level of prior knowledge, however, as the work is done with less support (Bates, 2019). It does, however, require that all the necessary information is easily accessible to the learner in line with Connectivism and Nielsen's 10th heuristic (Nielsen 2020; Siemens, 2004). In order to offer the right level and type of support to the individual, the solution designed will need to be able to determine the level of knowledge of different users. This thesis will not cover specific examples of how this can be done, but according to Collins and Kapur (2014), one of the main benefits of scaffolding in software is the potential for the support to gradually disappear as a learner gains more knowledge (Collins & Kapur, 2014)

No matter if a user is an expert or a novice, today's technology makes certain types of knowledge and memorization obsolete. Connectivism argues that knowledge in today's society is changing and evolving at such a pace that it is more important to know where to access information than to possess it. Learners should have the conceptual understanding to apply and combine information from different sources. This means that learning specific information is not important as long as that information is easily accessible to the user (Siemens, 2004). In addition to being accessible, one could also assume that the information will have to be useful, usable, and understandable for the user. Thus, requiring the designer of a solution for learning, instruction, and information retrieval to take best practices for user interface design, such as Nielsen's (2020) heuristics, into account.

2.8.2. Scaffolding Through the Process of Learning

Successful learning in e-learning requires learners to be self-directed in their learning, and a scaffolding feature done right has the potential to facilitate this trait. Scaffolding could also be beneficial for self-directed learning if it is designed to guide the learner through the self-directed learning process by, for example, helping the user to analyze the task and set goals, execute the task, and monitor their progress, as well as evaluate and reflect on their performance (Panadero, 2017). The steps for facilitating self-directed learning have many similarities with the two main jobs of scaffolding proposed by Collins and Kapur (2014). Scaffolding should, according to Collins and Kapur (2014), structure tasks for learners, making it easier for them to complete the tasks as well as problematize learners' performance by explicitly questioning their learning, to facilitate deeper reflection and greater learning. This process approach to scaffolding, where the learners are guided through the learning process, shares many similarities with the different types of cognitive processing introduced in Multimedia theory. Clark and Mayer (2016) suggest that learners should; reduce extraneous processing by, for example, minimizing distractions and providing step-by-step demonstrations; streamline essential processing by, for example, segmenting complex content into shorter pieces and introducing key concepts beforehand; and facilitate generative processing and a deeper understanding, by for example including both words and multimedia content and requesting learners to teach others through discussions and presenting relevant questions for learners to answer and problems to solve (Clark & Mayer, 2016). Although the suggestions from the three different theories differ in some respects, they all promote a learning process where the user is getting assistance with structuring or setting goals for their tasks as well as reflecting on them afterward.

2.8.3. Balancing Simplicity and Integrated Support

According to Nielsen's 10th heuristic, help and documentation should ideally be available when and where the user needs it, and Squires (1999), Peters (2012), and Wheatley (2000) all argue for learning to be conducted in a real-world or realistic context. This suggests that a

solution for learning should be integrated into to software itself or an environment identical to it. This notion has the potential to collide, however, with the best practices suggested by Clark and Mayer (2016), Sweller et al. (2019), Krug (2014), and Nielsen's 6th heuristic, which argues that simplicity is key to reducing cognitive load and making an interface more usable. This means that it is important to find ways to provide integrated information and learning features to those ones that need them without it intruding on the user experience of the ones that do not. This falls in line with Nielsen's (2020) 7th heuristic which argues that more experienced users should be provided with options for skipping or circumventing the supportive features.

2.8.4. Psychological Needs & Intrinsic Motivation

A successful scaffolding feature should adapt to the user's knowledge and keep the user in Vygotsky's (1978) zone of proximal development, which, according to Peters et al. (2018), also should facilitate their motivation by keeping them in a state of optimal challenge. As intrinsic motivation is key to learning, an e-learning solution should not only seek to facilitate feelings of competence through training and optimal challenge but also through the other two basic psychological needs for autonomy and relatedness (Peters, 2012; Ryan & Deci, 2017; Ryan & Deci, 2020). The facilitation of autonomy in an e-learning solution connects closely to Nielsen's (2020) 3rd, 7th, and 9th heuristics, which facilitate autonomy by giving the user control of the interface and by giving the user the information that they need to be self-sufficient. Autonomy can also be facilitated through the openness of the learning tasks themselves, such as project and problem-based learning. The level of autonomy should, however, be attuned to the user's level of expertise and motivation for the task. This assumption is based on the findings of how worked examples are more effective for novice learners and how support for goal setting is an important part of facilitating self-directed learning (Clark & Mayer, 2016; Panadero, 2017).

Relatedness and communities of practice

The last psychological need concerns relatedness, i.e., a sense of belonging and connection (Ryan & Deci, 2020). This need could potentially be facilitated either by increasing the connection between users within an organization or by facilitating collaboration and connection between users from different organizations. Whether it is within one or between several organizations establishing connections and collaborations between users has the potential to establish communities of practice. Although online communities of practice have the potential to develop individual knowledge through them learning from more knowledgeable members, online communities of practice also have the potential for collaborative knowledge building (Lave & Wenger, 2005[1991]; Scardamalia & Bereiter, 2010). Knowledge building puts the emphasis on collaboration towards new ideas and innovations (Scardamalia & Bereiter, 2010).

3. Methodology

This research was conducted in collaboration with a mid-sized organization planning to develop a learning platform for the enterprise software that they are selling to their customers. In addition to providing practical and theoretical findings to the research field, this study also acts as the first stage of a larger design and innovation process toward the development of the finalized solution. Due to this fact, the research will, in addition to adhering to traditional research methods, also adhere to the guidelines given by established practices in the literature on Human-Centred Design (HCD) (Baker & Moukhliss, 2020; IDEO, 2015). Designers and engineers often work in isolation and may not have a full understanding of how their products are being used in the real world. As a result, they may miss important details or make design decisions that do not reflect the true needs of their users. To create truly successful products, designers must take the time to gather feedback from users to better understand the true needs and goals of their target audience (Norman, 2004). This study will aim to understand administering (admin) user's needs through ten semi-structured qualitative interviews with users responsible for their organization's configuration of a Swedish enterprise software. *This chapter will cover the research design with its underlying philosophy, approach, and strategy, as well as cover how the research was conducted with regard to sampling, the interviews, and the analysis.*

3.1. Research Design

With the research question, *"What admin user needs are crucial to consider in the development of a solution for learning, instruction, and information retrieval in enterprise software?"* in mind. The main objective of the research is to explore and understand the needs of admin users of enterprise software by investigating the needs of users of one particular software. This study will therefore have an overall research design that could be characterized as an exploratory case study with an analytical foundation in grounded theory. This subchapter will explain and motivate the philosophy, approach, and strategy of this research project. (Saunders, Lewis & Thornhill, 2012)

3.1.1. Philosophical Assumptions

To understand the research design of this project, one must first understand the underlying philosophical assumptions. From an ontological perspective, i.e., one's understanding of reality, the project is based on the constructivist assumptions that social actors are continuously bringing about social phenomena and their meanings. This means that social phenomena are assumed to not just be made by people interacting but that they are also always changing. This viewpoint stands in opposition to the objectivist viewpoint that social phenomena are external realities that exist beyond our subjective interpretation of them. They have a fixed, objective existence that we cannot influence by our actions (Bell et al. 2019). The constructivist mindset falls in line with much of what is emphasized in user-centered design methodology, specifically, the focus on understanding the true needs and goals of the user (Norman, 2004). The epistemological perspective, i.e., the theory of knowledge, follows logically from ontology. Meaning that the ontological position of the project determines its epistemological position, which is how we can gain knowledge of that reality. Epistemology helps us understand how we should conduct research to generate knowledge that provides a sound basis for making claims about the subject at hand. This means that we in this project need to gain knowledge in a way that falls in line with a constructionist viewpoint, for example, by observing and interviewing social actors in an attempt to understand how they

shape and understand their environment (Bell et al. 2019). Another important question within the epistemological perspective is whether knowledge should be studied in the same way as the natural sciences or not. As this is a qualitative research project, it is reasonable that it adheres to an interpretive approach rather than a positivist. Interpretivism considers 'reality' as being constructed through the meanings that individuals assign to their experiences; in contrast, positivism emphasizes working with an observable social reality with a highly structured methodology that enables replication. Interpretive research is often referred to as naturalistic because researchers operate within a natural setting to establish trust, participation, access to meanings, and in-depth understanding. It requires researchers to make sense of the subjective and socially constructed meanings expressed by the research participants. (Saunders et al., 2012)

3.1.2. An Abductive, Problem-solving Research Approach

Being a study focused on problem-solving and exploration of human behavior and needs, an abductive research approach was chosen. Abduction involves starting with a surprise or problem, which can occur when researchers encounter empirical phenomena that an existing theory cannot easily explain. Abductive reasoning aims to identify the conditions that would make the phenomenon less puzzling or problematic, transforming surprising facts into a more understandable way forward (Mantere and Ketokivi 2013, as cited by Bell et al. 2019). This requires researchers to engage in a back-and-forth process with both the social world as an empirical source for theoretical ideas and the literature, known as dialectical shuttling. (Atkinson et al. 2003; Schwartz-Shea and Yanow 2012 as cited by Bell et al. 2019). The abductive approach has grown in popularity in business research and was partly picked for this project for its ability to address the limitations of traditional deductive and inductive research approaches (Bell et al. 2019). Deductive reasoning is an approach to research that employs a specialized research strategy to test a theoretical proposition (Saunders, Lewis & Thornhill, 2012). Deductive reasoning was dismissed as a possible research approach for this project due to the misalignment between its strict dependence on a rigorous process of testing and disproving hypotheses and the difficulty of picking a theoretical proposition for this project (Bell et al. 2019). Inductive reasoning is an approach to research that relies on empirical data to generate theoretical insights (Saunders et al., 2012). Inductive reasoning was dismissed because of the risk that using the approach would result in an inability to generate theories regardless of the amount of empirical data collected (Bell et al. 2019). Lastly, the chosen research approach falls in line with design thinking as abductive reasoning is a fundamental part of HCD methodology that helps the designer face complex and paradoxical situations that conventional problem-solving fails to address (Dorst, 2011).

3.1.3. A Qualitative Research Strategy

Building on the abductive research approach, this project is based on a qualitative research strategy. The alternative of conducting a quantitative research strategy is dismissed on the same basis as the deductive research approach. The openness of the project and research question lends it poorly to the causal and effect relationship necessary for reaching statistical significance with quantifiable data. The projects focus on human experiences and behavior connects more closely to qualitative data collection and analysis (Bell et al. 2019).

As this study has an exploratory component, qualitative research interviews are a natural inclusion in the research design. The decision to include qualitative interviews is further strengthened by the fact that the objective of the research necessitates that the researcher understands the underlying motives behind the decisions, attitudes, and opinions of research

participants in order to uncover the true needs of the users (Norman, 2004; Saunders et al., 2012). Additionally, qualitative interviews allow for follow-up probing questions which is particularly important in interpretive research, where understanding the meanings ascribed by participants to different phenomena is crucial. Probing involves asking interviewees to explain or expand on their responses. (Bell et al., 2019; Saunders et al., 2012). Semi-structured interviews were picked over unstructured interviews as a structure of preprepared questions is important for ensuring that all the necessary areas of interest are covered (Bell et al., 2019; IDEO, 2015).

A Case study

Being an explorative study aimed at understanding and uncovering needs in relation to a wide and ill-defined problem, it made sense to categorize and structure this study as a case study (Yin, 2009). Due to the fact that the study was done by interviewing ten individuals from ten different organizations, but which all use the same enterprise software, characterizing the study as either a single or a multi-case case study was not obvious. The study looks at different companies or cases to identify patterns and trends across cases and draw generalizable conclusions about what the users need, which is a characteristic of a multi-case case study (Yin, 2009). However, even if the research investigated different cases, they were still all connected to a single context, i.e., the particular enterprise software. The study is therefore deemed to most closely resemble an embedded, instrumental case study, meaning that it aims to use one case to comprehend a wider problem (Bell et al. 2019). The case study is seen as holistic rather than embedded due to the breadth of the study. The study looks at the need in response to learning, instruction, and knowledge retrieval in the context of their use of the software as a whole rather than investigating one particular aspect of need in response to the software (Yin, 2009). The decision to look more holistically at the case stems from a lack of prior research in the area, as well as an unwillingness to limit the scope of the study in line with what is proposed for the inspiration phase of a HCD process (IDEO, 2015).

3.2. Narrative Review

Following from being a project based on interpretivism, the theoretical framework formed from a review of literature that was done to generate an understanding rather than to determine what the research project can add to the area of research (Bell et al., 2019). Additionally, the abductive research approach of this project also meant that the literature review was not completed before the data collection began but was developed alongside it in a back-and-forth process known as dialectical shuttling. (Atkinson et al. 2003; Schwartz-Shea and Yanow 2012 as cited by Bell et al. 2019). This fluidity allowed the researcher to change their view of the area of research as a result of the analysis of collected data. Being a narrative review, the criteria for inclusion and exclusion was also less rigorous (Bell et al., 2019). The researcher aimed to include trustworthy and widely cited papers and books covering the most prominent theories of learning, instruction, and information retrieval, as well as how they relate to design and are applied in the digital space. Articles were discovered through a snowball approach using a site called connectedpapers.com and retrieved from publications with access agreements with the University of Gothenburg. Important to keep in mind is that much of the literature on this topic is based on educational content directed toward academic students rather than business professionals. Although underlining the need for studies such as this, it also means that some level of skepticism is necessary when applying the theories to a business setting.

3.3. Qualitative Sampling

This project used a generic purposive sampling approach where participants were picked based on their relevance to the research question. The goal was to ensure variety in the sample while keeping the scope of the research focused and the result reliable. The sampling was not done randomly, based on convenience, or with a snowball approach, but with a basis on a range of selection criteria (Bell et al., 2019). All participants needed to be employees at a company currently using the Alpha software. They also needed to be the main person responsible for administering the software in their organization. These users, or administrators, were picked with the underlying assumption that these kinds of users are the ones with the most advanced needs in the software as well as the best overview of their organizations' overall needs. Additionally, these individuals were also deemed to be the most likely person to be responsible for managing the development of the software from the customers' side, as described in Subchapter 2.1. Aside from the participants being the main person responsible for administering the software at their company, variety in the sample was reached by interviewing participants of different ages, genders, and educational backgrounds (Bell et al., 2019). The prioritization of organizations sampled was based on two main variables, i.e., the number of helpdesk requests over the past year and the perceived strength of the relationship with the company Alpha. Companies with frequent requests for assistance on complex activities were seen as prime interview targets as they were assumed to have more to say on the subject as well as prime subjects for a future solution. Companies with a strong relationship with the company were assumed to be more likely to be open for longer in-depth interviews as well as prototype testing in the larger projects later stages. The selection and prioritization criteria resulted in a list of thirteen prospective interviewees who were all the main or one of the main people responsible for the software at their respective organizations. The interviewees were all working at a company that had either a good and long history of working in the software or were known to have a lot of issues relating to learning, instruction, and information retrieval. The companies interviewed range from municipal infrastructure providers to industrial manufacturers and service providers. Ten out of thirteen prospective interviewees responded that they were open to participating in an interview, and all of the interviews were scheduled and executed within a timeframe of two weeks. Even if all interviewees were the admin users responsible for the software in their company, their official roles and responsibilities at the company ranged from Strategic Business Developers to Sustainability Managers and Archivists, see the full list in Appendix 1. Additional sampling sessions were not deemed to be necessary once the data collection was complete because the last interviews did not suggest any new emergent theory or new dimensions to the theories already identified, suggesting sample saturation. The sampling should be seen as generic rather than theoretical since no additional data collection was conducted to test the findings identified (Bell et al., 2019). The findings in most need of further testing will be presented in subchapter 5.3.

3.4. Semi-structured Interviews

In order to gather a solid base of knowledge of the problem and its context ahead of the primary data collection, short interviews or meetings were conducted with employees at the Alpha company, in line with what is suggested by IDEO (2015). The meetings were conducted in an unstructured format with the main goal of gaining background knowledge about the software, what customers commonly are struggling with as well as what support is currently offered. The findings from these meetings served as background for the interviews and are included to some extent in sub-chapter 1.4 and referenced as personal

communication. The main method for data collection in this project was, as mentioned, semi-structured qualitative interviews. The interviews were done over Teams due to benefits such as flexibility in terms of scheduling changes and geographical proximity, time and cost savings, convenience and safety (Deakin and Wakefield 2014; Hanna 2012; Weinmann et al. 2012 as cited by Bell et al., 2019). Video call-based interviews were selected despite associated risks such as technological and connectivity issues and a higher likelihood that scheduled online interviews are forgotten compared to face-to-face interviews. The researcher deemed the risks mentioned by Bell et al. (2019) to be minuscule in today's post-pandemic society, where professional individuals in a business setting can be assumed to be well-versed and used to communication and meetings over video call platforms such as Teams. Although research, as referenced by Bell et al. (2019), showed no notable decrease in rapport building for video call interviews in comparison to face-to-face interviews, there is still a possibility that the remoteness of the video call interview has some downsides from a human-centered design perspective. IDEO (2015) argues that interviews should be conducted, if feasible, in the individual's environment, in this case, the workplace. Speaking with someone in their personal space can, according to IDEO (2015), provide valuable insights into their mindset and behavior. Mitigating this potential loss of insight was not possible, but the researcher argues that the benefits in terms of the number of interviews that were enabled by doing them online outweigh the potential loss of insight. Additionally, to some extent, one can argue that the interviews were conducted in the interviewee's personal space as most interviewees were either at their work or at home. The semi-structured interview was picked over unstructured interviews to ensure that all the necessary topics were covered. Semi-structured interviews still allowed the interviewer to adjust according to how the interview proceeded, probing for necessary topics and letting the interviewer elaborate on unexpected topics (Bell et al., 2019). Semi-structured interviews with users also fall in line with design philosophy. According to Donald Norman (2004), engineers and designers are too close to a product's technical details and design difficulties to understand how other people live and perform their daily activities. This means that they cannot view it objectively in the same way as an unrelated person can (Norman, 2004). Semi-structured interviews are a critical part of the Inspiration phase in HCD, as they provide valuable insights into the people you are designing for (IDEO, 2015).

3.4.1. The Interview & the Interview Guide

The interview guide was constructed around five topics of interest based on the research question as suggested by Lofland and Lofland (1995, as cited by Bell et al., 2019). The basis of the research question and, subsequently, interview guide topics were initially formulated based on meetings with employees and managers at the software company. The research question and the interview topics and questions were later adjusted in response to the interviewee's responses. This approach to interpretive research allowed the researcher to follow the direction of the interviewees and adjust the interview questions accordingly. This was done since a standardized and fixed interview guide can hinder the discovery of new concepts, as suggested by Gioia, Corley, and Hamilton (2013). The initial topics can be summarized as; introductory questions, the initial learning process, the process of use, the process of information and instruction retrieval, and the aptitude for and process of developing the configuration of the software according to the company's needs. After the first two interviews, three more topics were added, namely, motivation, external knowledge sharing, and internal knowledge dissemination, Appendix 2. This was done in response to the interviewees showing an unexpectedly high level of knowledge,

Before the interview, the participants were provided with an overview of the interview guide in order to increase dependability, as proposed by Bell et al. (2019). All interviews were conducted within a 45–60-minute timeframe except interview 9, where an additional 20-minute interview had to be conducted two days later. To ensure compliance with GDPR regulations and that the interviewees felt secure to share an accurate representation of their situation, the researcher made sure to ask for permission to record the interview and make clear that the interviewee would not be referenced by name (Bell et al., 2019; *GDPR, 2022).* The interview included introductory questions to establish a background and a frame of reference as well as open-ended questions aimed to give extensive answers on the main areas of interest. In case the interviewee was not able to give an extensive answer initially, which was often the case, pre-prepared and circumstantial follow-up, and probing questions were asked to seek elaboration and direct answers (Gioia et al., 2013; Kvale, 1996, as cited in Bell et al., 2019). Overall, the interviewee took great care to construct the interview guide around the research question, formulate optional follow-up and probing questions into anticipated related issues, and take great care not to ask any leading questions, as suggested by Gioia et al. (2013). The interviewer took care to record the interviews and had Microsoft Teams transcribe exactly what the interviewee said rather than what it was interpreted to mean in order to make sure that the data was accurate and free from bias (IDEO, 2015). Additionally, the interviewer was careful to observe and take note of the interviewee's body language and tone of voice in order to gain as many contextual insights as is possible in an online interview. Notes of interpretations of the tone of voice, context, and body language were written down during and after the interview in order to ensure that they were incorporated into the overall analysis (IDEO, 2015).

3.5. A Grounded Theory Analysis

Since the aim of this project is to explore the needs of admin users and establish a theory for what they need, the analysis was done using the early stages of a grounded theory analysis process introduced by Gioia et al. (2013). The process includes a first-order analysis and a second-order analysis, see Appendix 3 (Gioia et al., 2013). To simplify the first-order analysis, it was done in six phases where each topic of the interview guide was analyzed separately, with the introductory information and overarching impressions of the interview serving as context throughout all six topics of analysis, see the interview guide in Appendix 2. The first-order analysis was done using a process where interview statements were identified without combining or rephrasing the wording of the interviewees. Once this was done, the many statements were categorized based on similarities in order to eventually be distilled into fewer first-order concepts that encompass several interviewee statements. Since nine out of ten interviews were done in Swedish, the initial identification of categories was made using the original statements to ensure reliability, but the first-order concepts were formulated in English to ensure that the structure of the analysis could be followed by anyone reading the thesis, see Appendix 3. Once the first-order concepts were formulated, the researcher looked for similarities and tried to identify if there was an underlying structure. The analysis resulted in fewer second-order themes, later referred to as findings, which in this project primarily constituted identified and interpreted needs of the different interviewees.

In line with HCD, the findings are not solely based on what the interviewees say that they need but also based on an analysis of what their expressed preferences and needs might mean. The goal was to uncover the interviewee's underlying needs, since just asking interviewees what they need most often does not lead to important insights (Brown & Katz, 2009). At this point, the researcher took a step back and looked for connections between findings, practicing

what Gioia et al. (2013) call a “gestalt analysis”. This analysis was done in the light of the theoretical framework to a degree, but the researcher took great care to avoid confirmation bias by maintaining semi-ignorance of the literature. Meaning that the researcher was aware of relevant literature but not letting it influence the interpretation of the data too much (Gioia et al., 2013). Taking a step back led the researcher to structure the analysis into new, more distinct areas or aggregate dimensions, i.e., Company and Interviewee Characteristics, Learning, and Instruction, Information Retrieval, and Needs for Knowledge Dissemination, rather than strictly adhering to interview topics, see Appendix 3. At this point, the process diverged from what was proposed by Gioia et al. (2013) due to time restraints. If more time had been available, the researcher should have conducted more interviews to dig deeper into the different needs and investigate their nature further (Bell et al., 2019; Gioia et al., 2013). The findings of this project are presented in the form of insight statements. This was done in order to present the findings in a clear way as well as to simplify the use of them in the later stages of the larger development process of which this project is a part (IDEO, 2015).

3.6. Research Quality

The research quality of this project was viewed through the lens of Lincoln and Guba's (1985 as cited by Bell et al., 2019) definition of trustworthiness in qualitative research. Trustworthiness includes four criteria, i.e., credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985, as cited by Bell et al., 2019). To ensure the credibility of the findings in this project, the researcher adhered to best practices of established research methods such as qualitative interviews and grounded theory thematic analysis (Bell et al., 2019; Gioia et al., 2013). Furthermore, the rigorous process of data collection and analysis was outlined in this methodology. To further strengthen the credibility of the findings of this study, the researcher had the habit of asking interpreting questions, i.e., questions that ensure that the interviewer's interpretation was correct (Kvale, 1996, as cited in Bell et al., 2019). As this is a qualitative study that examines a small sample of users in a unique context, general transferability is not the priority. The researcher did, however, make sure to provide readers of the study with a comprehensive description of the context of the case study and the data collected. The aim of this was to give readers the content necessary for themselves to judge if the findings are applicable to their circumstances or not (Bell et al., 2019).

Lincoln and Guba (1985, as cited by Bell et al., 2019) suggest that peers should serve as auditors to ensure dependability and that the research procedures have been conducted in a proper manner. This was not done in this project as a consequence of time restraints. This was also an area where this project differed from the one practiced by Gioia et al. (2013) in their approach to grounded theory analysis. They reduced subjectivity in the analysis by having more than one researcher analyze and interpret the data. Where Gioia et al., 2013 were able to reach a consensual interpretation through dialogue, the findings of this project are based on just one researcher's interpretation, which might put the dependability of the findings into question (Gioia et al., 2013). The researcher sought confirmability by striving to be as unbiased as possible while recognizing that complete objectivity is unattainable in business research. The researcher made an effort not to let personal values or theoretical beliefs influence the analysis by, for example, maintaining a semi-ignorance of the literature while conducting the analysis (Bell et al., 2019; Gioia et al., 2013). Furthermore, the researcher also paid attention to inclinations in the interviewee's voices in order to detect nuances that might suggest biases, such as impression management, where the interviewee answers what they think will reflect most positively on them rather than answering truthfully (Giacalone & Rosenfeld, 1989).

4. Findings & Analysis

This chapter will present and analyze the results of the ten qualitative interviews. The findings are presented in themes formed through the process of the formation of the interview guide, the interviews themselves, and the analysis. Each larger theme has subheadings detailing the findings or needs identified in each. The larger themes of findings that will be covered and analyzed in this chapter include Company & Interviewee Characteristics, Learning & Instruction, Information Retrieval, and Needs for Knowledge Dissemination. Each need identified is presented in the form of an insight statement, as this is an effective way of achieving clarity and giving direction to the later stages of the larger development project of which this study is a part (IDEO, 2015).

4.1. Company & Interviewee Characteristics

The result for this theme is derived mostly from the introductory questions, the question regarding the user process, and the overall perception of the interviewee's knowledge. The ten interviews conducted resulted in an understanding that the knowledge level of the person with the utmost responsibility for the administration and configuration of the software differs for the different organizations. This knowledge level is often also correlated with the amount of time that the individual has dedicated to working with the development of the software as opposed to working in the software, which subsequently correlates with whether administering the software is their main responsibility or not. The roles of the interviewees range from Strategic Business Developers, which main responsibility is to administer and improve the software the organization uses, to Sustainability Managers and Archivists, which main responsibility and expertise concern the management system itself rather than the software it runs on, see Appendix 1. For simplicity, the interviewees were divided into three groups based on their level of knowledge of the software and the time dedicated to working on developing and improving their configuration of the software. The groups are:

- High-knowledge individuals who have time and motivation to work with their configuration of the software.
- Individuals that show motivation to learn, but for different reasons, do not have the time to gain the level of knowledge necessary for making more complex changes in the software.
- Low-knowledge individuals that are interpreted to lack the interest and the time to learn all the complexities of the software.

Important to note is that low knowledge does not mean that they are unable to perform basic tasks in the software; it means that they are not comfortable with making more complex configurations. It is also important to note that the knowledge level of the individuals is based on a subjective interpretation done after all the interviews were done.

High knowledge, high time	Emergent knowledge, low time	Low knowledge, Low time
Interviewee 1 Interviewee 2 Interviewee 3 Interviewee 6	Interviewee 4 Interviewee 8 Interviewee 10	Interviewee 5 Interviewee 7 Interviewee 9

Table 1 shows the different interviewees categorized according to their level of knowledge and time dedicated to working with their enterprise software.

4.1.1. Loss of Knowledge & Expertise.

During the interviews, it became clear that a major problem facing the companies using the software is loss of competence as a consequence of one or more knowledgeable admin users changing jobs. Interviewees 9 and 10 both talked about how the person that was mainly responsible for configuring the software quit three years ago and how the pace of development has stalled since then.

> *"There was a person responsible for configuring the software who made changes to the configuration in response to requests from the people responsible for each workflow. Since this person quit three years ago, changes have been less focused since I have had to do them haphazardly."* (Interviewee 9, personal communication, March 28, 2023)

Interviewees 5 and 7 also mention that they have lost one or more people with knowledge of the software.

Analysis

Losing the person with the knowledge to configure the software decreases the organization's ability to make changes to their software as their needs and the market change (Rettig, 2007). Best case, the company would be able to hire someone who is able to spend a large amount of time with the software and learn to configure it. In the case of interviews 5, 7, 9, and 10, the responsibility instead fell on someone who had a limited amount of time available for developing the software due to their main commitments lying elsewhere, e.g., sustainability management, archiving, and quality monitoring. Additionally, it is likely that the responsibility lands on someone who lacks the interest as well as the academic and professional experience to configure the software, as seems to be the case for interviewees 5, 7, and 9. Knowing that enterprise software is complex and requires a deep conceptual understanding of the software and the business to reach its full potential, all companies should ideally have a highly trained employee able to configure it (Raess, 2019; Wheatley, 2000). The research shows, however, that the reality is different. The level of knowledge of the person responsible for administering the software differs, and some organizations only have individuals with limited amounts of time and levels of motivation for learning and making advanced changes. Knowing this means that a solution for learning, instruction, and information retrieval needs to take different admin users into account:

- The admin users that already know a lot but want to gain a deeper strategic conceptual understanding in order to develop their configuration of the software further.
- The admin users that want to learn conceptual, strategic knowledge to use all of the complexities of the software but currently have low levels of knowledge and a limited amount of time.
- The admin users that lack time and motivation to learn all of the complexities of the software and make the necessary changes.

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Admin users need a solution which is able to identify and adapt to their different levels of knowledge as well as their time and motivation available for learning.***

4.2. Learning & Instruction

This subchapter covers the problems and preferences that the interviewees expressed when asked questions about their ability to and what hinders them from making changes to and developing their configuration of the software. It also includes the problems which were uncovered when asked about the initial learning process. In addition to presenting the identified preferences and problems, the subchapter also covers the interpretation and analysis of what needs might be the basis of these problems and preferences and presents those as insight statements (IDEO, 2015). Suggestions given are analyzed as something that suggests what their needs are rather than a solution valid on its own in line with what is proposed by Brown and Katz (2009)

4.2.1. Self-Directed Learning & Transferability

All interviewees were asked one or more questions about their initial learning. Most interviewees did detail how their initial learning was conducted as well as how they perceived it, except interviewees 5, 6, and 9, which gave less precise answers either due to not remembering or focusing on other problems with the implementation phase. Most interviewees received physical training days, which were generally perceived as good but inadequate for being the sole source for learning how to use the software. All interviewees, regardless of how their initial learning process was, saw that they needed to teach themselves to use the software by testing things on their own or deconstructing what was built by the implementation consultants from the software company.

"You have to practice more on how to do things in the software in order to feel secure. That was clear when they came back (after a one-day course). I had to sit down with them and show them where things were … our configuration is pretty complex, so I had to make sure that they didn't make any big mistakes."

Interviewee 10 (personal communication, March 30, 2023) stated when talking about two individuals at his company who recently underwent initial training in using the workflow feature in the software. Interesting to note is also that the interviewees that were perceived to have the highest degree of knowledge in the software, interviewees 1, 2, and 3, are also the ones who most clearly state that they are or have actively sought to learn more about the software on their own.

"*With the training that we got and by looking at the document types and workflows that the software company had built, we were able to deconstruct and reconstruct. The software is a logical tool, so by looking at them, you can figure out how the pieces fit together.*"
(Interviewee 3, personal communication, March 23, 2023)

Analysis

These accounts suggest that self-directed learning is an important success factor in the current practice of reaching a high degree of knowledge in how to use and making changes in the Alpha software. A future solution that aims to enable deep knowledge and the ability to make changes to the software should therefore incorporate elements and strategies that facilitate self-directed learning. Features that facilitate planning and goal setting in the forethought phase, self-direction and motivation in the performance phase, and self-evaluation and reflection in the self-reflection phase (Panadero, 2017).

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Admin users need a solution that facilitates their self-directed learning throughout the learning process.***

Transferability of learning

Three interviewees explain what they think could have been done differently with respect to the initial learning. Interviewees 7 and 8 stated that the training days were good but that they forgot much of the content before they were actually able to apply it to their implementation of the software. Suggesting that the training should either be done later or that an additional training session should be conducted when the software is implemented and adjusted to the company's needs.

> *"I think you should either have another training session or one of the two initial training sessions at a slightly later stage. It should really have been held when the set-up was completed with us."* (Interviewee 7, personal communication, March 27, 2023)

Similarly, interviewee 10 states that he would have liked to see that the training was done in their configuration of the software instead of in a general test environment.

Analysis

All three of these accounts as well as the finding that self-directed learning is an important success factor in the current practice of learning the software, suggest that a solution that is developed to facilitate learning should do so in a way that facilitates transferability and application of knowledge to the user's personal context and their organizations' configuration of the software. This aligns with Squires (1999), Peters (2012), and Wheatley (2000), whom all argue for learning to be conducted in a real-world or realistic context.

One way of doing this is through a solution where the learner is guided through a process similar to the one described in project-based learning. The learner is asked to organize their work and decide on how to conduct a project which is meaningful to them and fulfills an educational purpose (Bates, 2019). The guidance could be automated with a scaffolding feature that helps learners structure tasks, makes completing tasks easier, and facilitates reflection by questioning their learning (Collins & Kapur, 2014).

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Admin users need a solution*** **which guides and supports them through a development project which is meaningful to them, is situated in a real-world context, and fulfills an educational purpose.**

4.2.2. A Conceptual Understanding

The interviewer was unable to derive any usable insights regarding obstacles to making complex changes in the software from interviewees 1 and 2 due to the interviewees' high level of knowledge and the interviewer's inability to ask probing questions that opened the interviewee's minds. Probing questions such as "What did you struggle with before you learned the software?" or "What do you think someone that was supposed to take over your job would struggle with?", see Appendix 2. The addition of these probing questions after

interview 2 made it possible to derive important insights from later high-knowledge interviewees, i.e., interviewees 3 and 6.

Interviewee 6 had been working in the software since 2010, both for her past and present employer. At her present employer, however, she has not been working with the workflow module, meaning that she had not been working with that aspect of the software since 2018. Because of this, she was able to talk about what she believes the obstacles are for creating workflows and making changes in existing ones. She states that building a workflow is, in her experience, a very complex process and that it is difficult to do without some kind of support. She stresses that first, one needs a general understanding of what a workflow looks like and how it can be structured, this is needed to stimulate creativity; and secondly, one needs help with a needs analysis.

> *"With an understanding of the needs, it becomes easier to see how you could shape the workflow. If you do not know what the* software *can help you with in relation to your needs, it will be difficult."* (Interviewee 6, personal communication, March 27, 2023)

She suggests that someone from the software company is necessary to provide support in these two perspectives and bridge the gap between them. Lastly, she states that a solution that aims to give admin users the knowledge necessary for making changes to the software not only needs to give them the technical knowledge for configuring the software but also the conceptual business knowledge and tools for understanding their organization.

> *"Once you've made a workflow together, I think you can handle many things yourself, making changes and maybe even building workflows yourself."* (Interviewee 6, personal communication, March 27, 2023)

This statement aligns well with what was said by interviewee 8, which was by the interviewer perceived to be someone who wants to learn but has, due to time restraints and organizational issues, not been able to. When asked if she felt like she had the knowledge necessary to create workflows and start using the workflow module, she said that *"One of the main obstacles is that I am having problems understanding the needs of the organization and the workers."* (Interviewee 8, personal communication, March 28, 2023). She goes on to say that she understands some aspects of the software but that she would most likely need help from someone at the software company in order to create workflows that *"take them all the way"* (Interviewee 8, personal communication, March 28, 2023). Interpreting this suggests that a solution developed to facilitate the formation of knowledge necessary for making changes to the software not only needs to give them the technical knowledge for configuring the software but also the conceptual business knowledge specific to their industry and tools for understanding their organization and its needs.

Interviewee 3 states that for him," The *challenge is not to figure out how to do something; the challenge is to figure out how to do it in a way that makes it easy to use and understandable for the end user"* (Interviewee 3, personal communication, March 23, 2023). This quote emphasizes the complexity of the work of the admin users, who, in many ways, need to be the designers of their own configurations of the software.

Analysis

Adding Interviewee 3's statement to the statements of Interviewees 6 and 8 suggests that a solution that aims to give admin users the knowledge necessary for making changes to the software not only needs to give them the technical knowledge for configuring the software. But also conceptual business knowledge and design know-how specific to their industry and tools for understanding their organization and its user's needs. This is an example of more knowledgeable users expressing the need for strategic knowledge as opposed to procedural, technical skills (Clark & Mayer, 2016). Fostering this deeper conceptual business knowledge was proposed by Wheatley (2000) to be the key for an organization to see successful results from their enterprise software. Strategic knowledge or a deep conceptual understanding could be reached by guided discovery, where learners are engaged both behaviorally and psychologically by asking them to perform tasks while receiving guidance (Clark & Mayer, 2016). The level of guidance should be given in relation to the user's level of knowledge (Collins & Kapur, 2014). And in the case of the more knowledgeable users, such as interviewees 3 and 6, strategic conceptual understanding could be fostered by using a Problem-based approach to experiential learning (Bates, 2019). In this approach, the user would be tasked with identifying what they know, what they need to know, and how and where to access the new information to solve a problem that they have in their configuration of the software (Bates, 2019). This approach would require the learner to be self-directed and motivated in their learning and have a solid knowledge base on the subject beforehand (Bates, 2019). It would also require tools and features that enable the necessary information to be easily accessed by the users, in line with what is proposed by Connectivism and Nielsen's (2020) 10th heuristic (Siemens, 2004).

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Admin users need a solution where their conceptual understanding of design and business knowledge is developed and supported through a problem-based learning process where they are responsible for accessing the information necessary to solve a problem.***
>
> ***Admin users also need this information to be accessible to them in a user-centered and accessible way.***

4.2.3. Feedback & Evaluation

Interviewee 4 believes that once he has time to make changes and develop the configuration of the software, he will do so on his own first but will still need the support team to ensure that the concept, idea, and planned execution is a good one, both in the short and the long term. This need is also mirrored in interview 5, where the interviewee explains that it is not enough to know how something is done; she also needs to know what the consequences or results will be based on what is being built.

This uncertainty is amplified when working with accesses and roles, as highlighted in interviews 9 and 10. Both interviewees see the creation of workflows as too complex to create comfortably without support. Both interviewees bring up the complexity and the high stakes of accesses and roles, stating that "it is difficult to know what the effects will be of the changes made" (Interviewee 9, personal communication, March 28, 2023) and that "there is a

lot at stake in case something goes wrong" (Interviewee 10, personal communication, March 30, 2023), respectively.

Analysis

This uncertainty highlights that the obstacle is not always on how to start but rather an uncertainty about how good one's initial idea is and what the results of it will be. This uncertainty is amplified when there is a lot at stake, such as with regard to the management of access to confidential information. The uncertainty stemming from the high risk of something going wrong mirrors what Rettig (2007) said about how the complexity of enterprise software often leads to barriers to change through the high risks associated with making changes to the configuration. It also connects to Nielsen's 1st, 5th, and 9th heuristics, which argues that an interface should; give users appropriate feedback to ensure that they are aware of the system's status, seek to eliminate error-prone situations or incorporate confirmation options for users before they execute actions that could cause problems; and design error messages that make it easy for the user to understand what the problem is and how it can be resolved.

As opposed to needing support along the way, as many of the theories in the theoretical framework cover, these statements suggest a need for certainty that what is done is done right and that it does not negatively impact what was already in place. Although this does not have an obvious solution with a basis in the theoretical framework, it is likely that an increased conceptual understanding, as well as a procedural, technical understanding, will improve confidence and certainty that what is done is done correctly. The alternative would be a feature that evaluates and predicts outcomes and suggests improvements based on actions proposed or attempted by the user. Such a feature would most likely need to be built on emergent AI-assisted technology, such as a more advanced version of Duolingo's (2023) "Explain My Answer" feature. Due to time restraints and its novelty, the application of AI technology to this case will not be covered in detail. It is, however, likely that AI technology will need to play an important role in many of the features of a future solution for learning and instruction.

When asked about the value of a feature that could evaluate prototypes and ideas, interviewee 10 jokingly replies*, "Yeah, like an AI robot that approves that things are done in the right way."* (Interviewee 10, personal communication, March 30, 2023)

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Admin users need a solution which evaluates, predicts outcomes, and suggests improvements for propositions of and attempts on complicated software configurations.***

4.2.4. Best Practices & Clear Guides

Some interviewees, i.e., interviewees 5, 7, and 9, were clear about the fact that they did not have the time or the technical expertise to do the more complex configurations of the software. When Interviewee 5 was asked what she believes inhibits her from developing and improving the configuration of the software on her own, she explained that she had been shown two different ways of doing something by the support team. The particular example brought up concerns about different methods for building workflows. She says that she would need clear instructions on how something is done in order to be able to learn it.

"My experience is that they (the consultants) have different ways of building (workflows). The possibilities are endless; you can get the same result by building it in a number of different ways … this makes it difficult for me as a hobby user to think that "That is something that I can do." I would like to see more clarity in "This is how you do it" and "This is the result that you get." (Interviewee 5, personal communication, March 23, 2023),

This example is similar to the one brought up by interview 7, who states that consultants seem to be uncertain about which is the best course of action when it comes to methods for choosing and restricting access to documents for different users and different organizations in the group. Interviewee 7 also brings up that the step for creating a workflow is not ordered in a clear way in the user manual. According to interviewee 7, the user manual describes what the different elements of the workflow are but not in which order they should be conducted. Additionally, the interviewee argues that the steps are not done in the order that one would naturally assume. She says that she naturally would go from the bigger, more overarching characteristics of the workflow and then add the smaller characteristics. Instead, the software is designed in a way where the smaller aspects need to be defined first, which further strengthens the need for outlining the appropriate process.

In a similar way, interviewee 9 mentions that one of his biggest obstacles is not knowing what is user-centered and not knowing how things should be built. He would like to see more elements of the software autogenerated. This suggests a need for less knowledgeable users who may or may not have the time or ambition to gain a complex understanding to be still able to create user-friendly workflows and process types in the software. Although slightly separate from the area of learning and instruction, providing users with templates for how something can be built can also serve as a worked example that can be deconstructed and learned from.

Analysis

This suggests that users who have, for any reason, e.g., time and/or motivation, not acquired the deep conceptual knowledge necessary for making changes and developing the software, need best practices and clear step-by-step instructions to get started on their learning journey. Whether they have the time and intention to develop a deep degree of knowledge or not. This falls in line with what Clark and Mayer (2016) say about how procedural goals, such as how to use software, are achieved through directive lessons, such as step-by-step guidance for learners. It also connects to the author's principle for Worked examples, which emphasizes that learners with little prior knowledge learn well by getting step-by-step demonstrations on how to perform a task or solve a problem (Ayres, 2015; Leppink et al., 2012). It also aligns with Nielsen's 10th heuristic, which states that help and documentation should be provided when and where it is needed, as well as list all the steps necessary.

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Low-knowledge admin users need accessible, easy-to-use worked examples for how to perform more advanced activities in the software.***

4.2.5. Facilitating Intrinsic Motivation

Many of the methods for deeper learning required to make more complex changes to a software configuration require the learner to be motivated and self-directed in their learning. In order to gain insights into how a solution could be designed to facilitate motivation, interviewees were asked what motivates them or what they would need to be motivated to learn more and take responsibility for developing and making changes to the software configuration. Six out of the ten interviewees, i.e., 1, 3, 4, 6, 7, 8, mention that they are motivated or would be motivated by seeing the results of the work that they do, seeing that their work helps the end-user. In the light of Self-Determination Theory, this could be seen as an example of intrinsic motivation by both increasing their feelings of competence and helping them feel relatedness to others in their organization (Ryan & Deci, 2000). Four interviewees, i.e., 2, 3, 4, and 10, mention that they are motivated by the challenge of figuring out how something works and/or building something new. This can also be seen as a source of intrinsic motivation in that optimal challenges are associated with increased feelings of competence according to Self-Determination Theory (Peters et al., 2018; Ryan & Deci, 2000).

Analysis

Peters et al. (2018) argue that the basic psychological needs for autonomy, competence, and relatedness need to be taken into account when designing digital experiences. If they are, they argue that it can lead to increased engagement and motivation, better learning outcomes as well as individual and societal well-being (Peters et al., 2018). Even if the facilitation of these basic needs is likely to be beneficial for users in general, no such conclusions can be drawn from this study. This study can only suggest that users would benefit from a solution that makes the already identified motivators of seeing the impact of one's work and being challenged more pronounced. Feelings of relatedness could be facilitated by making it easier for admin users to see the results of their actions and changes, with a focus on how it impacts end users. Additionally, a scaffolding feature could be implemented to facilitate feelings of competence by keeping the admin users in a zone of optimal challenge (Collins & Kapur, 2014; Peters et al., 2018; Vygotsky, 1978).

Insight statement

From these two identified sources of intrinsic motivation, one can construct two tentative insight statements of needs to work on:

> ***Admin users need a solution which facilitates their intrinsic motivation by making the results of actions taken or planned in the software more visible, as well as how these impact the end user.***
>
> ***Admin users need a solution which facilitates their intrinsic motivation by keeping them in a zone of optimal challenge when building or changing something in their software configuration.***

4.2.6. Online Collaboration & Communities of Practice.

After conducting the first two interviews, the researcher started adding probing questions about the interviewee's practice and needs for knowledge sharing. This came as a consequence of the first two interviewees showing a high degree of depth in their knowledge in combination with being the only one in their organization with that level of knowledge. Additionally, Interviewee 2 mentioned that a user forum could be good as he likes to be

inspired by other users to widen his understanding of what is possible to do with the software. The assumption was that someone with that level of knowledge would benefit from the opportunity to exchange their ideas and methods with individuals within the same area of interest, in line with what is proposed in the theories of Knowledge building and the theory of Situated Learning (Lave & Wenger, 2005[1991]; Scardamalia & Bereiter, 2010).

Interviewees 3-10 were asked to what extent they have exchanged knowledge with another company about the use of the software, whether that is something that they value, and what they think can be done to make those exchanges of knowledge more frequent. All interviewees said that they think that knowledge exchange would be valuable when asked, although with varying degrees of enthusiasm. None of the interviewees has had more than one occasion of knowledge exchange with another company about the software aside from the yearly user conference. The majority of interviewees mention the user conference as a valuable occasion for getting inspired by other users. This suggests that the interviewees value this type of knowledge exchange. Although most interviewees only mention good things about the user conference, Interviewee 3 emphasizes that the level of complexity at the user conference is low and that he would like more detail in the presentations. This can be interpreted as a need for knowledge-seeking administrators to be able to share knowledge with one another. Interviewee 4, who works in the health and wellness care industry, sees a need for knowledge exchange with actors in similar fields as his. This is interpreted as a need for industry-specific knowledge exchange.

Analysis

The research suggests that knowledge exchange is currently low between companies that use the software as well as that it is something that users would value. Certain statements also suggest a need for smaller groups of individuals who might have more in common, such as a common industry or their level of motivation for gaining knowledge. This falls in line with Lave and Wenger's (2005[1991]) three components that a community of practice needs to have, i.e., a shared domain of interest, a shared practice, and a shared repertoire of resources. Looking at the characterization, which was done in subchapter 4.1. one can argue that individuals that lack the motivation and time to learn do not share the same domain of interest as more motivated and knowledge-seeking individuals, such as interviewee 3. One could also argue that because of the wide variety of customization that enterprise software often entails. And how the usage of the Alpha software differs between organizations in different industries, users working in different ways, and industries might not be considered to have a shared practice or repertoire of resources. This does not necessarily mean that the current community that exists for all admin users should not. But it does imply that smaller and more segmented groups have a better chance of experiencing the advantages that come with communities of practice and knowledge building (Lave & Wenger, 2005[1991]; Scardamalia & Bereiter, 2010).

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Admin users need access to smaller communities which are segmented to fit their industry, their way of working with the software, and the user's level of motivation for learning.***

4.3. Information Retrieval

In order to uncover the interviewee's needs and preferences for information retrieval, the interviewees were asked questions about how they figure out how to do something that they do not know how to do, both with regard to the software in question and, in other instances, Appendix 2. The interviewees were also asked if they had any suggestions for how the company could improve when it comes to learning, instruction, and information retrieval in the software. All of these questions were asked in order to figure out what the needs of the users are rather than to get actual ideas of what should be done. As emphasized by Brown and Katz (2009), asking interviewees what they need most often does not lead to important insights, so the suggestions are analyzed as something that suggests what their needs are rather than suggestions in themselves (Brown & Katz, 2009).

4.3.1. Goal-specific Multimedia Content

In terms of how they figure out how to do things in the software, the main distinction is whether the user uses the manual or not. Eight out of ten interviewees report roughly the same process; they start by testing what needs to be done in the test environment in the software, then they check the user manual, and only in rare cases do they contact the support team. When the support team is contacted, it often concerns something complex that they are either not comfortable doing on their own or not able to do on their own or something which is not yet possible to do in the software. The extent to which users are actually able to figure out how to do something by trying it out in the software and to what extent they are successfully using the manual is expected to differ by their level of knowledge as well as be subject to a certain level of impression management bias (Giacalone, Rosenfeld, 1989).

This process is confirmed to be broken by two interviewees, i.e., interviewees 4 and 9. Interviewee 9 reports that he rarely looks at the manual, and Interviewee 4 reports that he rarely looks at the manual but that he has been doing it more and more as he has gotten more and more comfortable with using the software. Because of the statement by interviewee four and since none of these interviewees is among the more knowledgeable in the software, one analysis is that the user manual is more useful for expert users than novice users. This analysis is further strengthened by the fact that Interviewee 6 states that the user manual is very complex, in connection to talking about the need for having separate user manuals for end-users and administrators.

A preference for multimedia content

When asked specifically how they prefer to consume their information, some interviewees say that they prefer a video format, i.e., interviewees 4, 6, 7, 8, and 9, while one, i.e., interviewee 5, states that she prefers text-based step-by-step instructions. The rest of the interviewees are either indifferent to the format in which instructions are presented or highlight that the preferred format depends on what they need to learn.

Interviewee 1 says that *"It depends. If it is something practical, then I want to look at a video where they describe this is step one, and this is step two, and so on; if it is something different, texts might work"* (Interviewee 1, personal communication, March 22, 2023). This statement falls in line with what is highlighted in multimedia research, where animations might be better for learning procedural tasks but might not be beneficial for other types of knowledge, such as the development of a conceptual understanding (Hoffler & Leutner, 2007; Lowe & Schnotz, 2015). The preference for video format instructional content was also shown

when interviewees were asked what the software company could do better when it comes to learning, information retrieval, and guidance. Interviewees 3, 4, 6, 7, and 8 eight all bring forth ideas for longer videos that give users an overview of the software or short-form videos that show particular activities.

Analysis

The finding that the likelihood and proficiency of use of the current, complex, and mainly text-based manual correlate with the user's knowledge of the software could be an example of how the Multimedia principle is more prominent for novice users than for expert users (Clark & Mayer, 2016). Combining this with the finding that the interviewees prefer video-based instructions or are indifferent to how the format of instruction suggests that company Alpha should introduce more multimedia content and particularly video-based content, to their user manual. The interview statements and prior research do, however, suggest that the company should be careful about what multimedia format is used for different types of learning goals, with video-based instruction being effective for procedural learning goals such as using the software and static visuals being better for achieving strategic goals and a conceptual understanding (Hoffler & Leutner, 2007; Lowe & Schnotz, 2015).

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Low-knowledge admin users need a solution with more multimedia content, and the format of the content should be picked according to what is to be learned.***

4.3.2. Keeping Instructional Content Close at Hand

Connecting to where instructional content should be made available, interviewee 3 highlights that once you are in the software, you do not want to leave in order to retrieve information. With this in mind, he suggests that the company expand its current hover-over function, which currently gives users a short description of the buttons' function.

Analysis

The specific idea might not be applicable, but the general idea that users need instructions that are easily accessible when they are working in the software is a good point which aligns with Nielsen's 10th heuristic that states that easy-to-use help and documentation should be provided when and where is needed (Nielsen, 2020). Important to keep in mind when introducing integrated support is that it is not done to the extent where it interferes too much with the simplicity of the interface, which is key to reducing cognitive load and making an interface more usable, as suggested by Clark and Mayer (2016), Sweller et al. (2019), Krug (2014) and Nielsen's (2020) 6th heuristic. The idea of keeping instructional information accessible also aligns closely with Connectivism, which is centered around the idea that it is more important to know where to access information than to remember information in an environment of rapid change (Siemens, 2004).

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***Admin users need information and instructions to be integrated with the software interface, but this should not be done to the extent that it interferes too much with the simplicity of the interface.***

4.3.3. Conversational Style Support

All interviewees reported that they search on Google or another search engine when they want to find information about how to do something in their private lives. Even if this is not necessarily the best way to search for information, it is important to note that consistency and the following of industry standards are important when designing for usability, as suggested by Nielsen's 4th heuristic (Nielsen, 2020). However, as mentioned in the theoretical framework, there is a chance that we are standing on the cusp of a change in society which might lead to a switch in how we search for information (The Economist, 2023).

When asked what company Alpha could do differently, interviewees 10 and 5 would prefer more affordable and regular customer support, respectively.

> *"I wish to have more regular contact with the customer contact person from the software company. The contact person would be able to describe changes in the* software *as well as give feedback on how the* software *is perceived and answer questions about if there have been any problems."* (Interviewee 5, personal communication, March 23, 2023)

Interviewees 9 and 4 also mention that they see a need for and value in more regular contact with someone at the software company, especially when approaching more complex actions in the software. These requests suggest a need for a more conversational style of support that can know their business and can answer simple and more complex questions.

Analysis

Combining this expressed need for conversational support with the emergent switch from search to chatbots powered by generative AI and large language models suggest that a future solution for search also should include a conversational AI component (The Economist, 2023). The AI could, in theory, be trained with general information about the software, the specific company, and their configuration of the software, allowing for company-specific support and training (Dilmegani, 2023; The Economist, 2023).

Insight statement

A tentative insight statement to work on in connection to this need is:

> ***In addition to effective search functionality, admin users need conversational style support on simple and more complex questions on their specific software configuration.***

4.4. Needs for Knowledge Dissemination

The interviews showed that all interviewees were, in addition to being responsible for the software itself, also responsible for sharing knowledge and instructions on how the software is used with the end users. Additionally, almost all interviewees expressed that they were responsible for answering questions on how the software works as well as making changes in response to requests and suggestions by users. This realization, which occurred during interviews 1 and 2, inferred the addition of questions about the process of sharing instructions with end users, see Appendix 2.

4.4.1. Accessible Configuration-specific Instructional Content

To what extent and how well the process of sharing instructions with the end users is done differs between interviewees. It became clear that this was a problem for many of the interviewees. Either by them saying straight out that the users are not very likely to read their instructions, such as in interviews 4 and 5. According to interviewee 5, most of the employees at her company "*work with the method of learning by doing. They do not typically read instructions. Instead they try and ask for help when something goes wrong.*" (Interviewee 5, personal communication, March 23, 2023). Or by them emphasizing that the employees disliked the software, such as in interviews 8 and 9. *"Overall, the organization dislikes the software."* (Interviewee 9, personal communication, March 28, 2023). Assuming that the dislike is at least partially caused by the end users not receiving sufficient instruction on how to use the software effectively suggests that the interviewees and their organizations would benefit from a solution that makes sharing configuration-specific instructional content easier.

There were also interviewees that did not seem to have that big of a problem with sharing information, such as interviewees 6 and 10. These interviewees are still likely to benefit from a solution that makes this process easier, though, since they can be assumed to be more likely to use the feature, and they already have material created. The need is also emphasized by this statement by Interviewee 10:

> *"I really think that you should push for having some sort of LMS tool in the software itself, that you would be able to add instructional videos as a customer as well as questionnaires ... for controlling that the user knows what they need to know."* (Interviewee 10, personal communication, March 30, 2023).

This quote also suggests that the placement of the solution should be in the software itself rather than in a separate platform. Placing the company-specific instructions close to where the work is done also has the potential to satisfy the needs of the end-users that interviewee 5 refers to, the once that practice "learning by doing" rather than reading instructions. This idea is further emphasized by an example given by Interviewee 3, where he would like to see a function where a QR code is placed out where his users work, which would lead them to an instructional video that would play without needing to be downloaded. He emphasizes that one needs to make the consumption of instructional content as easy and accessible as possible if it is to be used.

Analysis

A solution that aims to increase the end users' consumption of configuration-specific instructional content should make this content easily accessible from users' places of work, be that in the software or in the physical space. This connects to Nielsen's 10th heuristic of effective interface design, which states that designers should provide instruction when and where the user needs it, which helps users understand how to complete their tasks (Nielsen, 2020). It also aligns closely with Connectivism, which emphasizes that it is more important to know where to access information than to remember information in an environment of rapid change (Siemens, 2004).

Insight statement

A tentative insight statement to work on in connection to this need is:

Admin users need a solution which enables them to share configuration-specific instructional content in a way where it is accessible and easy to use for end users when and where they need it.

4.4.2. Two-way Communication

The majority of the interviewees state that one of their responsibilities is to answer questions as well as develop the software in response to suggestions from employees. Receiving suggestions and feedback from employees is also said to be a major source of motivation for some interviewees. One of the main challenges that interviewees 6, 8, and 9 express is that they do not know what their users want and need.

Analysis

This suggests a need for a solution that facilitates easy two-way communication between the admin users and other employees in the organization, both in terms of questions on how things work as well as suggestions for how things can improve. Enabling communication and collaboration between different users of the software connects to the theory of Knowledge building. Knowledge building switches focus from individual learning to collaboration with the goal of coming up with new ideas and innovation. A solution that facilitates knowledge-building needs to; facilitate two-way communication, as everyone should be encouraged to take an active role in knowledge creation and innovation, regardless of their prior knowledge or experience; as well as provide tools for feedback, as concurrent, embedded, and transformative internal assessment is key to knowledge building (Scardamalia & Bereiter, 2010).

Insight statement

A tentative insight statement to work on in connection to this need is:

Admin users need a solution which facilitates easy two-way communication between them and other employees, enabling knowledge-building and effective feedback.

5. Conclusion

The research question of this project was "*What admin user needs are crucial to consider in the development of a solution for learning, instruction, and information retrieval in enterprise software?".* The needs identified will be presented in the form of cursive insight statements.

First, it became clear that admin users differ in their levels of knowledge as well as in their motivation and time available for learning. Admin users express different needs depending on these factors.

> ***Admin users need a solution which is able to identify and adapt to their different levels of knowledge as well as their time and motivation available for learning.***

Learning how to use the software was shown to be a process that necessitates practice on one's own or "learning by doing" in the company-specific configuration, suggesting that a solution should facilitate transferability and self-directed learning.

> ***Admin users need a solution that facilitates their self-directed learning throughout the learning process.***

> ***Admin users need a solution*** **which guides and supports them through a development project which is meaningful to them, is situated in a real-world context, and fulfills an educational purpose.**

In addition to procedurally learning how to use the software, highly motivated interviewees express a need to understand their organization as well as how to design with the end user in mind.

> ***Admin users with strategic learning goals need a solution where their conceptual understanding of design and business knowledge is developed and supported through a problem-based learning process where they are responsible for accessing the information necessary to solve a problem.***

> ***Admin users also need this information to be accessible to them in a user-centered and accessible way.***

Admin users hesitate from making certain changes to the software on their own due to fear of or uncertainty about what the result will be.

> ***Admin users need a solution which evaluates, predicts outcomes, and suggests improvements for propositions of and attempts on complicated software configurations.***

Admin users request clearer step-by-step guides for how to conduct more complicated activities in the software.

> ***Low-knowledge admin users need accessible, easy-to-use worked examples for how to perform more advanced activities in the software.***

The interviewees expressed that they are intrinsically motivated by seeing the results of the work that they do and by the challenge of figuring out how something works or building something new in the software.

> ***Admin users need a solution which facilitates their intrinsic motivation by making the results of actions taken or planned in the software more visible, as well as how these impact the end user.***

> ***Admin users need a solution which facilitates their intrinsic motivation by keeping them in a zone of optimal challenge when building or changing something in their software configuration.***

When asked about their opinions on and preferences regarding knowledge exchange with other organizations using the software, a need for smaller, more segmented groups was expressed by some interviewees. Combining the statements with the three components of a community of practice suggest that users need groups where they can share knowledge and collaborate with individuals working in a similar way and industry, as well as with a similar level of motivation for learning.

> ***Admin users need access to smaller communities which are segmented to fit their industry, their way of working with the software, and the users' level of motivation for learning.***

With regard to interpreted needs for information retrieval, interview statements suggest that the current user manual at company Alpha is too complex for novice users. Additionally, the interviewees were found to either prefer video-based multimedia content or to be indifferent to which instructional format is used. Some interview statements and prior research do, however, suggest that the company should be careful about what multimedia format is used for different types of learning goals.

> ***Low-knowledge admin users need a solution with more multimedia content, and the format of the content should be picked according to what is to be learned.***

One interviewee emphasizes the importance of that information and instruction are accessible without them having to leave the software interface.

> ***Admin users need information and instructions to be integrated with the software interface, but this should not be done to the extent that it interferes too much with the simplicity of the interface.***

Admin users express a need for conversational style support in relation to information search.

> ***In addition to effective search functionality, Admin users need conversational style support on simple and more complex questions on their specific software configuration.***

During the interviews, it became clear that admin users have responsibility for and sometimes struggle with sharing configuration-specific instructional content with the end users.

Interviewees' statements suggest that configuration-specific content needs to be accessible in order to be consumed.

> ***Admin users need a solution which enables them to share configuration-specific instructional content in a way where it is accessible and easy to use for end users when and where they need it.***

The majority of the interviewees state that it is their responsibility to answer questions as well as develop the software in response to suggestions by employees, and some interviewees express that one of their main challenges is that they do not know what their users want and need.

> ***Admin users need a solution which facilitates easy two-way communication between them and other employees, enabling knowledge-building and effective feedback.***

5.1. Practical Implications

This research provides practical implications for the case study company as well as companies similar to it by giving advice on which needs admin users have when it comes to learning, instruction, and information retrieval in enterprise software. In short, when developing a solution for learning, instruction, and information retrieval in enterprise software, designers need to keep in mind that admin users have different levels of knowledge and goals for their learning. Admin users with strategic learning goals of achieving a conceptual understanding of design and business knowledge need a solution that facilitates their intrinsic motivation and self-directed learning through a transferable learning experience that adapts its support to their evolving level of knowledge. These admin users also need access to smaller communities which are segmented to fit their industry, their way of working with the software, and their level of motivation for learning. Admin users with primarily procedural learning goals need a solution that offers accessible worked examples, evaluates software configurations as well as offers accessible video-based instructions and access to conversational support. Finally, all admin users need a solution that enables them to share configuration-specific content with end users when and where they need it, as well as facilitates easy two-way communication between them and the end users.

If the insights of this study are applied effectively to enterprise software, it has the potential to enable work to be more effective and enjoyable. Which subsequently would result in higher economic development and human well-being. The research further tests the applicability of widely regarded learning theories to the context of enterprise software, which subsequently has the potential to inform practitioners in the field.

In the short term, the findings of this study will serve as the inspiration phase of a larger development process for a solution for learning, instruction, and information retrieval conducted by a company providing a software platform for enterprise management. The insight statements provided in the conclusion should serve as the starting point for several brainstorming sessions leading to several rounds of prototyping and customer testing. The final solution should enable higher customer satisfaction and utilization of the service offered, leading to more growth and expansion for the software company. The solution should also enable the company to scale its service by reducing the number of customer support requests.

5.2. Theoretical Implications

The study offers theoretical implications by investigating the applicability of widely regarded learning theories to an area of growing importance in today's society, an area that has been largely neglected by scholars historically. Even if research on learning theories and their integration with software is extensive, little to no research has been done on user needs with regard to software-based learning, instruction, and information retrieval for enterprise software. Aside from Wheatley (2000), the author of this thesis did not find any articles that covered enterprise software and training specifically, with the reservation for the fact that the literature review was narrative rather than systematic (Bell et al., 2019).

The research confirms the problems with enterprise software in terms of its complexity and customization and the risks and barriers to change that this creates, as proposed by Cynthia Rettig (2007), a director of knowledge management, and Arthur Raess (2019), a Global Product Leader. Thus, adding academic validity to a claim which seemingly lacked a basis in academic research previously. The research also adds an aspect to the challenge of complex and customized enterprise software, which was not discussed by Rettig (2007) and Raess (2019). That likely a substantial source of the barriers to change stems from organizations losing the employees responsible for the software and replacing them with someone with limited time or interest in maintaining the software configuration. The research further provides insights into the needs of these users as well as those that did not quit and how these differ from one another.

5.3. Limitations & Future Research

Being an explorative study researching a wide and ill-defined problem, the conclusion opens up for more questions rather than providing clear and exhaustive answers. Similar studies typically use a theoretical sampling approach where additional interviews are conducted to investigate identified findings further (Bell et al., 2019; Gioia et al., 2013). Since this was not possible in this study due to time restraints, most of the findings identified would benefit from further research. Among the findings, a few larger need areas are deemed to be especially viable for further research.

The subject of motivation in the context of software design for learning should be studied further to shed light on the effectiveness of different intrinsic and extrinsic factors of motivation on learning outcomes. Motivation could be studied in the context of gamification, investigating the discrepancy between how gamification rewards are mainly extrinsic while intrinsic motivation is argued to be superior for learning outcomes (Peters, 2014; Ryan & Deci, 2017). Similarly, further research could look deeper into the best ways of forming active communities of individuals from different organizations which help each other and collaborate to build knowledge and spur innovation.

Finally, more research would need to be done on the subject of admin users and end-user communication and collaboration. The realization that this aspect of the project was important came during interviews 1 and 2 and would likely deserve its own series of in-depth interviews with both advanced admin users as well as end users. Facilitating the sharing of high-quality configuration-specific instructions is important since it is likely to influence the perception of the software for the majority of its users. Additionally, the end users' ability to take part in the development of the software configuration and give feedback on their

experience is key to creating an effective and enjoyable user experience. Many interviewees expressed that not knowing what the end users needed was one of the many things inhibiting them from developing the software further. Research could investigate what tools would allow for better knowledge building, effective end-user involvement, and feedback, as well as what analytical tools would allow admin users to make informed design decisions.

Important to note also is that this research was done for one company's software in a Swedish context, with nine out of ten interviewees being of Swedish origin. This means that the validity of the findings would benefit from being tested in a different, perhaps less digital savvy cultural context. It would also be beneficial for similar research to be done on different kinds of enterprise software in order to validate the transferability of the findings.

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Appendix

Appendix 1

Interviewee 1	Strategic business developer	High knowledge, high time
Interviewee 2	Strategic business developer	High knowledge, high time
Interviewee 3	Global Director of QA, HS&E, MS and Process Improvement	High knowledge, high time
Interviewee 4	Quality developer	Emergent knowledge, low time
Interviewee 5	Head of Quality and Environment Unit in the Service Department	Low knowledge, Low time
Interviewee 6	Business Developer	High knowledge, high time
Interviewee 7	Archivist and registrar.	Low knowledge, Low time
Interviewee 8	Business Developer	Emergent knowledge, low time
Interviewee 9	Sustainability manager	Low knowledge, Low time
Interviewee 10	Quality & Compliance Monitoring Manager	Emergent knowledge, low time

Appendix 2

Introduction

Hi,

I am studying a Master in Innovation and Industrial Management at the Gothenburg School of Business, Economics and Law.

The purpose of this interview is to understand your needs and preferences around learning and instruction, and information retrieval in the Alpha software. I am happy to listen to anything you have to say about the Alpha software, but I personally do not work with the Alpha software itself and am far from being an expert.

Is it okay if I record this interview? The recording will be deleted when the project is finished, and anything you say during the interview will remain anonymous in the final work.

Where do you work and how long have you worked there?

What is your role and what kind of work do you do?

How is the Alpha software used in your organization today?

- Can you put into words the main reasons for using the Alpha software, what "job" does the Alpha software do for you?

How long have you been using the Alpha software?

How long have you been working in the Alpha software and how much of your working day do you work in the Alpha software in hours per week?

Initial learning

How was the process of initially learning to use the Alpha software for you?

- What was your experience during that process? Please guide me through the process.
- Describe if you encountered any problems or anything that was less good during the process.

The user process

Could you describe how you use the Alpha software?

- Give examples of specific tasks and activities that you perform in the software.
- Describe the process for me, and please include if and when you encounter any problems or anything that is less good?
- (If possible, let the interviewee share the screen and show me how they use the software - especially if they are talking about a specific problem).

Information search and guidance

To what extent do you feel that your knowledge of the software matches the activities you are expected to perform?

- Can you put it on 1-10

What do you do if you need to know how to do something in the software that you have forgotten or have never done before?

- Please guide me through an example of when you found yourself in that situation. What was your experience during this process?
- Do you have any other examples?
- Describe if you encountered any problems or anything that was less good during the process.

How do you look for information and knowledge in other contexts and software?

- How do you search for information privately?
- Do you have an example when you searched for information in some way and had a very good experience? Do you want text-based, movies etc.
- Do you have an example of a solution that you think is good?
- Tutorials on Youtube, learning platforms that you have used in another context, Chat GPT etc.

What, if anything, would you like to see Alpha do differently when it comes to training, support and instructions for the Alpha software?

Ability to adapt and develop the Alpha software according to the changing needs of the organization:

To what extent has the Alpha software changed or evolved as your organization and needs have changed since you first started using the software?

- Please describe how this process took place.

To what extent do you feel you know what is possible in the Alpha software?

- Can you put it on 1-10
- For example, you may have acquired the Alpha software to handle your deviation management, but the module can also be used for other types of flows such as improvement work or audit management? The document module can be used for more than instructions but can also.

To what extent do you feel you have the knowledge required to update, adapt or expand your use of the Alpha software?

- Can you put it on 1-10
- How much of your time working in the Alpha software is spent developing and making adjustments to the software?

What prevents you or what would you need to be able to identify needs and take responsibility for developing and adapting the software to keep it relevant and alive for your daily activities?

- If the threshold is too high, what support would you need to take the step to dare to make changes and create new things in the software?
- What did you struggle with before you learned the software?
- What do you think someone that was supposed to take over your job would struggle with?

What prevents you from having the motivation to take responsibility for your learning of the Alpha software?

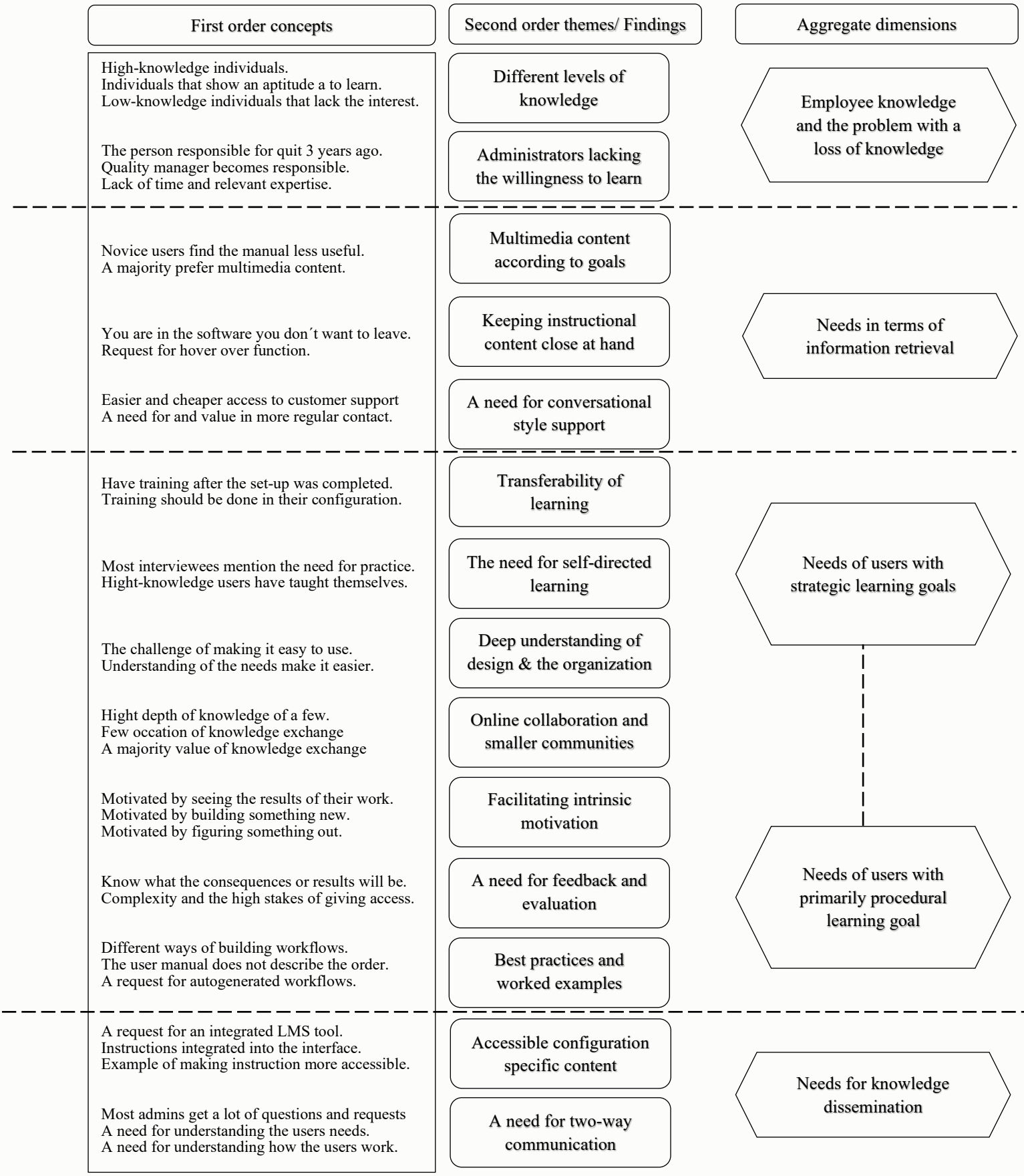
How do social interactions and knowledge sharing play a role in your learning and knowledge-seeking?

- As the person who is expected to have the highest level of knowledge in the software, do you feel that you lack knowledge sharing with peers or a more competent mentor?
- How much exchange have you had with other companies?
- How do you think you could benefit from knowledge exchange with other companies?

How do you share instructions with your end users?

- How could Alpha facilitate this process for you?

Appendix 3


First order concepts
Second order themes/ Findings
Aggregate dimensions
High-knowledge individuals.
Individuals that show an aptitude a to learn.
Low-knowledge individuals that lack the interest.
Different levels of knowledge
The person responsible for quit 3 years ago.
Quality manager becomes responsible.
Lack of time and relevant expertise.
Administrators lacking the willingness to learn
Employee knowledge and the problem with a loss of knowledge
Novice users find the manual less useful.
A majority prefer multimedia content.
Multimedia content according to goals
You are in the software you don´t want to leave.
Request for hover over function.
Keeping instructional content close at hand
Needs in terms of information retrieval
Easier and cheaper access to customer support
A need for and value in more regular contact.
A need for conversational style support
Have training after the set-up was completed.
Training should be done in their configuration.
Transferability of learning
Most interviewees mention the need for practice.
Hight-knowledge users have taught themselves.
The need for self-directed learning
Needs of users with strategic learning goals
The challenge of making it easy to use.
Understanding of the needs make it easier.
Deep understanding of design & the organization
Hight depth of knowledge of a few.
Few occation of knowledge exchange
A majority value of knowledge exchange
Online collaboration and smaller communities
Motivated by seeing the results of their work.
Motivated by building something new.
Motivated by figuring something out.
Facilitating intrinsic motivation
Know what the consequences or results will be.
Complexity and the high stakes of giving access.
A need for feedback and evaluation
Needs of users with primarily procedural learning goal
Different ways of building workflows.
The user manual does not describe the order.
A request for autogenerated workflows.
Best practices and worked examples
A request for an integrated LMS tool.
Instructions integrated into the interface.
Example of making instruction more accessible.
Accessible configuration specific content
Needs for knowledge dissemination
Most admins get a lot of questions and requests
A need for understanding the users needs.
A need for understanding how the users work.
A need for two-way communication