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Analysing user requirements for technical support system through service design

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PREFACE

I have learned that it is probably best not to begin writing a thesis from a preface. However, I considered that if this was the only way to complete the task, then it was a necessary compromise. I must acknowledge that this thesis presented a significant challenge for me. The process of reaching this final version has been lengthy and at times arduous, though largely rewarding and justifiable given the considerable time invested in its creation. As with most of my fellow students, the most significant challenge was identifying sufficient time to complete the writing.

I would like to express my gratitude to my thesis supervisor, Päivi Haho, for her encouragement and for ensuring that I would eventually complete my studies.

Helsinki, 28.11.2024

Lauri Haimelin

Abstract

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The objective of this thesis was to identify the user requirements for a technical support system that could be used to assist both local dealer technicians working at a dental clinic and the technical personnel supporting them.

A Finnish high-technology dental healthcare manufacturer company, subsequently referred to as the "company", has historically relied on the expertise of highly experienced technical support personnel. Local dealer technicians operating worldwide have been able to contact the company's technical support team during normal Finnish office hours. However, due to the varying geographic locations of the dealers, there have been instances where the provision of technical support has been delayed, which has occasionally been critical. Furthermore, the company has numerous local country offices worldwide, which are also able to provide technical assistance. However, these local offices also face the challenge of being accessible during normal business hours.

As the differences in technology between dental healthcare device manufacturers have narrowed and end customers at dental clinics have placed greater emphasis on efficiency and profitability, excellent service has emerged as a crucial factor in differentiating competitors in the market. Large, professionally led dental clinic chains are demanding minimal device downtime, necessitating the availability of technical support from early morning until late in the evening. The company has identified the development of a technical support system accessible to local dealers and country

offices as a key objective. This will enhance the precision and timeliness of the technical assistance provided to customers.

The objective of this study was to ascertain the user requirements for a technical support system and to identify the optimal means of fulfilling them. The study's primary data source was interviews with key stakeholders in the technical support function, conducted at both the company head office and the local country offices. The specific requirements of the system may vary depending on the location of the technical support personnel. It was therefore vital to gather data from a diverse range of support levels. Furthermore, the study conducted a literature review to gain a deeper understanding of the essential requirements for excellent customer service and to identify the reasons behind its importance in a company's success. Benchmarking existing systems proved to be an invaluable method for gaining insight into the potential of a technical support system. The actual design and implementation of the system were not within the scope of this study.

The interviews and literature search revealed that there are three principal user requirements that a technical support database must satisfy. The system must be centralised and easily accessible, document tacit knowledge, facilitate systematic knowledge sharing, and include enhanced troubleshooting tools and automated processes.

Keywords: user requirements, system, customer-centric, technical support, database, knowledge, FAQ, chatbot, AI, generative

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List of Abbreviations

AI	Artificial Intelligence
CRM	Customer Relationship Management
FAQ	Frequently Asked Questions

1 Introduction

1.1 General

This thesis was commissioned by a Finnish high-technology dental healthcare manufacturer, which will from now on be referred to as the "company". The company specialises in the development of high-quality products, including dental treatment units, dental imaging devices, dental scanners, and software for dental clinics and universities. The objective of this thesis is to provide a set of guidelines that will enable the company to develop its technical support tools in a way that will facilitate more effective and timely assistance for end users worldwide. This will be achieved by ensuring that the dealer companies and technicians are equipped with the necessary resources to provide accurate and reliable support for the company's products.

As a medical device manufacturer, it is the company's responsibility to ensure that its products comply with all relevant local legislation and standards. It is therefore vital that the technical support provided is accurate and reliable, and that any modifications made to the devices do not alter their intended functionality.

The company in question is the largest privately owned dental manufacturing company, with a history spanning over five decades. The company has grown to become a global leader in the industry, with an annual revenue of €1.2 billion and a workforce of 4,400 employees, primarily through its commitment to rigorous product development.

1.2 Background of the problem

The objective of this thesis is to address the following research question: What are the user requirements for a customer-centric technical support system? To identify the answer, the following three questions are presented:

- What are the needs for a technical support system?
- What are the must-have features for a technical support system?
- What are the key improvement areas of the current system.

In this context, the term "customer-centric" is used to describe a system that is accessible, straightforward to use, and capable of providing guidance on the most prevalent issues related to the company's products, if not all issues. At the time of writing, the company's technical support function is highly effective, providing accurate, personalised technical assistance on a global scale. The company's technical support is facing two main challenges: unavailability outside of business hours and occasional prolonged wait times due to high support queue volumes. The company has a global presence, with local support personnel situated in numerous organisations across Europe, North and South America, China, India, Africa and the Middle East. The local support offices are typically modest in size and, on occasion, require assistance from the head office. On occasion, queries are directed to the head office and local support offices that could be readily answered by consulting the technical documentation available via the company's extranet. Nevertheless, previous studies have indicated that the necessary information can occasionally be difficult to find.

1.3 Objectives and methods

It seems reasonable to suggest that if the company in question can implement a solution to the issues in the technical support sector, thereby establishing a customer-centric technical support system, both its own dealers and the end customers who engage with them will be more satisfied with the company's products and services. It seems reasonable to suggest that this increased satisfaction will create new business opportunities. To address the current challenges, a three-phase study was conducted using service design as a development process. Service design can be defined as a process of planning and organising the various elements that comprise a service, including the people, communication channels and materials involved, with the aim of

enhancing the quality of the service provided and the interaction between the service provider and the users. Service design is an effective tool for modifying existing services and creating new ones. The first step in the process involved a comprehensive review of the existing literature on customer support and related themes, with the aim of gaining an in-depth understanding of the essential requirements for effective customer support and the underlying factors that contribute to its success. The second part of the literature review focused on the analysis of service design as a method. The second phase was to conduct interviews with the key personnel at both the headquarters and the local country offices. The purpose of the interviews was to gain insight into the current situation and identify the most crucial features that users require from the system. A review of existing systems was also conducted to identify best practices for comparison. The objective of this study was to define the user requirements for the support database. This study did not address the operational and technical requirements. In addition, the precise design and construction of the system described in the study were not addressed. These areas would be ideal for further investigation in a subsequent thesis.

1.4 Explanation of the study

The thesis is divided into four parts. The first section introduces the theme under study and provides an overview of its place within the broader context of general knowledge. This is done by explaining the background to the problem, the aims of this study and the methods used to achieve these aims.

The second section introduces service design as a method. It also presents theme interviews, literature review and benchmarking in the context of service design.

The third section presents the findings of a comprehensive literature review, with the aim of developing a robust understanding of the essential elements that make up effective customer service. The third part also demonstrates how the service design method is used in practice by going through the four steps of the double

diamond: discover, define, develop and deliver, which represent different parts of the study. In addition, the findings from the interviews are presented in detail, outlining the identified weaknesses, strengths and key areas for improvement. The third section also includes a comparison of the existing systems with industry benchmarks. The third section also provides a comprehensive analysis of the findings and presents a proposed technical support system as a result.

The fourth section presents the conclusions of the study with reflections on the methods used and lessons learned. The fourth section also reflects on the reliability and validity of this study.

2 Methods and background research

Service design is the method of this research, and the structure of the thesis follows the service design process. Service design is an interdisciplinary approach that should not be defined in a narrow manner. This allows for a comprehensive examination of the subject matter, which is essential for effective service design. Service design often draws on methodologies and tools from a range of different methodological traditions. The evolving design process is used to develop business concepts, designs and customer experiences. It can be argued that service design is an effective methodology for designing, developing and implementing services within a business context. [1, p. 28] [2, p. 136]

The cornerstone of effective service design is a comprehensive understanding of the customer and their requirements. It is crucial to identify the customer's objective and to ascertain the relative importance they ascribe to their various needs. It is also crucial to comprehend how the service will be utilized and identify optimal strategies for its continued development. [2, p. 136] A key element of service design is understanding and awareness of the customer. The objective is to place the customer at the heart of the design process and to encourage their active involvement. As service design is an inherently collaborative process, it is vital to involve the customer's key personnel from the outset. It is also important to view service design as an iterative process, rather than a one-way

communication channel. Given the shift in perspective regarding products as platforms, service design is now focused on the interaction between people and technology. [1, pp. 50, 56]

2.1 Service design

This section details the core principles of service design, emphasizing customer needs assessment. It covers the four phases: discovery, definition, development, and delivery presented in Figure 1. Each of the phases focus on creating effective services.

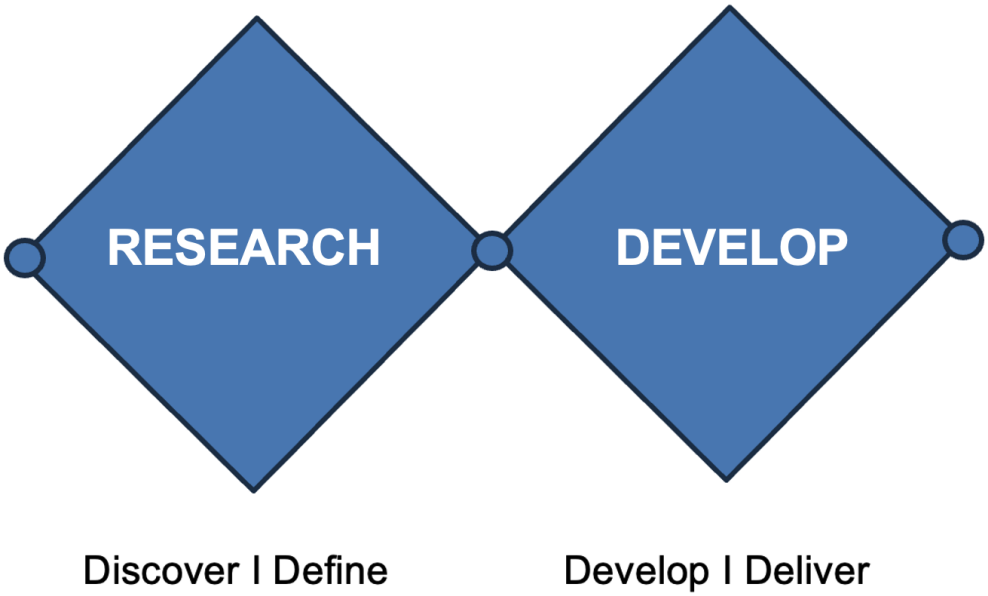

Figure 1. Double diamond model adapted from Stickdorn and Schneider [1, p. 126].

There are four phases in any service design process as described in Figure 1. The first two phases are within the first diamond. In the first phase, the service designer is responsible for the discovery process. This subject area covers gaining insights from the organisation's preferences and the overall objectives of the service. It is also essential to identify the issue in a reliable and consistent manner during this phase. It is advisable to maintain close communication with

the customer throughout this process. The second phase is concerned with defining the problem, focusing on the most pertinent themes and disregarding those of lesser importance. It is crucial to ensure that this second phase is completed successfully so that there is correct information for further development. [1, pp. 128 - 135, 149]

The second phase of the diamond model encompasses the third and fourth phases, which correspond to the development and delivery stages. In the third phase, a preliminary concept should be available for development and testing. It is important to note that the concept should not be regarded as a finished product. Rather, it should be viewed as a preliminary sample to be further explored. The fourth phase is the delivery of the finished service. It is of the utmost importance that the final service be presented in a manner that will garner support from the company's key opinion leaders. The introduction of a new service frequently requires modifications to existing processes and the management of personnel to facilitate these changes can prove to be a significant challenge for any business. It is vital to gain the support of individuals who can be considered change agents within the organisation. An effective service designer can identify individuals based on three key characteristics: their central position within the organisational structure, their ability to combine groups, and their proximity to uncertain opinion leaders. [1, pp. 128 - 135, 149] [3]

2.2 Service design as a development method

This study employs a service design methodology. The objective of service design is to achieve seamless service delivery and high-quality customer experiences through the implementation of a human-centred approach throughout the design process [1, p. 28]. The overall study process for this thesis is presented in Figure 2.

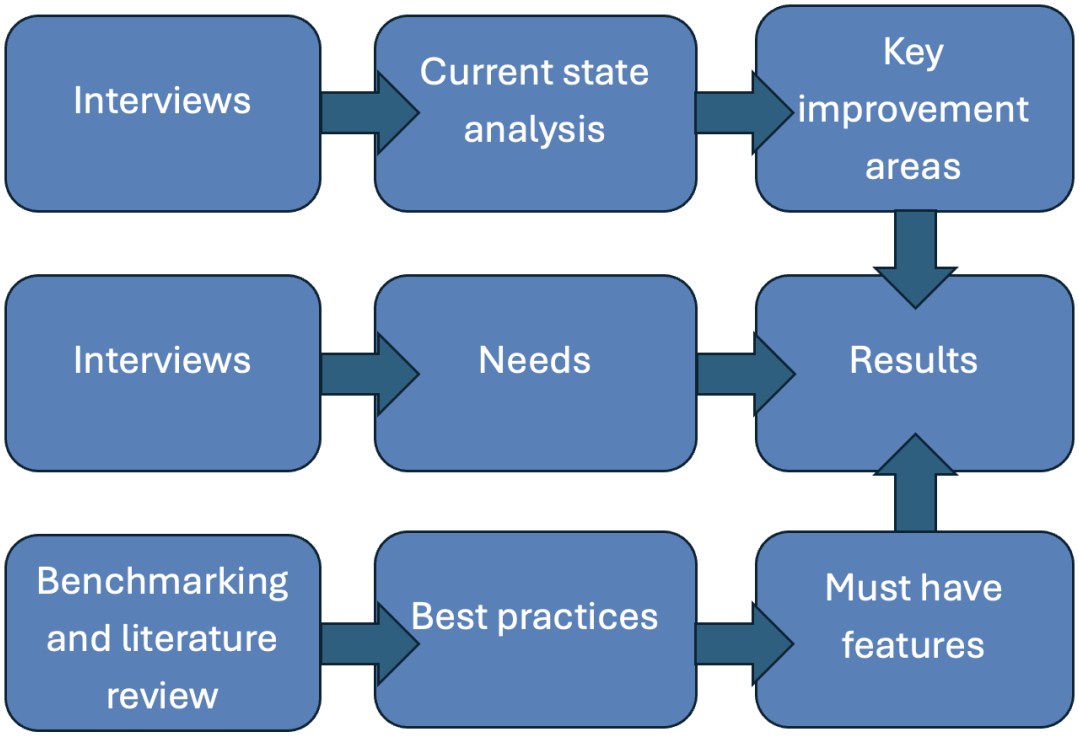

Figure 2. Research methods of service design used in this study.

Data for this study was collected in three individual phases:

- theme interviews
- literature review
- Benchmarking.

2.2.1 Theme interviews

To gain a comprehensive understanding of the current situation at the company's technical support, it is recommended that interviews be conducted with the key stakeholders at both the company head office and country offices as their role in the support is slightly different. The objective of the interviews is to engage in a comprehensive discussion on a wide range of subjects relevant to the primary research question: what are the user requirements for a technical support system. The interviews facilitate a more in-depth understanding of the surrounding factors. It is also crucial to ascertain the primary areas for improvement in the

existing system, as these are the most urgent issues that require resolution. The interviews were conducted using a theme interview approach, as this method was deemed the most appropriate for a theme of such breadth and complexity. The theme interview was selected as the principal method due to its suitability for defining the needs, competencies and capabilities required for effective service design. [4, p. 110]

2.2.2 Literature review on methods and technical support environment

A review of the literature was conducted to obtain information on the general principles of service design and to develop an understanding of the appropriate methodology for conducting theme interviews. This was a crucial element of the study, as the theme interviews were the main source of information. The literature review also aimed to deepen the understanding of the wider technical support system environment and related systems such as CRM. A technical support system is always the sum of its parts and cannot function effectively without a good understanding of the customer. The objective of the literature review was therefore also to provide an overview of the importance of customer communication and the quality of customer service.

2.2.3 Benchmarking

The third study method was to benchmark existing companies with a similar support structure. During the planning stages of the thesis, it was anticipated that the availability and accessibility of this data would be challenging. Technical support systems often contain detailed information about a company's products, and outsiders often do not have access to this information. So even if a company is willing to present its system, it is often difficult to gain a deep understanding of how it works without product information. The technical support system may appear to provide good answers to difficult questions, but only a deeper look and understanding of the product will reveal how useful the information is. The potential benefits of benchmarking were felt to be so great at the time of planning

the work that it was felt to be something that should be pursued, even if the ultimate benefits were uncertain.

2.2.4 Adapting the double diamond process

The followingTable 1 describes in more detail the service design methods used in this work. In addition, the table describes in the form of objectives why each method was chosen for this work and reveals the outcome of these methods from the perspective of the work.

Table 1. Adapting the double diamond process.

Process phase	**Method**	**Objective**	**Outcome**
Discover	Literature research	Summarise the available knowledge of good service in literature	Precise insight into the effectiveness good service
Define	Theme interviews	Finding the user requirements for technical support system	List of user requirements for the technical support system
	Benchmarking	Finding the best practises for technical support system	Knowledge of working solutions for technical support system
Develop	Analysing data from interviews and benchmarking	Finding answers to the question: what are technical support system user requirements	List of strengths, weaknesses and key elements for a technical support system
Deliver	Testing	Seek out the final user requirements for a technical support system	Simplified description of a technical support system

3 Double diamond in practise

This chapter describes the use of service design in research through theory and practice. The four dimensions of the double dimension, discover, define, develop, deliver, guide the progress of the work as headings. Through theory and related practice, the chapter aims to explain how service design can be used to solve complex and multi-dimensional problems in a way that results in a customer and user friendly, efficient and effective solution.

3.1 Good service in theories – Discover

In the literature review the aim was to recognize if there are any themes which should always be considered when developing a customer-centric system. Equally important was to gain understanding on the other than user requirements for the system such as what type of information from the customers are required to properly operate the system.

3.1.1 What is CRM?

To gain a deeper insight into our users and customers and to identify the most effective ways to serve them, it was essential to familiarise ourselves with the supporting systems. At the heart of our customer-centric technical support system is a customer relationship management (CRM) system. Customer management is focused on building and enhancing customer relationships to increase customer value through a more comprehensive understanding [5, p. 4]. It is important to recognise that CRM is not solely applicable to sales or marketing but is also a crucial component of service and support. CRM can also be viewed as a means of streamlining business processes in marketing, sales, service and support. [6, p. 33].

3.1.2 What is marketing?

Marketing, or digital marketing, is the process of reaching out to customers and engaging in communication and discussion with the objective of managing this connection in a profitable manner [7, p. 41] [8, p. 13]. There is a question as to whether service design and marketing are complementary disciplines or if service design is even part of marketing. An alternative view is that marketing should be considered as part of service design. For the purposes of this study, this is a largely irrelevant question. However, it is important to understand that marketing is one of the key elements in the process of bringing innovation to the services on offer. [1, p. 50]

3.1.3 Why is good customer communication important?

A customer's perception of a company is shaped by a multitude of interactions across various channels and points of contact. Each of these interactions plays a crucial role in influencing the customer's overall impression. To gauge customer reaction to a new product, a marketing communication plan must be put in place. Technical support or service is a crucial aspect of the overall customer experience. It is therefore essential to gain insight into how customers perceive the service encounter. [9, pp. 3, 510]

3.1.4 Why does service matter?

A company can gain a competitive advantage by consistently delivering high-quality products or services to its customers. However, it is important to note that the product alone does not secure a competitive edge. Service is also a vital component in the success of manufacturing companies. It is often challenging to define service quality, even more so than product quality. This makes it difficult to assess the status of a company's services. When the service in question is based on personnel, it can be costly to provide a high-quality service, and there may be a temptation to select quantity over quality. One potential solution to the

problems is to consider how technology can be used to enhance the service process. [7, p. 249] [10, p. 33]

3.1.5 How to define good service

The quality of both the service and the product are factors that influence each other. It is therefore essential to consider both the service and the product when evaluating the quality of the service. It is not sufficient for a company to simply create a service for its customers. It must also define itself as a service company and learn how to create and control services. [10, p. 13]. The Gummesson 4Q quality mode shown in

Figure 3 describes well the expectations from the customer towards a product and service and is therefore a useful tool in designing services.

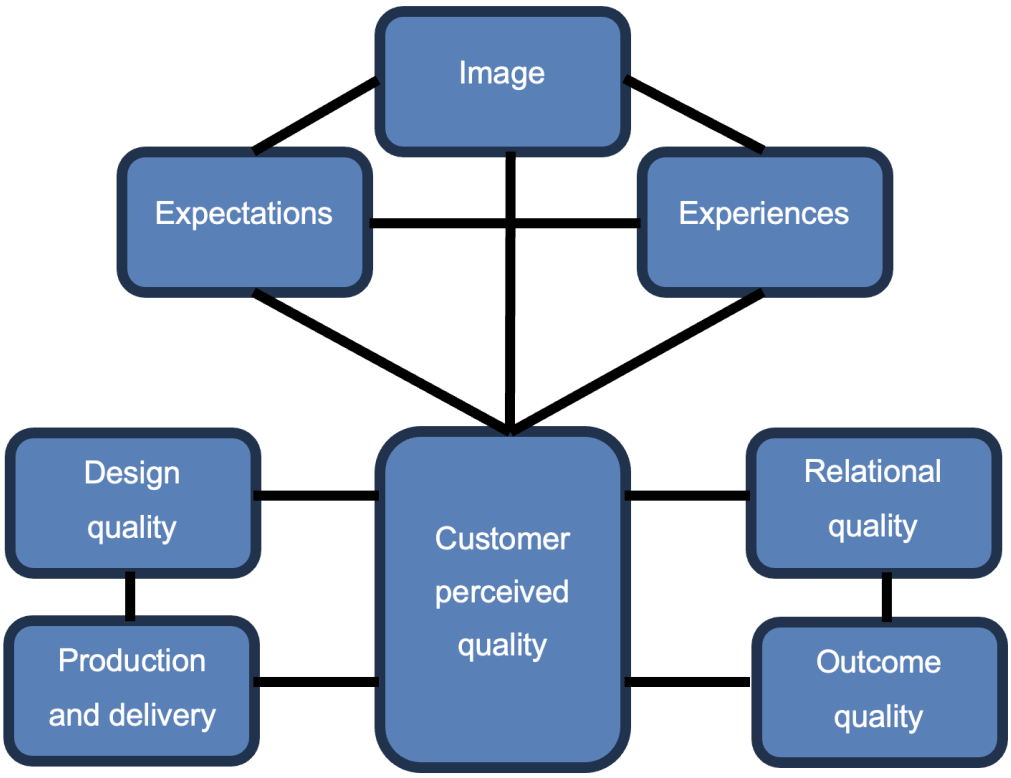

Figure 3. Gummesson 4Q quality model [11, p. 229].

3.1.6 Defining user requirements

Gaining an understanding of user requirements is an essential aspect of information systems design and is crucial to the success of interactive systems. However, defining these requirements is not a straightforward process. Figure 4 offers a streamlined yet robust approach to user requirement analysis.

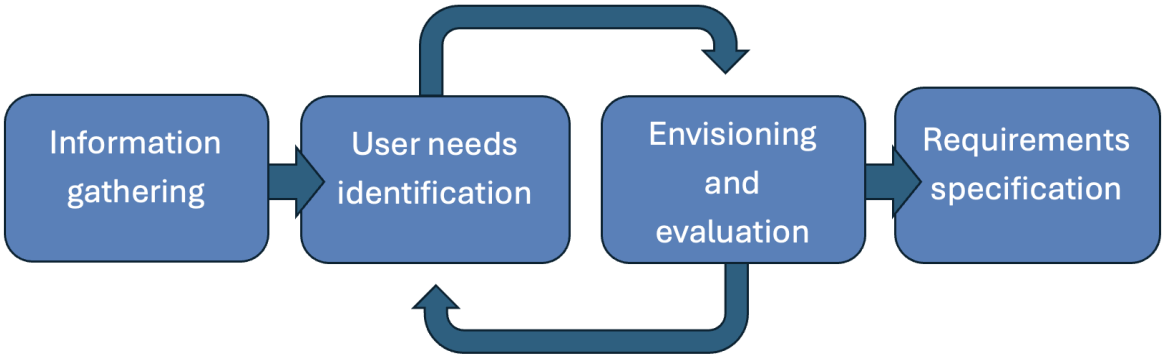

Figure 4. Process for user requirement analysis [12, p. 134].

A user centric the users' needs and requirements. The advantages of this approach include increased productivity, enhanced quality of work, reduction in support and training costs, and improved user satisfaction [12]. It is worth noting that Figure 4 broadly aligns with the double diamond model presented in Figure 1. This provides further evidence that the process is suitable for use in this study.

3.2 Current state - Define

The company's technical support process is currently modern, with a CRM-integrated technical support ticket system that allows any employee to see and participate in technical support cases. The only significant drawback is that, although there is a wealth of high-quality online learning resources and documentation available, it can occasionally be challenging for less experienced dealer technicians to locate the requisite information to resolve issues in a timely manner.

In addition to the ticket system, the company's technical support team uses a remote-control program to access dealers' or end customers' computers. This is particularly beneficial when resolving intricate computer or network-related problems. All interviewees also highlighted the importance of a chat program for direct communication within the support team and towards the company's research and development teams.

3.2.1 Theme interviews

Thematic interviews were an important source of information for this study. The semi-structured thematic interview is open-ended, allowing new ideas to emerge during the interview. In a semi-structured interview, the interviewer usually has a framework, such as a list of questions, or themes to explore. In the case of this study, the thematic interview was used to find out the current situation of the company's technical support, its strengths and weaknesses. The thematic interviews also aimed to identify suggestions for improvement and to identify important features of the technical support system.

A theme interview is a qualitative research method. Qualitative research represents a data collection technique that generates and collects non-numerical data. In qualitative research, the meanings are derived from the words or images themselves, rather than from the numerical data. Thematic interviews result in verbal data that can be transcribed into textual form for analysis and subsequent review. The interviews are recorded and subsequently transcribed into textual data, which is then collated into a report. [13, pp. 175, 179]

Qualitative research is also conducted with the objective of gaining a deeper understanding of a phenomenon through open discussion in themed interviews, with responses documented in an open text format. [4, p. 29]. In qualitative research, the theme interview is the most used method for data collection [4, p. 110].

It was determined that the most effective method for data collection for this thesis would be through interviews with key stakeholders. The interviews were conducted using a thematic format, as this was deemed to be the most appropriate method for gathering the necessary data. A theme interview is a qualitative data collection method. [13, p. 175]

A themed interview is typically conducted using a set of questions designed to establish a foundation for the discussion. It is essential that the discussion is allowed to flow freely during the interview, and that there are no strict guidelines or order for the interview itself. [14, p. 27]

A research theme interview is a structured conversation between two or more individuals with a specific objective in mind. In a semi-structured interview, a list of themes is provided at the outset, along with a list of key questions related to the themes, which serve to guide the interview. [13, pp. 434, 437]

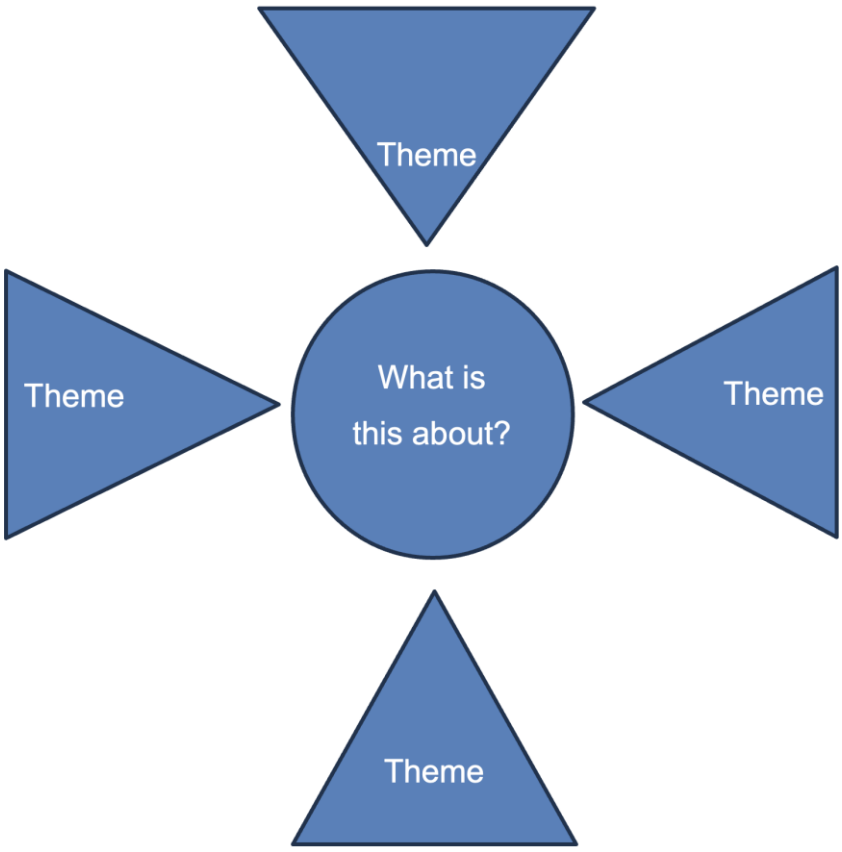

Figure 5. An understanding of a phenomenon is obtained through a theme interview [4, p. 129].

The interviewees should be chosen so that they are associated with the phenomenon or are concerned with it [4, p. 111]. The are no exact number for an adequate number of interviewees but a number or 12 to 15 has been suggested in some literature [4, p. 112]. For this thesis seven interviewees were selected as the team size and partial inexperience of some team members limited the number of available persons.

In open-ended questioning, it is common to employ question words such as why, what and how. These questions require more than a one-word response and demand a comprehensive explanation. [4, p. 114]. A theme interview process can also be described as in Figure 6.

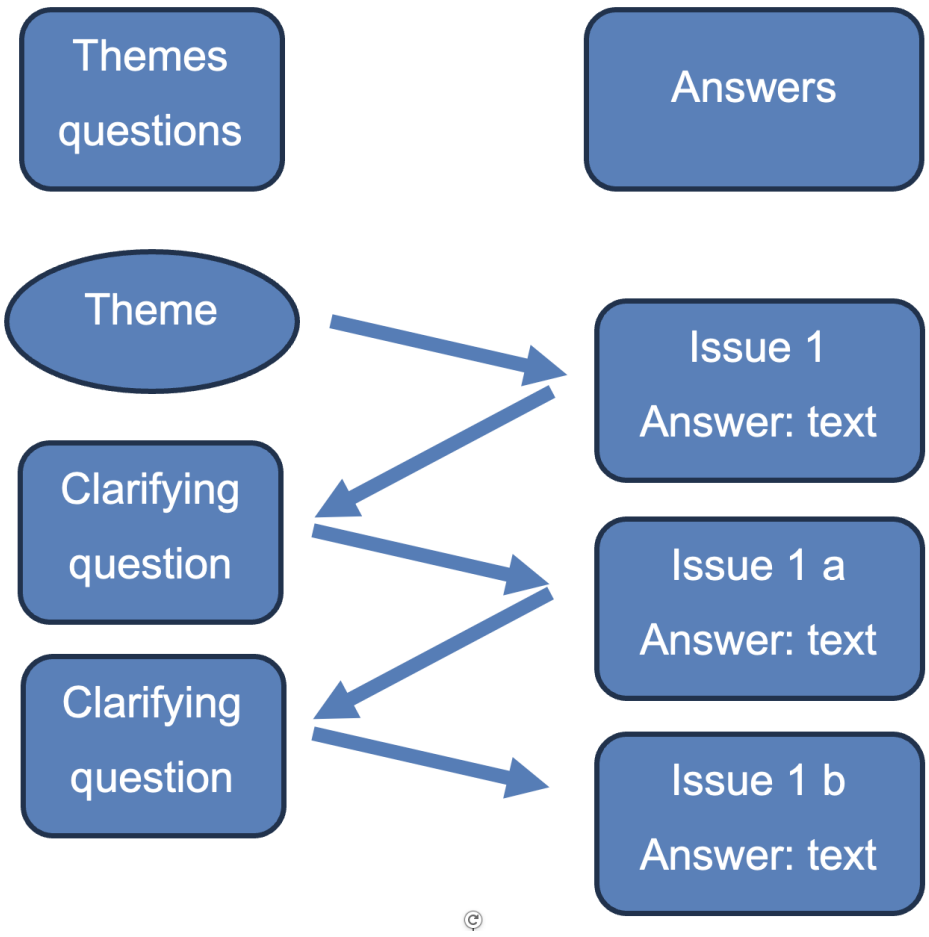

Figure 6. The logic of a theme interview [4, p. 114].

3.2.2 Interview process

The company's internal interviews were conducted during August and September 2023. The objective was to gain insight into the current state of the company's technical support process at two distinct levels, with a view to determining future requirements. Furthermore, the interviews sought to deepen comprehension of the existing technical support process, thus enabling the sourcing of relevant literature and the selection of the most suitable cases for benchmarking.

Seven technical support professionals, each with approximately a decade of experience in the company's technical support department, took part in the themed interviews. Three of them were based at the company's head office, while four were employed at different country organisations. The interviewees were

provided with nine supporting questions in advance, which they could respond to via email or Teams. The questions and responses were then discussed in further detail during the interviews. The individuals who participated in the interviews are introduced in the following Table 2.

Table 2. The company's interviews.

Interviewee identification	**Work location**	**Interview date**	**Interview method**
1	Head office	24.8.2023	Microsoft Teams
2	Head office	28.8.2023	In person
3	Head office	31.8.2023	In person
4	Head office	24.8.2023	Microsoft Teams
5	Local country office	9.8.2023	Microsoft Teams
6	Local country office	5.9.2023	Microsoft Teams
7	Local country office	7.9.2023	Microsoft Teams

The researcher individually recorded the responses to the supporting questions and the interview notes for each session in Microsoft Word. These notes were subsequently utilized to analyse the feedback received and to determine the user requirements and areas for improvement related to the technical support system.

All technical support personnel interviewed for this thesis have substantial experience in their respective fields. The head office's technical support structure is organised in such a way that each product line is assigned a dedicated technical support professional. Three of the four principal product lines were included in the interviews. Due to a lack of available participants resulting from personnel changes, one product line was excluded from this study. The interviews were conducted in both Finnish and English, and all records were produced in English.

3.2.3 Theme interview questions

The following questions were provided to the interview participants at least one week prior to the scheduled interviews. A sufficient time ensured the participants time for reflecting the questions and the submission of preliminary responses.

1. Describe your role / position in the organization.
2. Describe your role in technical support.
3. Describe the technical support process of your company.
4. What are the strengths of the current process?
5. What are the weaknesses and shortcomings or key improvement areas of the current process?
6. Who are the key stakeholders involved in the technical support?
7. What tools are used for technical support?
8. What would you consider being the key elements for a successful technical support process?
9. Other comments or suggestions?

3.2.4 Analysing the interview results

A considerable amount of data was collected from the interviews, in practice the data consist of answers to the pre-interview questions and the notes from the interviews. This section describes the process and methods used to model and understand this data.

Qualitative analysis is particularly important in a planning project as it is qualitative data that provides answers to questions such as why, how and what. From the data collected it is important to understand what the individual respondents think and to understand the data. One way of categorising the findings is through coding, which refers to the classification of comments, statements and observations made during the customer research phase. The analysis of qualitative data is to some extent an interaction between the researcher and the data. [15] [16]

The researcher reviewed the interview transcripts several times, making notes on themes and identifying similarities, which were listed in the tables according to the themes examined. Themes that were outside the scope of the study, which was to identify user requirements for a technical support system, were excluded. The notes were then collated to identify common themes, categorised and sorted using the double diamond process into strengths, weaknesses and areas for improvement of the current system.

3.2.5 Strengths of the current system

For the strengths of the current systems the interviewed mentioned four main areas.

1. Transparency and availability. Most interviews recognize that having a clear and visible technical support ticket system helps to ensure that other support personnel as well as the sales responsible for the area have access and can contribute to the ongoing issues ensuring collaboration.

2. Knowledgeable personnel. The company's current system of training new technical support personnel by having a responsible mentor accelerates skill development and concentrating on a specific product at the time expedites the learning process creating very experienced staff at a quick pace.

3. Direct access to product development. Quick involvement of product development for complex cases is seen as a major strength.

4. Reactiveness to urgent cases. The possibility for dealer technicians to call the support personnel on urgent cases has widely seen as a key factor in solving critical situations.

3.2.6 Weaknesses of the current process

For the weaknesses the current technical support system the following four main themes came out from the interviews.

1. Documentation gaps. The biggest concern for the current system was that finding product specific information can often be very time consuming. Information is scattered across multiple platforms making it difficult to find specific information. Much of the information is also considered informal which means it is shared from person to person and not openly available in official documentation.

2. The technical support overall relies too much on so-called silent knowledge which resides only with the most experienced support staff and it's difficult to transfer to junior staff. The challenge with silent information it's not limited to Technical Support only but what was seen as a clear the issue also within product development.

3. Insufficient preliminary information. Incoming cases often lack detailed initial information such as log files and serial numbers meaning technical support staff must spend time requesting the basic background data which slows down the process.

4. Inefficient tools. The inability to gather information from previously solved similar support questions is seen that's a major issue.

3.2.7 Key improvement areas

As the main improvement areas, the following four themes were raised several times in the interviews.

1. Unified knowledge base. Almost all interviewees mentioned the need for a centralised database to store troubleshooting guides, error codes, and other technical information to reduce reliance on human memory and personal notes.

2. Enhanced tools improvements in automated log analysis were highly requested. It currently takes a considerable effort from the technical support staff to analyse the log data provided. Regularly the product development is involved in analysing the log data to gain a detailed picture of the sequence of events with the products. The availability of product development is seen as a major benefit, but the interviewees also recognized that this is very resource hungry process.

3. Better communication between different departments in the head office and between head office and country organizations. Best practices are not always successfully taken in use within the company if the information is not easily and openly available.

4. Stronger support for log file interpretation. The utilization of artificial intelligence was raised several times during the interviews as a possible aid in analysing log files.

3.2.8 Comparison of existing systems

The third data collection method involved an analysis and evaluation of two existing technical support systems. Benchmarking is considered one of the design research methods [17]. The initial objective was to identify potential organisations from a range of sectors that would implement the same customer relationship management (CRM) system as the company was using at the time.

The reasoning behind this approach was based on the plans to build the technical support system on the CRM platform, with the intention of identifying the best practices for this specific system through benchmarking. However, identifying and accessing suitable systems proved challenging due to the sensitivity of technical support data and the limited willingness of other companies to share it outside their organisation. Consequently, the preliminary search of suitable benchmarking cases was conducted among companies in different fields, but unfortunately no suitable systems were identified. One possible explanation for this outcome is the reluctance to share sensitive information, even for illustrative purposes. At this point, it was decided to discontinue the process of finding suitable benchmarking systems and exclude this part from the study.

Approximately midway through the study process, the company opted to change the CRM system and all its sub-components due to various reasons, one of the most important being increased costs. This necessitated the identification of an alternative supplier. This decision resulted in a significant postponement of the study process, as the initial plan to utilise the original CRM system as the foundation for the technical support system became impractical. Furthermore, as the new system had not yet been selected, there was no pertinent information regarding the capabilities of the new CRM system. Despite the sudden change creating a significant increase in workload, it also proved beneficial for the outcomes of this study.

When the plans for the new CRM system were released, sufficient time had passed to explore new opportunities for a technical support system. By the end of the study, it was possible to thoroughly investigate two existing systems. One of these systems could even be tested partially with the company’s own data, which provided highly valuable information on the performance of such system. The technical support systems reviewed in this study were found to be very similar in both design and functionality, thus their findings can be treated as one. The primary conclusion drawn was that employing a generative AI-based chatbot is an efficient method for handling questions of varying complexity in areas where source data can be predefined.

3.2.9 What to consider when planning a new service?

It is essential that the customer is at the heart of any new product development, including that of a service product. New technology can readily assume a leading role in product development, particularly in the case of new market entrants such as generative AI. It is essential that any product development process begins with a clear understanding of the customer needs. A customer-centric approach to product development prioritises the resolution of customer issues over the introduction of new technological innovations. [7, p. 249] Ultimately, customer satisfaction is determined by several factors, including the quality of the service or product provided, the price paid, the customer's experience and their expectations [2, p. 137]. It is not the products or services themselves that customers are looking for; rather, they are seeking the benefits that these products and services can provide [10, p. 25].

3.2.10 Other themes to consider

Privacy implications should be considered when establishing a CRM system or utilising its data. It is important to recognise that customer data is an asset for any company. However, it is also essential to ensure that the rights of customers to access and control their own data are respected. If a system or service utilises customer-provided information, it is essential that there is a mechanism in place to remove this information from the database. A customer may require a company to remove their data from its databases and prohibit the company from using this data in the future. [6, p. 108]

The Finnish high-technology dental healthcare manufacturer company has, for the time being, maintained a reliance on human interaction with its technical support. All communications have thus far been conducted between two or more individuals. The potential development of an automated system may result in this human connection becoming a less significant factor. Nevertheless, customers frequently express a preference or even a demand for the option of speaking with

a human representative. [5, p. 260] This should be considered when presenting an automated or partially automated system for the technical support.

3.3 Results – Develop

This section describes the development phase through results from the interviews. The data from the interviews was analysed qualitatively and any relevant reoccurring comments were placed per themes in the tables below.

The following themes were considered:

- Strengths of the current process
- Weaknesses of the current process
- Key elements for a successful technical support process.

Strengths and weaknesses of the current process are considered important themes to consider while designing the new system. It is essential to integrate the strengths of the current systems in a way that does not compromise their effectiveness. Key elements for a successful technical support process sets out the core elements that should be included in the new, improved technical support system. These themes can be considered as the fundamental building blocks for the new technical support system.

3.3.1 Strengths of the current system

As for the strengths of the current system, three themes were recognised from the interview data. As previously explained, the analysis of the interview data is always dependent on the researcher. It can be claimed that these three themes are valid as they were all raised at by at least three persons. These themes are mentioned in Table 3.

Table 3. Strengths of the current system.

Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7
fast reaction				fast reaction	fast reaction	
knowledgeable country organisations				knowledge of the products	knowledge of the products	good knowledge
	one platform	one system	one system			

3.3.2 Weaknesses of the current system

When looking for weaknesses in the current system, the results were more spread out than for the strengths of the system. Overall, the responses on this theme were not as concise and the results are not as strong. For the other themes, at least three mentions were recognised whereas with the weaknesses only two mentions were enough to be added in the Table 4.

Table 4. Weaknesses of the current system

Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7
long queue, too many cases					Long queue, impatient dealers	
sharing information	material spread out			too many systems		
silent information	silent information		not enough knowledge			silent information
collecting information		collecting information				
analysing data					analysing data	

3.3.3 User requirements for a customer-centric technical support system

Identifying the user requirements for a customer-centric technical support system was deemed the most critical aspect of this thesis. The analysis of the interview data yielded concise and clear results regarding the recognition of these requirements. The themes most frequently mentioned were ease of use, easy access, and the provision of accurate information. Additionally, the necessity for a quick response from the system was highlighted multiple times and has been selected in the Table 5.

Table 5. User requirements for a technical support system.

Person 1	**Person 2**	**Person 3**	**Person 4**	**Person 5**	**Person 6**	**Person 7**
quick reaction			quick reaction	quick reaction		
easy to access		easy to use	easy to access	easy to access		
correct information	correct information	correct information		correct informatio n		
skilled support personnel				skilled support personnel		

3.3.4 Summary of strengths, weaknesses and user requirements

To summarise the user requirement related themes from the interviews, the process aimed to find a clear and simplified summary of the main requirements of the technical support system. The following three figures Figure 7, Figure 8 and Figure 9 present narrowing down the themes to descriptive sentences.

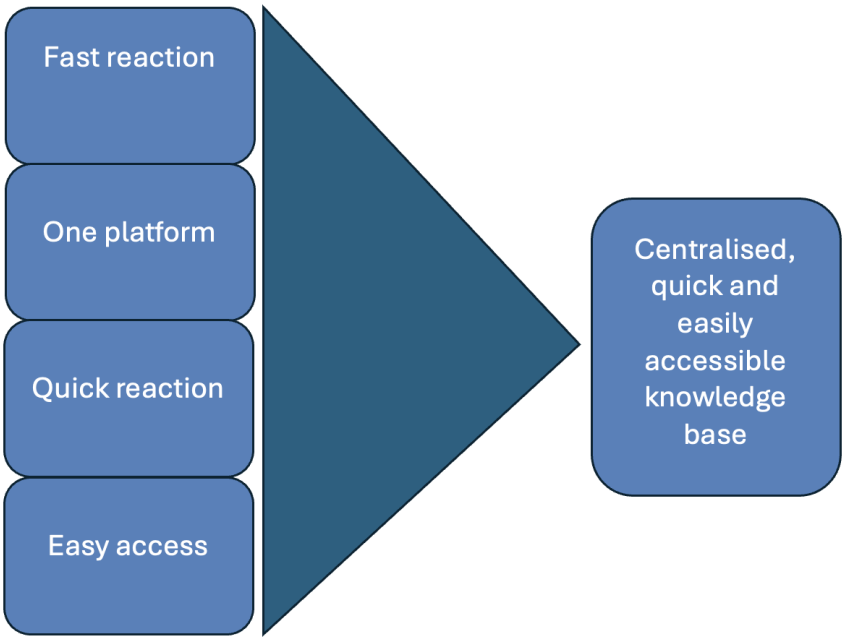

Figure 7. First user requirement for technical support system.

First user requirement is the need for a centralised, quick and easily accessible knowledge base. This could be seen as the most important requirement for such a system, as anything less is likely to result in users not using the system.

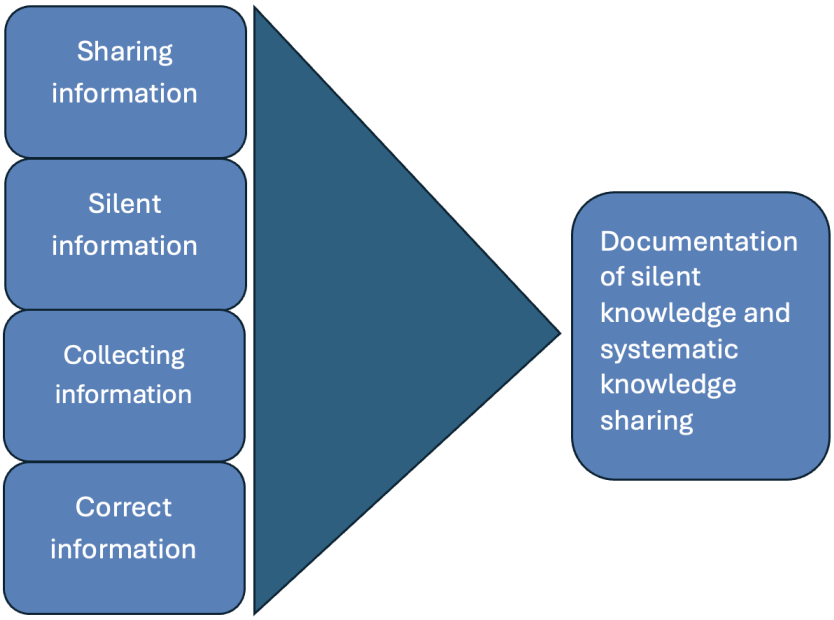

Figure 8. Second user requirement for technical support system.

The second composite user requirement describes the importance of information in the technical support system. The challenges of sharing and finding information were raised in several interviews.

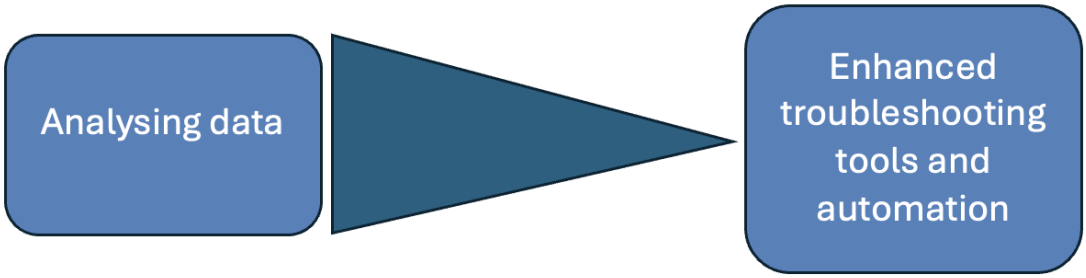

Figure 9. Third user requirement for technical support system.

The third user requirement for a technical support system reflects the importance of data. If the previous two requirements are met, there will be plenty of data available, making its analysis particularly important.

3.4 Suggested technical support system - Deliver

The objective of this study was to enhance the company's technical support capabilities for both its internal and external customers. The project commenced with the preliminary plan to construct this system on the company's existing CRM platform. The interviews and a portion of the literature reviews were conducted at a time when the system had been operational for approximately five years. All participants had already gained considerable experience with the existing CRM system, with a particular focus on its capabilities. It was subsequently acknowledged that focusing on the capabilities of the existing system had the unproductive effect of limiting the outcomes of this study. Fortunately, the company decided to change the CRM system, which resulted in a considerable delay to the thesis study. This change proved to be extremely beneficial, as it permitted a more open-minded approach to the study subject and created an opportunity to gain insight into the potential limitations of the preliminary plans to

build an article-based knowledge database, particularly in terms of time efficiency and overall effectiveness.

The rapid development of generative artificial intelligence (AI) systems has made them an increasingly relevant area of interest for this study. The initial plan to build an article-based knowledge database was swiftly replaced with a focus on studying and analysing the potential of generative AI in addressing user requirements for a customer-centric knowledge database. The design process for a human-centred design for interactive systems is very similar to that of service design [18]. From the interviews, it was evident that a significant amount of time was spent obtaining detailed information from the presented problem to ensure the correct solution was provided. It was also recognised that a considerable amount of time was spent answering simple questions that could be answered with ease by consulting the available documentation. However, it was also recognised that even an experienced support person may find it challenging and time-consuming to locate the answers to these simple questions from the available documentation.

Considering the findings of this study, it is recommended that a technical support system be implemented in the form of a generative AI-based chatbot utilising data defined by the company. The system could be accessed via a website or a messaging app and would appear to the user as though they were chatting with a real person. This would result in a centralised system that is straightforward to use, as it would not require any prior knowledge of the system. The system would contain all the necessary documentation, including that of recorded silent information, which would be then made available to all users.

The system would be able to guide the user in solving the technical problem at hand, thereby greatly automating the troubleshooting process. In case a solution to the technical issue could not found via the AI chat, a case can be created in the ticket system for later human intervention. Even in this case, a significant portion of the preliminary data collection would already have been completed at this stage, thereby accelerating the subsequent troubleshooting phase.

Figure 10 describes in a simplified manner the recommend solution for the technical support system.

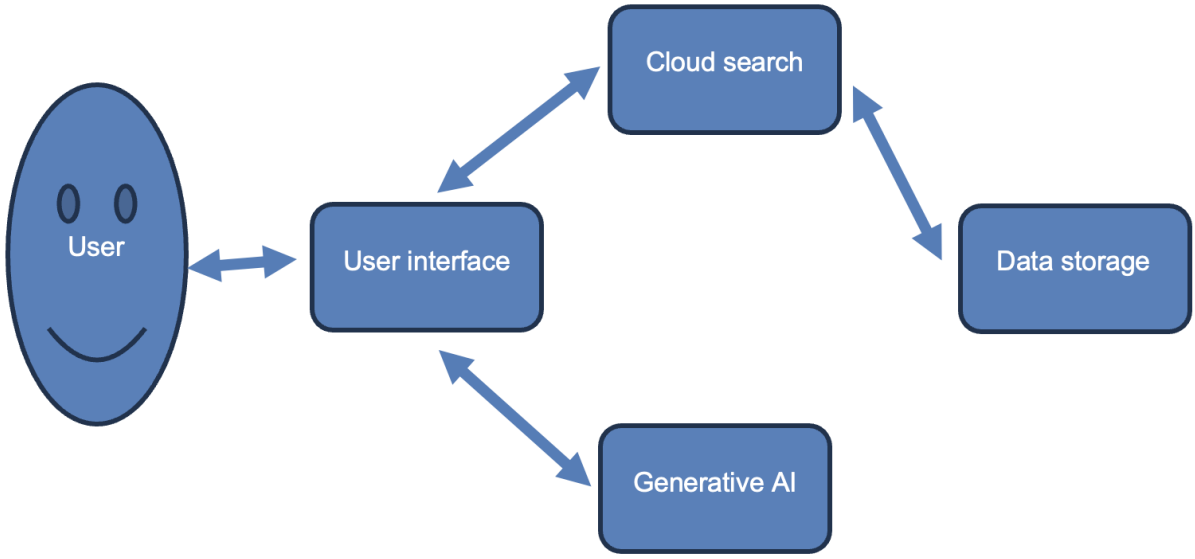

Figure 10. Simplified description of a generative AI chatbot.

4 Discussions and conclusions

The objective of this study was to define the user requirements for a customer-centric technical support system that would be able to efficiently support both internal and external users in a timely manner. This chapter presents the findings of the study and offers an assessment of its reliability and validity.

This study employs the double diamond service design process model, which is combined with service design methods and tools. Following a comparison of various service design processes, the double diamond was selected as it offers the most effective visual representation of the phases of this study and is also a familiar approach to the researcher.

The methodology employed was perfectly suited to the task at hand and ensured a smooth progression from start to finish. The double diamond was an invaluable reference point at various stages of the project, providing guidance when progress stalled, or insight was required on the essential elements.

4.1 Conclusion

Considering the objective of this study, which was to define and present the user requirements for a customer-centric technical support system, it can be argued that the study was a success, and the results are at least satisfactory. The work was completed using themed interviews, in-depth literature research and comprehensive benchmarking. Of these, the themed interviews proved to be the most crucial element. The results of the interviews were analysed qualitatively, and the conclusions were drawn up by the author of the thesis.

The interviews highlighted the benefits and key improvement areas of the current system in a consistent manner. The current technical support process was effective and transparent overall. The availability of experienced technical support personnel, for challenging cases, was identified as a significant factor in both the efficiency of the support process and as a key factor in work satisfaction. The main obstacles identified were the lack of structured communication and the absence of ways to share silent information in an effective manner. Furthermore, the data collection and time-consuming data analysis were identified as areas for improvement.

Chapter 3.3 presents the findings from the interviews and after sorting out themes not related to user requirements, the following three points can be listed:

1. Centralised, quick and easily accessible knowledge base.
2. Documentation of silent knowledge and systematic knowledge sharing.
3. Enhanced troubleshooting tools and automation.

The results indicate that the list of user requirements is relatively concise but that fulfilling them will likely require a significant investment of time and resources due to the complexity of each requirement.

4.2 Reliability and validity

Reliability and validity are key credibility concepts in the natural sciences. These concepts have been successfully adapted to quantitative research, where they are particularly well suited [4, p. 189]. It was acknowledged at the outset of the interviewing process that there might be some bias in the opinions expressed on this theme. The theme of the study was discussed at length by the company's technical support team over several years. It was considered possible that the discussions would affect the interviewees' responses. However, it was observed that during the interviews, the previously held ideas were not reinforced, and new concepts began to emerge.

Qualitative research does not allow for complete certainty of results, as the findings are always dependent on the researcher's perspective. It is therefore important to mitigate the risk of inaccurate results through the implementation of a robust research design. This is a crucial element in assessing the validity of a research project. It is essential to determine whether the findings can be replicated by another researcher. However, as the strength of a semi-structured or theme interview is based on its non-standardised approach, it is not practical to expect another researcher to reproduce it in the exact same way. [13, pp. 213-214] The objective of this study is to guarantee the reliability of the research process and findings by providing a comprehensive account of the methodology and results. To reinforce the credibility of the research, it is vital to ensure that the documentation on which the conclusions are based is transparent and accessible upon request. [4, p. 189]

Further suggestions regarding the technical support system were discussed during the interviews. However, these have been excluded for two main reasons. Firstly, they were not considered to contribute to the main objective of this study,

which was to define the user requirements for the system. Nevertheless, even though they were not included in this study, they still provide valuable input for the overall design of the system and have been carefully logged for future reference.

Several comments and ideas from the theme interviews were not included in the final results of this thesis, as they were not mentioned by a sufficient number of interview participants. It is possible that these themes would have been mentioned if they had been specifically asked. It is possible that this would have been the case. It is possible that these themes would have been considered important for this thesis. It is possible that this would have been the case. One example of a comment that was not included in the conclusion is the need for automated recognition of the same questions directed to different support personnel. It could be argued that this theme would have been of greater interest to the other interviewees, but for various reasons, it was not mentioned by them. It is possible that these comments, which were clearly important to one interviewee but not mentioned by others, could be considered inconclusive results. Nevertheless, it was the responsibility of the interviewers to determine the way the interviews were conducted and the themes that were raised. This dilemma is at the same time the biggest limitation of this study as, partly due to the nature of this study, there cannot be a full certainty that the results are accurate and correct.

The results of the literature research did not reveal significant insight into the actual new technical support system. The research gave invaluable insights into the theory of the interviews and helped to define the interview questions. Furthermore, the interviews were enhanced by providing insight into the correct methodology for conducting these interviews and the desired outcomes.

The literature research also emphasised the importance of excellent service in a production company's technical support services. This enabled a clear focus to be established for the study and a structured approach to be adopted for the

interviews. The conclusion was that the priority should be on resolving customer issues rather than solely on introducing new technological advancements.

4.3 Future studies

For further studies a logical step would be to develop the technical support system. As the speed of which generative AI based systems are evolving, any research should be focused on framework of the system and not on exact tools. It would be beneficial to conduct further research into the technology behind such a system and how it should be operated most effectively. A review of the available benchmarking cases indicates that most of the time is spent not on setting up the system, but on processing the data it utilises. This phase of the project encompasses data processing and categorisation, for instance.

References

[1] Stickdorn M. and Schneider J., This is Service Design Thinking: Basics, Tools, Cases, 2012.

[2] Keskinen T. and Lipiäinen J., Asiakkaan matkassa. Tuotekeskeisyydestä symbioosistrategiaan, 2013.

[3] Haimelin L., “Yrityksen jälkimarkkinointiosaston kehittäminen avainasiakasympäristössä,” 2020.

[4] Kananen J., Design Research as Thesis Research, 2013.

[5] Payne A., Handbook of CRM: Achieving Excellence in Customer Management., 2006.

[6] Peelen E. and Beltman R., Customer Relationship Management., 2013.

[7] Armstrong G., Kotler P. and Opresnik M., Marketing: An Introduction, Global Edition, 2016.

[8] Karjaluoto H., Digitaalinen markkinointiviestintä, 2010.

[9] Fill C. and Turnbull S., Marketing Communications: Discovery, Creation and Comverstations, 2016.

[10] Grönroos C., Palvelujen johtaminen ja markkinointi, 2009.

[11] Gummesson E., Quality management in service organizations: An interpretation of the service quality phenomenon and a synthesis of international research, 1993.

[12] Hammond J., Gross T. and Wesson J., Usability. Gaining a competetive edge, 2002.

[13] Saunders M., Lewis P. and Thornhill A., Research Methods for Business Studets, 2019.

[14] Valli R., Ikkunoita tutkimusmetodeihin 1, 2018.

[15] Goodwin K. and Cooper A., Designing for the Digital Age: How to Create Human-Centered Products and Services, 2009.

[16] Corbin J. and Strauss A., Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory, 2015.

[17] Stickdorn M., Hormess E., Lawrence A. and Schneider J., This Is Service Design Doing, 2018.

[18] ISO 9214-210, SFS-EN, “Ihmisen ja järjestelmän vuorovaikutuksen ergonomia. Vuorovaikutteisten järjestelmien käyttäjäkeskeinen suunnittelu,” Suomen Standardisoimisliitto, 2019.