HOW CAN ARTIFICIAL INTELLIGENCE (AI) BE USED TO ENHANCE AFTER-SALES PROCESSES?

Best practices for adopting Artificial Intelligence in after-sales processes

Lappeenranta–Lahti University of Technology LUT

Master's programme in Business Administration

2024

Siru Kirsilä

Examiners: Roman Teplov

Juha Väätänen

ABSTRACT

Lappeenranta–Lahti University of Technology LUT

LUT Business School

Business Administration

Siru Kirsilä

How can Artificial Intelligence (AI) be used to enhance aftersales processes?
Best practices for adopting Artificial Intelligence in after-sales processes

Master's thesis

2025

114 pages, 14 figures, 5 tables and 4 appendices

Examiner(s): Post-Doctoral researcher Roman Teplov and Professor Juha Väätänen

Keywords: Artificial Intelligence, After-sales service

Artificial intelligence has the potential to offer companies a range of opportunities for the development of their business. The benefits of artificial intelligence for businesses have been extensively studied in recent years, particularly in the early and mid-stages of the B2B purchasing process. While research data on the potential of AI in businesses has increased significantly, it is still insufficient, particularly in later stages of the B2B purchasing processes, such as after-sales service.

The aim of this study is to provide further information to the B2B after-sales service research field on the potential of using artificial intelligence as part of after-sales service processes. The primary research question guiding the study is: "How can artificial intelligence be utilized to enhance after-sales service processes?"

The study has been conducted as a qualitative study, in which semi-structured interviews have been utilized as the data collection method. The Gioia method was utilized to analyse the interview results. In addition to the interview, the research results were supplemented by utilizing secondary data, which consisted of previous literature and research.

The research results indicate that artificial intelligence has significant potential in enhancing the efficiency of after-sales service processes, thereby contributing to the development of the service-quality.

TIIVISTELMÄ

Lappeenrannan–Lahden teknillinen yliopisto LUT

LUT-kauppakorkeakoulu

Kauppatieteet

Siru Kirsilä

Miten tekoälyä voidaan hyödyntää jälkimarkkinoinnin prosessien tehostamiseen?
Parhaat käytänteet tekoälyn adoptointiin osaksi jälkimarkkinoinnin prosesseja

Kauppatieteiden pro gradu -tutkielma

2025

114 sivua, 14 kuvaa, 5 taulukkoa ja 4 liitettä

Tarkastajat: Tutkijatohtori Roman Teplov ja Professori Juha Väätänen

Avainsanat: Tekoäly, Jälkimarkkinointi

Tekoäly tarjoaa yrityksille lukuisia mahdollisuuksia kehittää liiketoimintaa. Tekoälyn hyötyjä liiketoiminnoille onkin tutkittu laajasti viime vuosina, tutkimuksen keskittyen kuitenkin erityisesti B2B-ostoprosessin alku- ja keskivaiheeseen. Vaikka tutkimustieto tekoälyn mahdollisuuksista liiketoiminnoissa on lisääntynyt merkittävästi viime vuosina, on tutkimustiedon määrä edelleen riittämätöntä, erityisesti B2B ostoprosessien jälkivaiheessa, kuten jälkimarkkinoinnissa.

Tämän tutkimuksen tavoitteena on tuottaa lisää tietoa B2B jälkimarkkinoinnin tutkimuskenttään tekoälyn käyttömahdollisuuksista osana jälkimarkkinoinnin prosesseja. Päätutkimuskysymyksenä tutkimuksessa on: ”Miten tekoälyä voidaan hyödyntää jälkimarkkinoinnin prosessien tehostamiseen?”

Tutkimus on toteutettu laadullisena tutkimuksena, jossa aineistonkeruumenetelmänä on hyödynnetty puolistrukturoituja haastatteluita. Haastattelutulosten analysoinnissa hyödynnettiin Gioia-menetelmää. Haastattelun lisäksi tutkimustuloksia täydennettiin hyödyntämällä sekundääristä dataa, joka koostui aiemmasta kirjallisuudesta ja tutkimustuloksista.

Tutkimuksen tulosten pohjalta havaittiin, että tekoälyllä on merkittävää potentiaalia jälkimarkkinoinnin prosessien tehostamisessa ja siten palvelun laadun kehittämisessä.

ACKNOWLEDGEMENTS

Writing this thesis was not an easy process. I conducted the research alongside a full-time job, so completing the thesis in a relatively short time was a considerable achievement. I would like to thank my husband for his significant support and patience during the writing of this thesis. Without his support, I would not have been able to finish it in time. I would also like to thank my work colleagues for their support and for being flexible while I was writing this thesis. Without the support and flexibility of the work, writing the thesis would have been an even more arduous process. Additionally, I would like to thank my supervisors, Roman Teplov and Juha Väätänen, for their invaluable support throughout this research and for guiding me in the right direction. They provided me with many useful tips and tools that helped me significantly during the thesis process. Finally, I would also like to thank all my friends and loved ones for their support and understanding throughout this process.

SYMBOLS AND ABBREVIATIONS

Abbreviations

AI	Artificial intelligence
CES	Customer Effort Score
CEM	Customer Experience Management
CRM	Customer Relationship Management
DL	Deep Learning
HR	Human Resources
LLM	Large Language Models
ML	Machine learning
NLG	Natural Language Generation
NLP	Natural Language Processing
NLU	Natural Language Understanding
NPS	Net Promoter Score
PSS	Product service system
RL	Reinforcement learning
SL	Supervised learning
TAM	Technology Acceptance Model
TOE	Technological-Organizational-Environmental

1 Introduction 13
1.1 Background of the study 13
1.2 Statement of the problem 14
1.3 Aim of the research and research questions 15
1.4 Research methodology 16
1.5 Theoretical framework 17
1.6 Delimitations 17
1.7 Thesis structure 18
2 Literature review 21
2.1 Artificial Intelligence 21
2.1.1 Machine Learning 23
2.1.2 Deep Learning 25
2.1.3 Natural Language Processing 26
2.1.4 Generative AI (GenAI) and Large Language Models (LLMs) 27
2.1.5 The principles of adopting Artificial Intelligence (AI) 29
2.1.6 Artificial and customer experience in service quality context 34
2.1.7 Challenges and considerations 38
2.2 Artificial Intelligence in B2B after-sales processes 41
2.2.1 Different areas of B2B after-sales processes 41
2.2.2 After sales process and customer experience 42
2.2.3 The possibilities of using Artificial Intelligence in B2B after-sales service's processes 45
3 Theoretical framework of AI adoption in after-sales process to enhance customer experience 50
3.1 AI adoption in technological context 53
3.2 AI adoption in organizational context 53
3.3 AI adoption in environmental context 54
3.4 Perceived usefulness (PU) and Perceived ease of use (PEOU) in the context of AI-adoption 54
3.5 Service quality dimensions and AI 55
4 Methodology 56
4.1 Research strategy and Approach 57

4.2 Data collection methods 58
4.3 Data analysis methods 61
4.4 Reliability and validity 64
4.5 Ethical considerations 65
5 Empirical Findings 67
5.1 Considerations related to the adoption of artificial intelligence 68
5.2 The perspectives of the personnel on AI adoption 70
5.3 Opportunities of artificial intelligence in after-sales service 73
5.4 After-sales service challenges 80
5.5 Measuring the impact of AI 83
5.6 The drawbacks and limitations of AI 86
5.7 Minimizing the challenges and risks of artificial intelligence 90
6 Discussion 92
6.1 Problematic areas of B2B sales that AI can solve 93
6.2 Measuring and assessing the impacts of AI adoption 97
6.3 Limitations and drawbacks of AI applications 98
6.4 Considerations regarding the AI implementation 100
6.5 Revised theoretical framework 103
7 Conclusions 105
7.1 Findings 105
7.2 Practical implications 107
7.3 Scientific contribution 111
7.4 Limitations and suggestions for further study 112
References 114

Appendices

Appendix 1. Semi-structured interview questions for sample group 1

Appendix 2. Semi-structured interview questions for sample group 2

Appendix 3. Code table

Appendix 4. Quality elements of After-sales service (Shokouhyar, S. et al. 2020)

Figures

Figure 1: Illustration of the research area and how the different elements interact together

Figure 2: Theoretical background of the study

Figure 3: Thesis structure visualized

Figure 4: A framework which helps to understand different levels of Artificial Intelligence (AI) (Mogili, U. & Mohamed, A. 2023)

Figure 5: The figure presents different type of datasets in unsupervised and supervised learning (Mogili, U. & Mohamad, A. 2023)

Figure 6: Different machine learning methods visualized (Gupta, V. et al. 2022)

Figure 7: The interaction process between the user and generative AI. (Chiarello, F. et al. 2024)

Figure 8: TOE framework describing the different elements impacting the adoption of Innovation technology. (Chong, J. LL. & Olesen, K. 2017)

Figure 9: A model proposed by Ameen Nisreen et al. (2021) on the impact of artificial intelligence on customer experience (Ameen, N. et al. 2021)

Figure 10: The conceptual framework by Chen, Y. & Prentice, C. (2024) to understand relationship between AI and customer experience

Figure 11: Drivers and components of Ethical Artificial Intelligence (Verma, S. et al. 2024)

Figure 12: The five key dimensions of service quality according to Parasuraman A. P. et al. (1988)

Figure 13: Theoretical framework of the study, which combines TOE and TAM - frameworks together with SERVQUAL framework (Chong, J. L. L. & Olesen, K. 2017; Parasuraman A. P. et al. 1988; Davis, F. D. 1989)

Figure 14: Data analysis method by Miles and Huberman (1994)

Tables

Table 1: Quality elements of After-sales service (Shokouhyar, S. et al. 2020)

Table 2: Possible AI-applications for B2B after-sales processes

Table 3: Dimensions of AICSQ (Chen, Q. et al. 2022)

Table 4: The basic information of the interviewees and the durations of interviews

Table 5: Application possibilities of artificial intelligence in B2B after-sales service

Use of artificial intelligence:

In this thesis, artificial intelligence has been used for initial brainstorming (ChatGPT) and in addition, DeepL was used for proofreading and language maintenance occasionally throughout the work.

1 Introduction

This research focuses on studying how AI can be used to improve after-sales processes and, consequently, the service quality. The continuous development of technologies, particularly artificial intelligence, is having a fundamental impact on the business environment and companies' internal processes. AI's expansion into a central part of operations is revolutionizing current methods and opening new opportunities for developing internal processes, such as after-sales services. After-sales services play a significant role in building customer relationships and satisfaction, and research shows that their impact is much greater than at earlier stages of the sales process. The highly competitive environment puts pressure on executives to stay alert and adopt new technologies that could benefit the business and give it a competitive advantage. To reap the full benefits of AI, it must be incorporated into the organization's overall strategy. (Nasir M. et al. 2021; Agrawal, K. P. 2023; Baroni, I. 2022)

1.1 Background of the study

The versatile use of artificial intelligence (AI) in various functions has been widely studied in recent years, as the topic has become increasingly relevant due to the rapid growth in the use of AI tools, particularly following the introduction of ChatGPT in 2022. So far, the examination has focused more on the early pre-purchase stage, including customer acquisition, purchasing behavior and personalization of the customer experience from a marketing perspective. While the utilization of artificial intelligence from a customer experience perspective has been extensively studied in recent years, there are still only a few studies focusing on AI implementations in the B2B post-purchase stage combined with service quality and customer experience perspective. Grewal, D. et al. (2023), for example, emphasize in their study how research focuses heavily on mapping the pre-purchase stage, and argue that more research should be prioritized to examine how AI can improve the the service quality and thereby customer experience in the post-purchase stage. (Grewal, D. et al. 2023).

Artificial intelligence offers numerous ways to increase productivity, streamline internal processes and enhance decision-making capabilities, including managerial efficiency. According to Agrawal (2023), it is necessary to study how different organizations around the world are using AI in various organizational contexts to gain a better understanding of its benefits. Chen and Prentice (2024) argue that the impact of AI adoption on customer experience in service industries has not been studied enough. Therefore, this study will examine the potential of artificial intelligence in after-sales services in different organizational contexts and consider how these solutions may affect the service quality. The information generated by this study could help to target the use of artificial intelligence in post-purchase stages, improving companies' service quality and customer retention as after-sales service becomes more efficient.

This research is being carried out as part of an assignment for a Finnish company which, as part of its operations, provides B2B after-sales services to its customers. As part of the research, two sample groups will be interviewed to gain an in-depth understanding of the potential AI solutions that could be employed in after-sales processes. The first sample group consists of key personnel from the commissioning company, while the second consists of external specialists in AI solutions. In summary, this thesis discusses the after-sales process, examining its impact on service quality and how artificial intelligence can be utilized to enhance it.

1.2 Statement of the problem

People's patience has shortened and the demanded level for service quality has increased. Aftermarket has a critical impact on customer experience and thus customer retention. Common challenges in aftermarket include insufficient response times, poor inventory turnover and overall challenges with customer satisfaction (Shokouhyar et al. 2020). These problems have been found to be very common in aftermarket and the purpose of this study is to map out how these challenges could be solved or reduced by utilizing artificial intelligence. As part of the study, it will also be assessed how the effects of artificial intelligence can be measured.

1.3 Aim of the research and research questions

As mentioned above, there is still very limited research knowledge on the use of artificial intelligence in after-sales service processes. This master's thesis aims to contribute to the research field of B2B after-sales service by highlighting concrete application possibilities for artificial intelligence in these processes, which could improve overall service quality and customer experience. The main research question that this thesis aims to answer is:

How can Artificial intelligence (AI) be used to enhance B2B after-sales processes?

By answering the above-mentioned main research question, the aim is to find out how artificial intelligence can be utilized in different stages of B2B after-sales services. Considering the main objectives of this study translated into the following sub-research questions:

- *What are the problems in B2B after-sales processes that AI can solve?*
- *How to measure and assess the impacts of adopting AI?*
- *What are the drawbacks and limitations of AI applications?*
- *What aspects should be considered in AI adoption?*

These sub-research questions aim to build a comprehensive picture of the link between artificial intelligence and service quality also addressing customer experience from the perspective of improved service quality. Combining the main research question with the sub-research questions enables us to investigate what the general problems of after-sales processes are that AI can help to solve, what are the general drawbacks of AI and how it is possible to measure and assess the impacts of adopting AI as well as what aspects should be considered related to implementation of AI. Figure 1 presents the research area and the interaction between the different elements.

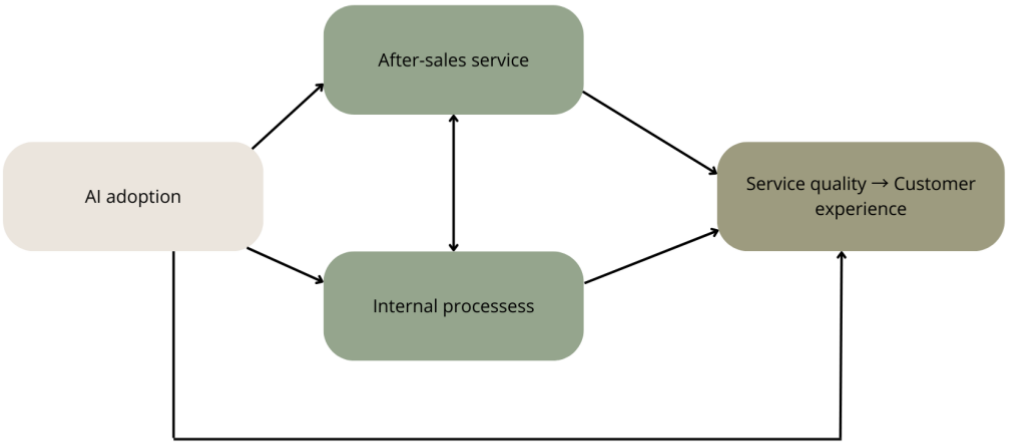

Figure 1. Illustration of the research area and how the different elements interact together

1.4 Research methodology

This study is a qualitative study. Semi-structured thematic interviews and secondary sources, including case studies, previous research materials and internal documents, were used as data collection methods. Three key individuals from the commissioning company and three individuals specializing in artificial intelligence solutions or with experience of integrating artificial intelligence into the company's B2B after-sales services were interviewed. Data analysis uses Miles and Huberman's (1994) content analysis framework, consisting of three phases: 1) data reduction, 2) data display, and 3) conclusion drawing/verification. This technique aims to outline and identify regularities, patterns, causal relationships and explanations in the data that are relevant to answering the research questions of this study, thereby bridging the research gap in how AI can be used to enhance B2B after-sales service processes and service quality. (Miles & Huberman 2002).

The Gioia approach data structure diagram was used to analyze and organize the data, classifying it into three groups: first-order concepts, second-order themes, and aggregate dimensions. The aim of using the Gioia data structure diagram was to present the data in a

clear and transparent way and to help identify recurring themes for analysis purposes. (Gioia, D. A. et al. 2012).

This study uses an abductive analysis method, which builds on existing theory and supplements it with data-driven findings. The abductive approach enables flexible combinations of research findings and underlying theories, helping to generate insights that would not necessarily be possible through inductive or deductive analysis methods alone (Vila-Henninger, L. et al. 2022).

1.5 Theoretical framework

The theoretical framework used in this study is a combination of the following three frameworks: The Technology Acceptance Model (TAM) by Davis, F. (1989); the Technological-Organizational-Environmental (TOE) framework introduced by Tornatzky and Fleischer (1990); and the SERVQUAL model by Parasuraman et al. (1988). The TAM is based on the Theory of Reasoned Action (TRA) and helps to study individuals' attitudes towards new technology, while also explaining and predicting users' acceptance and behavioral intentions regarding the use of technology (Davis, 1989). As the TAM framework is limited to evaluating the user experience, the theoretical framework has been expanded to also address the context in which a new technology is adopted from three different points of view (TOE), and to understand service quality dimensions through the SERVQUAL framework. This theoretical framework is explained in more detail in Chapter 3. Also, see figures 13 & 15 where the initial and revised theoretical frameworks are presented.

1.6 Delimitations

The main limitation of this study is the small sample size of just six people. This limits the generalizability of the results. Regarding the results relating to artificial intelligence solutions, it should be noted that the first group interviewed are not IT professionals. Therefore, the solutions they propose are based on information they have read or heard, as well as their own perceptions.

The review of after-sales services focused on B2B services within the technical trade sector. Therefore, the results cannot be generalized to other sectors. As the companies interviewed were all Finnish, the results are also limited in their applicability to other countries. Additionally, the review focused on the case company's after-sales processes. However, the challenges experienced in after-sales processes depend heavily on a company's industry and operations. Therefore, it is not possible to generalize these findings to cover after-sales processes in general. According to the literature, however, the challenges experienced by the case company were relatively common in after-sales processes. The identified challenges were primarily used to provide context on issues in B2B after-sales services that AI could potentially address. To bring a professional perspective to the research, as well as interviewing key personnel in the case company, a group of AI specialists were interviewed.

1.7 Thesis structure

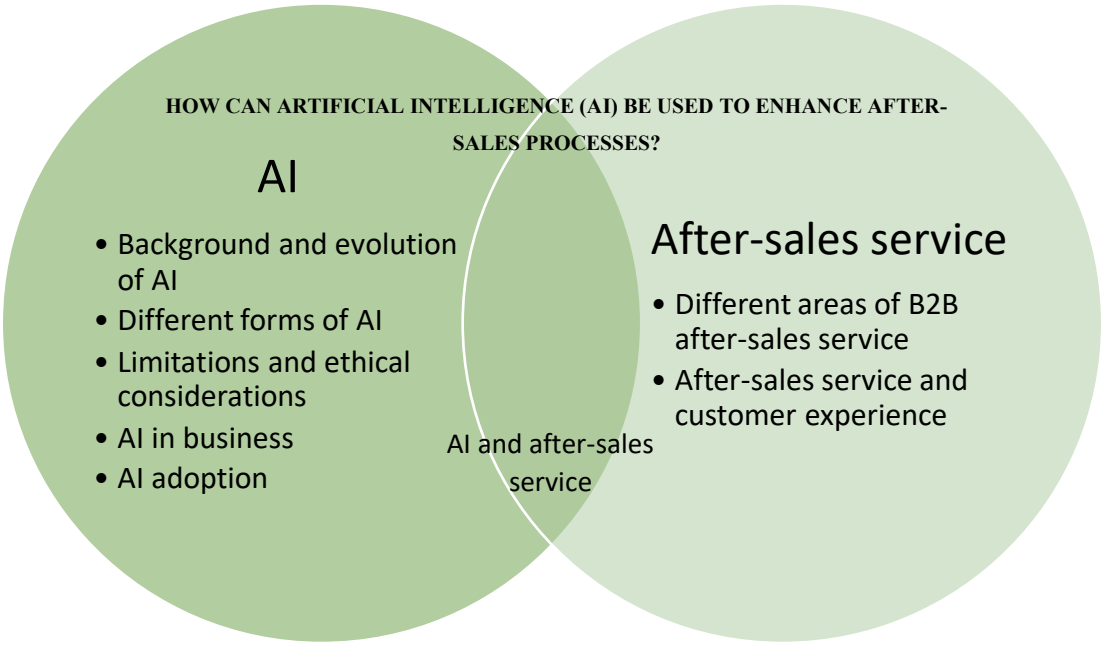

Figure 2. Theoretical background of the study

The theoretical part of this thesis is divided into two sections. (See Figure 2 for a visualization of theoretical background) The first section provides an overview of artificial intelligence and its various forms, including deep learning and machine learning (ML). The aim is to enhance understanding of artificial intelligence and related research. It also provides a brief overview of the history and evolution of AI, as well as the principles of AI adoption and related challenges and considerations. It also takes a brief look into how AI impacts customer experience. The Technology Adoption Model (TAM) by Davis, F.D. (1989) and the Technological-Organizational-Environmental (TOE) framework introduced by Tornatzky, I. G. & Fleischer, M. (1990) are also introduced in this section. These two frameworks will form part of the theoretical framework of this study.

Figure 3. Thesis structure visualized

The second theoretical part examines artificial intelligence in the context of after-sales service, presenting an overview of previous studies related to the research topic and the impact of after-sales service on customer experience. The third chapter presents the theoretical framework of this study, consisting of three frameworks: TAM (Technology Acceptance Model), TOE (Technology–Organizational–Environmental) and the SERVQUAL framework. (See figure 3 where thesis structure is visualized). The following section of the thesis provides a more detailed overview of the methodology, including the research strategy, data collection and analysis methods, and considerations regarding reliability, validity and ethics. The data obtained through the study are reviewed in the

'Empirical Findings' chapter and analyzed further in the 'Discussions' chapter, where they are discussed in relation to existing literature and research as well as the theoretical framework. The final section of the thesis is the Conclusions chapter, which summarizes the findings and discusses the practical applications of artificial intelligence in B2B aftermarket services. It also makes suggestions to management, evaluates the thesis's scientific contribution and limitations, and presents proposals for further research.

2 Literature review

This section reviews the literature relevant to this study, which is based on the topics in the research design and helps to provide background for the theoretical premises of this study. The literature review is divided into two main themes, the first of which discusses artificial intelligence in general, including the evolution and history of artificial intelligence, different forms of artificial intelligence, principles of artificial intelligence adoption, and challenges and limitations of artificial intelligence. The second and final section of the literature review discusses artificial intelligence as part of B2B after-sales marketing processes. This section reviews the different areas of B2B after-sales marketing, the impact of after-sales marketing on customer experience, and delves into the applications of artificial intelligence in after-sales marketing based on previous research and literature.

2.1 Artificial Intelligence

Artificial intelligence (AI) and machine learning (ML) are branches of computer science that develop software and applications based on mathematical algorithms. This software can learn and act under human guidance or autonomously, helping people to solve complex problems and improve the efficiency of numerous tasks. (Mogili, U. & Mohamed, A. 2023) The concept of artificial intelligence has numerous definitions, but it originally emerged in the 1940s with the publication of Isaac Asimov's fictional story Runaround, which revolves around the Three Laws of Robotics. This story has since inspired a generation of scientists, including Marvin Minsky. According to the Three Laws of Robotics: “1. a robot may not injure a human being or, through inaction, allow a human being to come to harm; 2. a robot must obey the orders given to it by human beings except where such orders would conflict with the First Law; and 3. a robot must protect its own existence as along as such protection does not conflict with the First or Second Laws” (Haenlein, M. & Kaplan, A. 2019).

Around the same time that Asimov published his work, the English mathematician Alan Turing developed a machine called the Bombe to help the British government solve the Enigma code. This is considered to be the world’s first electro-mechanical computer. This led Turing to publish an article in 1950 called “Computing Machinery and Intelligence”, in

which he discussed machines, intelligence, and how to test it. The so-called Turing test remains a significant benchmark for identifying artificial intelligence. The idea is that if a human interacts with both humans and machines and cannot tell the difference between human and machine interaction, then the machine can be considered intelligent. (Haenlein, M. & Kaplan, A. 2019). The actual term “Artificial Intelligence” was however coined a few years later, in 1956, when Minsky and McCarthy held a workshop in Darthmouth and came up with the term. (McCarthy et al. 2006)

The concept of artificial intelligence has diversified over time as various disciplines, including computer science, programming, neuroscience, robotics, linguistics, philosophy, and futurology, have contributed to the field. According to the most recent definitions, however, artificial intelligence is a subfield of computer science involving the ability of machines to perform human-like functions, such as learning, reasoning, problem solving, decision-making and data processing based on created algorithms. (Kuhl, N. et al., 2022). Haenlein, M. & Kaplan, A. (2019) on the other hand defines artificial intelligence as follows:” a system’s ability to interpret external data correctly, to learn from such data, and to use those learning to achieve specific goals and tasks through flexible adaptation.”

The study of artificial intelligence can be divided into different levels based on its algorithms and technologies, such as machine learning (ML), deep learning (DL) and natural language processing (NLP). The following paragraphs discuss each area in more depth. (See figure 4.) As mentioned earlier, algorithms form the basis of AI. These can be described as sets of instructions that machines follow to perform desired tasks. An algorithm typically involves input and a series of steps that ultimately lead to a result. AI uses these algorithms to simulate human intelligence, enabling it to learn, make decisions and solve problems independently. (Deng, L. 2018). With the help of algorithms, artificial intelligence can collect, handle, process, and recognize contexts, patterns, and compare data. (Deng, L. 2018; Haenlein, M. & Kaplan, A. 2019)

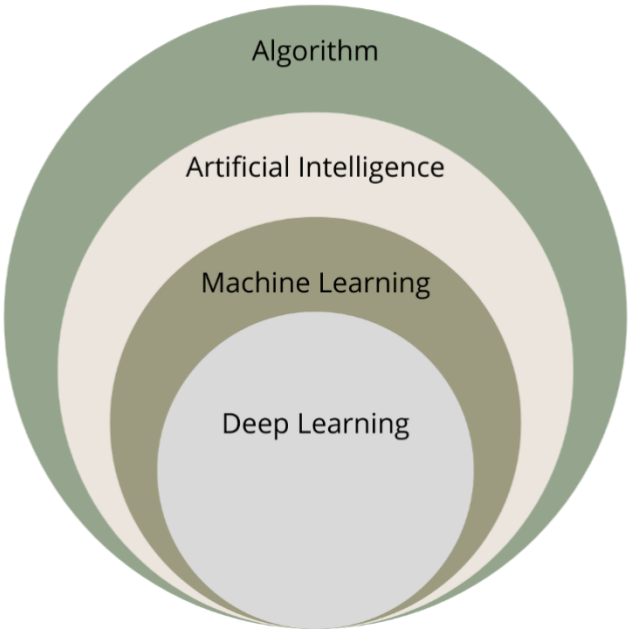

Figure 4. A framework which helps to understand different levels of Artificial Intelligence (AI) (Mogili, U. & Mohamed, A. 2023)

2.1.1 Machine Learning

Machine learning (ML) is a subfield of artificial intelligence (AI) that: “is used to develop artificial computer systems that can implement, adapt and learn without being given explicit or implicit instructions. These systems draw, analyze and implement conclusions from patterns in the data using algorithmic and statistical models.” Machine learning can be broken down into three types of algorithms: supervised, unsupervised and reinforcement. (Mogili, U. & Mohamad, A. 2023) In machine learning, a sufficient amount of high-quality data enables artificial intelligence to learn and develop its operations independently by combining connections, data, and models based on, for example, previous example cases.

(Deng, L. 2018; Haenlein, M. & Kaplan, A. 2019; Mogili, U. & Mohamad, A. 2023)

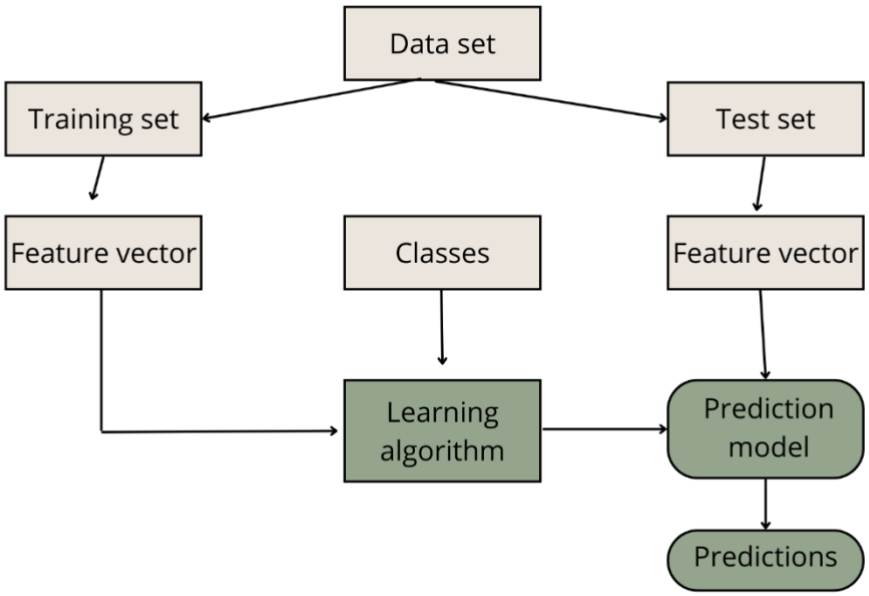

Figure 5. The figure presents different type of datasets in unsupervised and supervised learning (Mogili, U. & Mohamad, A. 2023)

Supervised and unsupervised learning can be distinguished from each other by whether or not learning takes place under guidance and supervision. Supervised learning (SL) takes place under guidance and supervision. In SL, artificial intelligence is trained using a labelled dataset to make predictions based on input data. Supervised learning can be used for regression and classification. Regression models can be used to make continuous data predictions (e.g. stock prices or sales), analyze correlations, or predict interest rates. Classification techniques, on the other hand, are excellent for analyzing binary or multi-class data. (Gupta, V. et al. 2022).

Supervised learning (SL) happens under guidance and supervision, whereas unsupervised learning happens without supervision. In unsupervised learning, artificial intelligence is trained using unlabeled datasets. Rather than providing outputs, the algorithm in unsupervised learning analyses the given input data, trying to identify similarities and patterns from the data points, and the machine learns without human interference. This type of artificial intelligence can be used for clustering (Gupta, V. et al. 2022).

The third type of machine learning is reinforcement learning (RL). Significantly different from the two models of machine learning presented above, RL occurs through interaction

with the environment, with the machine receiving either positive or negative feedback on the choices it makes. This feedback then guides the learning process, aiming to maximize cumulative positive feedback and achieve the best result. (Gupta, V. et al. 2022). In reinforcement learning, the past experience, is used to guide actions in future situations. (Mnih, V. et al. 2015) In practical applications, reinforcement learning, and especially deep reinforcement learning (DRL), has been utilized in games, robotics, and autonomous vehicles. Reinforcement-type learning based on feedback is somewhat similar to the learning process of humans. (Xu, N. 2019) (See the figure 6. where different machine learning methods are visualized)

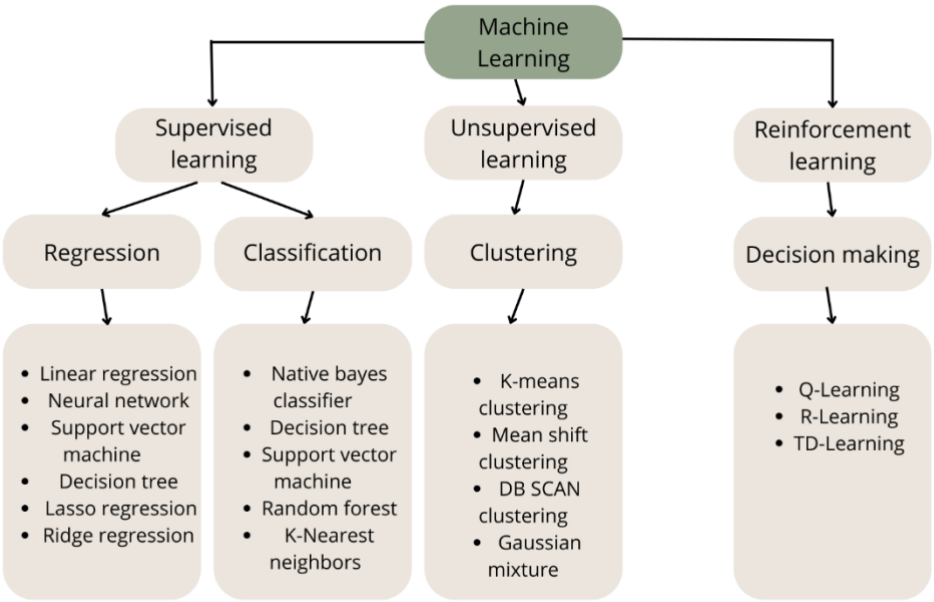

Figure 6. Different machine learning methods visualized (Gupta, V. et al. 2022)

2.1.2 Deep Learning

Deep Learning (DL), just like Machine Learning (ML) can be seen as a sub-field of Artificial Intelligence (AI) as also shown in Figure 4. (Mogili, U. & Mohamed, A. 2023) Deep learning focuses on using artificial neural networks to process large data sets and solve complex problems. These neural networks consist of multiple layers, the structure of which is inspired by that of the human brain. The concept of creating multilayered architectures dates back to the 1970s and 1980s, when several research groups independently developed the idea of multilayered information networks. The most common applications of deep learning utilize

image and speech recognition. (LeCun, Y. et al. 2015) In addition to the aforementioned functions, deep learning can be used for various modelling and prediction tasks. It can utilize both supervised (labelled) and unsupervised (unlabelled) data for learning, and process very large amounts of data. These features make it a powerful tool for speech and image recognition and prediction. (Kumar, R. & Manash, E. B. K. 2019)

2.1.3 Natural Language Processing

According to Shivahare, B. D. et al. (2022) Natural Language Processing (NLP):"is a field of computer science, artificial intelligence used to communicate between computers and human languages." NLP is also a sub-field of artificial intelligence (AI). NLP is focused on interaction of machines and humans through language and like other sub-fields of artificial intelligence, it is also built on algorithms. The study field of NLP focuses on exploring how NLP can be used in practical settings to provide value through different applications like for instance speech recognition. Some of the most typical NLP applications include translation systems, summarization software, speech recognition systems, voice assistants, chatbots, targeted advertising solutions and grammar checking software like Grammarly (Shivahare, B. D. et al. 2022).

Natural language processing (NLP) can be broken down into two components: natural language understanding (NLU) and natural language generation (NLG). NLU can be used to analyze written texts and extract the most relevant information. Natural language generation (NLG), on the other hand, is a generative tool that uses algorithms to edit and generate written text. The main function of NLG is to create automated content. Examples of tools that use NLP to organize data and generate content include GPT-3, Wu-Dao, LaMDA and Quillbot. While NLP provides numerous advantages, it also has disadvantages that should not be ignored (Shivahare, B. D. et al. 2022).

Through the use of NLP it is possible to get answers to any kind of question in just matter of seconds, therefore saving a lot of time. NLP extracts only the relevant information, providing direct answers to the questions. However, the answers provided by NLP cannot be fully trusted and the answers it gives should be treated with caution. NLP cannot always

understand contexts, which can affect the quality of the answers (Shivahare, B. D. et al 2022). One of the biggest challenges of NLP include the complexity and ambiguity of human language, especially dealing with contexts and taking into the consideration the extremely large amounts of data available. These both challenges make it harder for NLP to process and understand the data and meaning of the sentences (Juglan, K. C. et al. 2023). Due to these shortcomings, the content produced by NLP models should not be interpreted as facts and the results should always be viewed critically.

The process phases of NLP may vary depending on the application, but generally NLP process includes the following phases: 1. Data collection 2. Data pre-processing 3. Feature extraction 4. Model training 5. Model evaluation 6. Deployment and 7. Monitoring and maintenance. Depending on the application, the number of needed phases may vary (Juglan, K. C. et al. 2023).

Today, NLP has become a common tool used in various settings, such as customer service. Examples of NLP-related applications used in customer service include chatbots, personalized services and summarizing customer feedback and complaints. These applications help to provide faster, more personalized customer service. The different stages of NLP in customer service includee: Pragmatics, semantics, syntax, morphology. The 3rd International Conference on Advanced Computing and Innovative Technologies in Engineering, held in 2023, explored the effectiveness of NLP in customer service. It was found that, when used with caution and combined with high-quality input data, NLP can help companies enhance their customer service, making it more efficient and ultimately improving the customer experience. However, potential risks and ethical implications, such as data security and privacy, must be carefully considered when using NLP models in customer service (Juglan, K. C. et al. 2023).

2.1.4 Generative AI (GenAI) and Large Language Models (LLMs)

Large Language Models (LLMs), or as better known, Generative AI is in the core of natural language processing (NLP) techniques. One of the best known generative LLMs is ChatGPT that was launched in late 2022, revolutionizing the use usage of generative AI. Since 2022, the number of users has risen from 201,38 million to 281,26 million by the end of 2024. According to estimations, the number of users will reach 1172,44 million by the end of year

2031 (Statista, 2025). Despite of the exponential growth of the use of generative AI, this technology is still considered to be in its infancy especially considering its novelty and uncertainty. The typical kind of interaction between generative AI and the user usually happens through a dialogue, making it user-friendly even for the beginners. (Chiarello, F. et al. 2024)

In 1989, Davis Fred introduced a framework called The Technology Acceptance Model (TAM) describing how the users adopt and accept new technologies. According to this widely used framework, usefulness as well as perceived ease of use are found to be one of the key elements in adopting new technologies (Davis, F. D. & Granic, A. 2024). According to Chiarello, F. et al., this might partly explain the rapid growth of the users of generative AI. (Chiarello, F. et al. 2024)

The use of generative AI is simple and can be broken down into a few straightforward steps. The interaction begins when the user formulates a task and describes it to the generative AI, creating a "prompt". The user then sends this prompt, or formatted task, to the AI, which analyses the task and produces the final result (output). Users often have certain expectations for the final result. If these are not met, users can provide new instructions to the AI (iterate), which will process the new prompt and produce a new final result. Figure 7 below is an illustrative model of the interaction process between the user and the AI (Chiarello, F. et al. 2024)

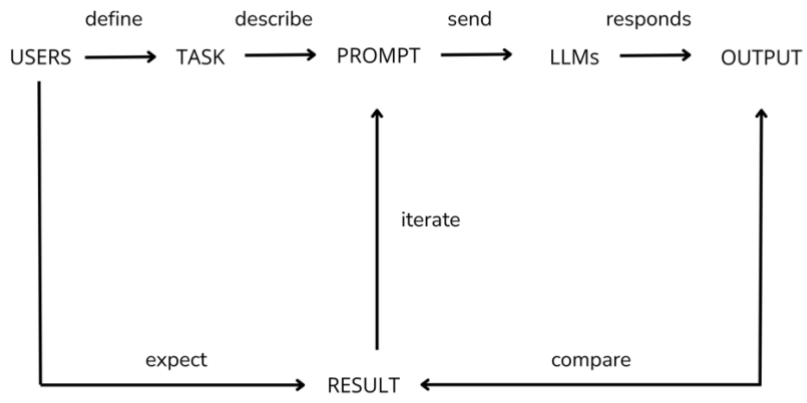

Figure 7. The interaction process between the user and generative AI. (Chiarello, F. et al. 2024)

Since the release of Chat GPT, research on artificial intelligence has exploded. Giordano, V. et al. (2024) highlights in their study how hard skills have a significant impact on the interaction between the user and generative artificial intelligence, in this context referring to ChatGPT specifically. The study highlights that hard skills are particularly useful for effective interaction, in contrast to the recent emphasis on the importance of soft skills. He therefore emphasizes the need for further research on the topic, in order to better understand how hard and soft skills affect the effective use of artificial intelligence. (Giordano, V. et al. 2024)

2.1.5 The principles of adopting Artificial Intelligence (AI)

The rapid growth in the use of AI puts pressure on companies to integrate it into their operations if they are to remain competitive in the long-term. Adopting AI in business is a complex, multi-step process. Implementation is influenced by industry, the nature of services and products, digital infrastructure, operating models, financial situations and organizational readiness to accept new technology. This section reviews the fundamentals of AI adoption.

According to the TAM (Technology Acceptance Model) created by Davis, F. D. (1989), the adoption of technology depends, among other things, on whether the technology is perceived as useful (Perceived usefulness, PU) and whether it is easy to use (Perceived Ease of Use, PEOU). These factors help to understand **why** and **how** new technology is adopted. In other words, if artificial intelligence is found to be easy to use and useful, it is more likely to be adopted. However, the adoption of artificial intelligence at the organizational level still requires systematic change management and training (Davis, F. D. 1989; Gupta, V. 2024).

The Technology-Organization-Environment (TOE) framework, first introduced by Tornatzky and Fleischer (1990), provides a different perspective on the factors that enable or inhibit the adoption and implementation of new technologies, such as artificial intelligence, compared to the Technology Acceptance Model (TAM) framework. It helps us

to understand the organizational and external motives and factors involved in adopting new innovative technologies. Since its emergence, the framework has been further developed by several researchers. It is based on three main contexts: technological, organizational, and environmental contexts (Chong, J. LL. & Olesen, K. 2017).

According to Chong, J. LL. & Olesen, K. 2017): "*The technological context relates to both the internal and external technologies relevant to the organization. Organizational context refers to descriptive measures about the organization such as size, scope, managerial structure and internal resources. The environmental context refers to an organization's industry, competitors and government policy on intention."* (See the figure 8.) (Chong, J. LL. & Olesen, K. 2017)

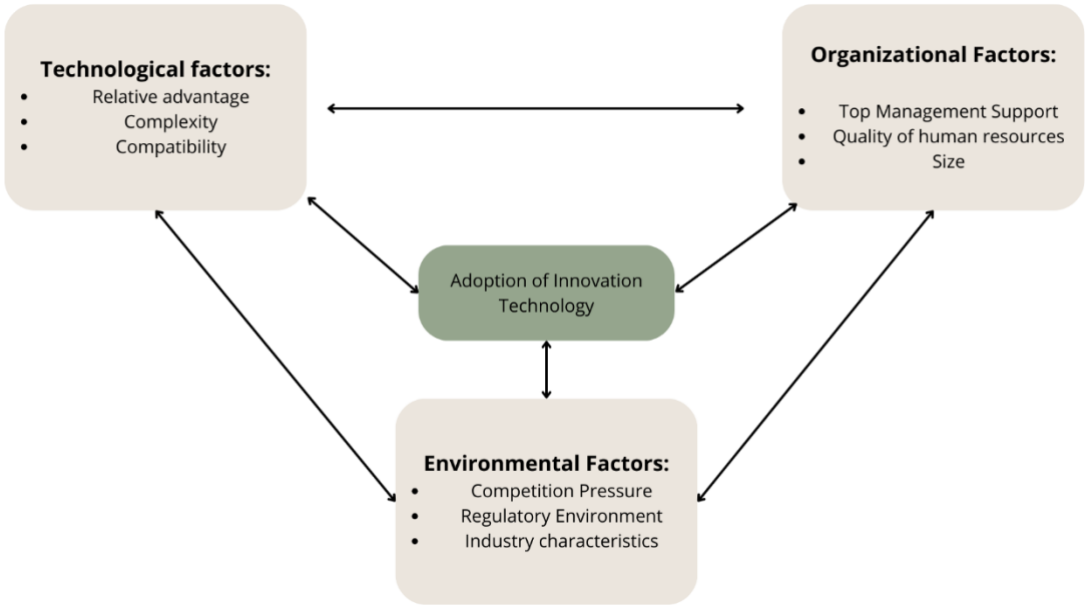

Figure 8. TOE framework describing the different elements impacting the adoption of Innovation technology. (Chong, J. LL. & Olesen, K. 2017)

Controlled and gradual adoption of AI can bring significant competitive advantages and new opportunities for innovation to small and SME companies. According to a study by Gupta V. (2024), AI-based solutions also bring added value to business and help companies in their digital development. However, to gain advantages from the use of AI technologies, companies' understanding of their own business needs and how AI technologies can be utilized to promote these needs with minimal effort is necessary (Gupta, V. 2024). According

to a tertiary study by Cubric, M. (2020), which is based on 30 systematic literature reviews, the main drivers for the AI adoption are economic in nature, dealing with cost, time, performance, customer satisfaction, decision making as well as drawing predictions. According to Haefner, N. et al. (2023): "*Companies that succeed in implementing and scaling AI can ensure they remain competitive, drive value creation across the value chain, unlock efficient, reliable, and explainable AI solutions, and develop new AI-based capabilities."*

As mentioned above, the adoption of AI is a multi-stage process. According to Gupta, V. (2024), the adoption of AI into a business can be divided into three main stages: the pre-perception and perception stage, the assessment stage, and the outcome stage. These different stages include a number of different factors. According to Gupta, V. (2024), "the pre-perception and perception phase is influenced by various factors, such as social factors, domain experience, technology experience, system quality, training and support, interaction convenience, and Anthro morphism". The assessment stage according to him: "is influenced by perceived usefulness, perceived ease of use, and perceived enjoyment". These elements influence the user's experience and attitude towards the technology in question. The third and final stage leads to either the adoption of the technology, the utilization of human knowledge, or the search for alternative solutions. According to Gupta, V. (2024), the use starts from hedonic reasons, turning into utilitarian motivations to assess how the technology could benefit the user and, in this case, the business in particular (Gupta, V. 2024).

According to a study by Gupta, V. (2024), social networks significantly impact how entrepreneurs view AI. If an entrepreneur's inner circle views the use of AI positively and finds it useful, the entrepreneur is more likely to view AI positively too. The study's findings suggest that social factors play a greater role than the perceived usefulness of the technology in shaping people's perceptions of it and its adoption. The key factors influencing willingness to adopt technology are whether it is perceived as useful and easy to use, and whether it brings joy. (Gupta, V. 2024). According to Gupta, V. (2024): "*entrepreneurs are more likely to adopt new technologies that stand out in terms of overall quality, performance, accuracy, maintainability, and accessibility*".

According to the framework proposed by Haefner, N. et al. (2023), the success of AI implementation hinges on the effective adoption and scaling of AI, including the utilization of appropriate socio-technical levers. These socio-technical levers include developing a

well-organized, reusable data pipeline, ensuring sufficient technical infrastructure, and using appropriate AI models. At the same time, the right social context must be established for the growth of AI, the expansion of AI capabilities within the organization and the development of a suitable organizational structure for AI. The AI vision sets the direction for implementation, while AI capabilities ensure that the opportunities AI can provide can be harnessed. These factors are found critical for successful AI adoption in Haefner's, N. et al. (2023) framework for AI implementation (Haefner, N. et al. 2023).

In the framework introduced by Haefner et al. (2023), the adoption of AI is divided into three levels: 1. Proving the concept 2. Productionizing 3. Platformizing. In the first phase, the aim is to prove the concept and familiarize oneself with the possibilities offered by artificial intelligence in general, as well as testing its ability to generate business value through pilot projects. At this stage, simple technological infrastructure is sufficient, and ready-made AI models can be used for initial experiments. External support is commonly used and advised for building models, training and deployment in the first phase. This can help to build basic competence within the company and provide valuable insights into the potential of AI. The most important thing at this stage is to establish a functioning data pipeline that can be used for future solutions. This will make it easier to implement future solutions and remove data silos. It is also essential in the first phase to create an AI deployment vision for the organization consisting of different types of pilot project offering business benefits, and to assign a team to respond to and coordinate AI development projects in cooperation with other personnel. (Haefner, N. et al. 2023).

In the second phase of the framework developed by Haefner, N. et al. (2023), artificial intelligence is transferred to a production environment where systems are continuously used, actively monitored and developed. The aforementioned scalable, reusable data pipeline is already operating in the background. During this phase, artificial intelligence implementation transitions from individual pilots to the entire value chain, enabling different business units to utilize it more extensively to support various processes. At this stage, there is an increased need to consider information security, GDPR and regulation, and the technical infrastructure requirements also become more demanding. The technological infrastructure must support data management, the use of artificial intelligence, and evaluation and development for scaling and further development at an appropriate level. The goal at this stage is to be able to carry out different types of experiments in fast cycles. The

importance of key AI experts within the company is emphasized. These experts are responsible not only for development projects, but also for encouraging others to use artificial intelligence. (Haefner, N. et al. 2023; Chong, J. LL. & Olesen, K. 2017).

The third and final phase of the framework developed by Haefner, N. et al. (2023) involves platformizing AI, thereby scaling it up from individual projects to different business areas. Rather than involving individual solutions, this phase involves a strategic shift at an organizational level into becoming a data-driven company with strong AI expertise and the ability to develop extensive solutions to support business. This requires a significantly greater technological infrastructure than the previous phases, as the large-scale utilization and scaling of AI requires computing power, performance, resource management and speed. When developing the technological infrastructure, it is important to ensure that the models are not dependent on individual service providers or cloud services. This improves the extensibility of platforms and facilitates future infrastructure changes. In order to establish a clear development direction, a long-term strategic vision for the use of AI within the company must be established. In this third phase, the focus shifts from vertical solutions to horizontal capabilities and interdisciplinary collaboration within the organization so that artificial intelligence can be used as effectively as possible to serve the organization as a whole, from operational decision-making to speeding up manual processes (Hafner, N. et al. 2023; Chong, J. LL. & Olesen, K. 2017).

The main obstacles to adopting AI are financial and related to the limitations of the digital environment, particularly in small and medium-sized enterprises. Staff resistance can also slow down or even prevent the adoption of AI. Other recognized barriers include the availability of data, reusability models and social considerations such as job security and safety. Lack of knowledge and trust are also commonly cited challenges. A lack of AI-related expertise and interest is also commonly perceived as a challenge to AI adoption in many companies (Cubric, M. 2020).

To overcome the aforementioned challenges and obstacles, it is crucial for companies to integrate artificial intelligence into their strategy and systematically implement it into business operations. In the initial phases, utilizing external experts can help prove the concept and facilitate gradual implementation. Using instructional and educational materials, such as YouTube videos and internal training sessions, can help to overcome resistance to accepting new technology. Assimilating and learning the technology helps

users to understand it, and plays a key role in how it is experienced and how motivated users are to adopt it (Haefner, N. et al. 2023; Gupta, V. 2024).

2.1.6 Artificial and customer experience in service quality context

As highlighted in previous chapters, artificial intelligence can be used for a variety of purposes, such as improving the customer experience through improving the service quality and streamlining internal processes. These applications can influence the customer experience and its various touchpoints. This section briefly defines the concept of customer experience and its related subthemes also diving deeper into the relationship between artificial intelligence and customer experience in a service quality context.

Customer experience is a broad concept consisting of the various touchpoints between customers, companies and products/services. It encompasses all forms, from customer service quality to marketing, packaging and product/service usability and durability. It is these numerous areas that shape the customer experience. Customer satisfaction is formulated from these so-called customer experience series, with the final result achieved by subtracting negative experiences from positive ones. Meyer, C. & Scwager, A. (2007) define customer experience as follows: ”Customer experience is the internal and subjective response customers have to any direct or indirect contact with a company” (Meyer, C. & Schwager, A. 2007) According to Verhoef, P. C. et al. (2009), an even more holistic perspective should be taken when examining customer experience. This perspective considers the customer's cognitive, affective, emotional, social and physical reactions at different touchpoints with the company. The examination should cover the entire customer journey, from searching for a service or product to purchase, consumption and after-purchase stage including after-sales service.

Artificial intelligence is shaping customer experiences, enabling companies to personalize and enhance them in new ways. When combined with data analytics, AI enables companies to react faster and understand customer purchasing behavior. According to Nisreen et al. (2021), strategically using AI at various stages of the customer journey can significantly benefit companies and potentially improve customer satisfaction. Common AI applications include chatbots, augmented reality, computer vision-driven image recognition, predictive inventory management, content production and customer insight. AI also enables highly

advanced, data-driven personalization. According to previous reports, this personalization can reach the top 1% of customers with the greatest potential. These customers are up to 18 times more valuable than average customers. (Ameen, N. et al. 2021)

To effectively benefit from the above-mentioned AI technologies, it is important to understand the customer, their preferences and how previous customer experiences influence the background. AI can also be used to understand the customer and build customer profiles. The information obtained with AI can help to identify the best communication and interaction models with different customers (Ameen, N. et al. 2021).

Ameen, N. et al. (2021) built a new model in 2021 (see figure 9) to try to understand how AI-enabled services can affect and help improve customer experience. The model is built on Morgan & Hunt's (1994) trust-commitment theory and Parasurama et al. service quality model (1994). According to Ameen Nisreen et al. (2021): “The model integrates factors that are relevant to the phenomenon of customer interaction with AI-enabled services. In addition, trust and perceived sacrifice are integrated as mediators in the model, mediating the effect of the exogenous factors: convenience, personalization and AI-enabled customer service, and the endogenous factor: AI-enabled customer experience.” This model takes into account that customers are motivated by hedonism and that humans have a need for autonomous action. However, the model also considers the human tendency to make sacrifices at the “cost” of autonomy in certain situations, if the choice otherwise brings pleasure or comfort. This phenomenon can also be called perceived sacrifice (Ameen, N. et al. 2021).

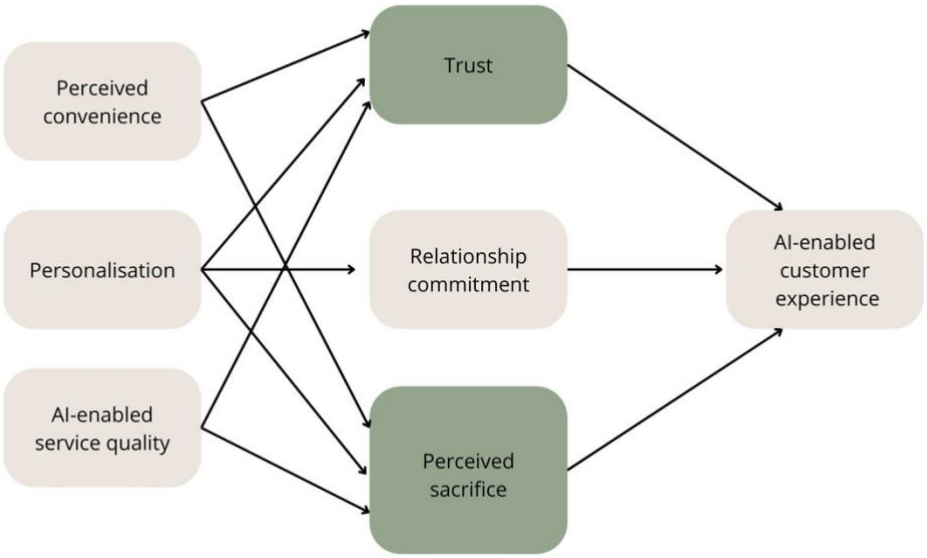

Figure 9. A model proposed by Ameen Nisreen et al. (2021) on the impact of artificial intelligence on customer experience (Ameen, N. et al. 2021).

Artificial intelligence can be used to shape the customer experience in both online and offline contexts. Customer experiences related to artificial intelligence consist of hedonic and recognition aspects. In terms of service, artificial intelligence enables improvements to the customer experience in several areas, increasing efficiency and saving time. Additionally, artificial intelligence enables personalization and the provision of enjoyment and delight through various means. Therefore, artificial intelligence enables the improvement of both hedonic and recognition aspects of the customer experience on the service side (Saponaro, M. et al. 2018).

A study by Ameen N. et al. (2021) highlights the various potential benefits of utilizing artificial intelligence and examines the so-called sacrifices made by customers. The drawbacks of using AI-enabled services include a lack of human interaction, loss of privacy and control, and time consumption, all of which can negatively affect the customer experience. However, the study's results emphasize the importance of trust and service quality. Building trust between a company and the technology it provides — in this context, artificial intelligence — is facilitated if the AI-enabled services are personalized, convenient and of high-quality. Customers are also more willing to accept new technology and sacrifice

elements of traditional interaction, provided that the AI-embedded service is perceived as reliable and high-quality. Examining the quality of services enabled by artificial intelligence can be divided into the following dimensions: Interface design, security and additional customer support. (Ameen N. et al. 2021). The quality of the service, its interface design, reliability, and possible additional customer support therefore significantly affect how customers experience services enabled by artificial intelligence and how willing they are to adopt the new technology.

To better understand the relationship between customer experience and artificial intelligence, Chen, Y. and Prentice, C. (2024) prepared a conceptual framework. In this framework, they divided it into three building blocks and four functions that impact customer experience, ultimately leading to the adoption of AI and its outcomes. (See figure 10.) The three building blocks include the following components: touchpoints, context, and quality, whereas the four functions include: Analyze, Design, Engage and Guide. The outcomes, on the other hand, include AI-enabled personalization, AI and trust, and AI adoption and customer experience. Forming the conceptual framework, Chen, Y. & Prentice, C. (2024) already thought of the future directions consisting of factors, functions and outcomes coming up with several proposals for future studies and possible research questions. (Chen, Y. & Prentice, C. 2024)

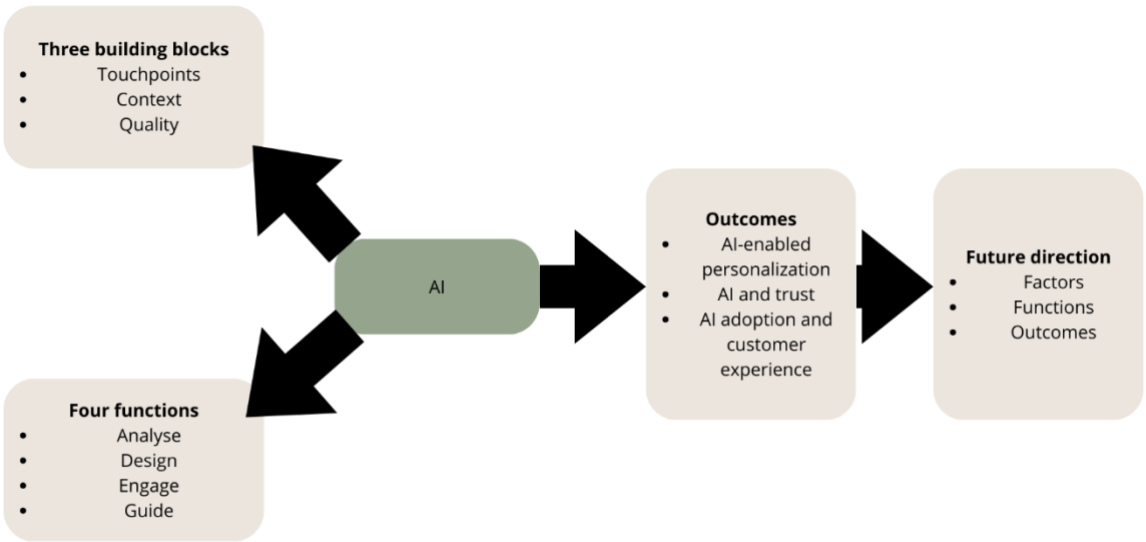

Figure 10. The conceptual framework by Chen, Y. & Prentice, C. (2024) to understand relationship between AI and customer experience

According to Chen, Y. and Prentice, C. (2024), the adoption of AI may elicit a range of feelings from customers, from anxiety to excitement. A common concern among customers is data privacy. To enhance the customer experience and address concerns about data privacy, companies should transparently communicate their privacy policies to customers. Overall, AI has great potential to improve operational efficiency and the customer experience when the solutions have been implemented well (Chen, Y. & Prentice, C. 2024).

2.1.7 Challenges and considerations

Although AI has clear potential to add value to businesses, it also presents certain challenges. While AI is an important tool for companies to collect and analyze data, such as customer information, information security and privacy must also be taken into account. This plays an essential role in building trust with customers. This chapter discusses the limitations, challenges and considerations related to the use and adoption of artificial intelligence in more detail.

Artificial intelligence, especially generative AI, presents numerous challenges and limitations of which users need to be aware. These include erroneous results, biases and difficulty to trace original sources. The quality of AI-generated outputs is only as good as the quality of the data sources and the effectiveness of the prompt. Rather than viewing AI as a solitary decision-making entity, Gupta, V. (2024) advocates viewing AI as a collaborative partner. The study highlights the idea that ChatGPT outputs should be used as hypotheses to guide research and the verification of information from different sources. This enables entrepreneurs to make rational decisions based on reliable information. It is essential that users understand the opportunities and limitations offered by AI technology, reducing their dependency on it while providing them with the opportunity to develop the dynamic capabilities needed to use such technologies in areas where they can add the most value to the business (Gupta, V. 2024).

One of the key ethical issues that must be considered in relation to artificial intelligence is bias, and how fair and equal it is towards different groups of people. Depending on its

programming or the input data, AI may learn to discriminate against certain population groups on the basis of race or gender, for example. (Verma, S. et al. 2024) This is an important area to consider, especially as artificial intelligence is increasingly utilized, for example, in HR processes, making it critical to ensure that artificial intelligence does not discriminate against applicants in recruitment processes, for example.

Verma, S et al. (2024) published a conference proceeding in International Conference on Disruptive Technologies (ICDT) and presented four contributions that can be used to prevent unintended adverse effects of AI technology, and they are as follows: algorithm transparency, fairness & duty, data rights & security, prolateness & surveillance. **Ensuring the transparency** of algorithms helps to understand how AI reaches the result and the logic behind it. **Fairness & duty**, in turn, ensures that AI does not perform biased or discriminatory functions. **Data rights & security** encompasses the organization of the necessary regulations to ensure the data protection and privacy of individuals. **Prolateness & Surveillance** stands for actions that aim to limit AI's access to collect data and use it for surveillance functions. Figure 11 illustrates the drivers of ethical artificial intelligence.

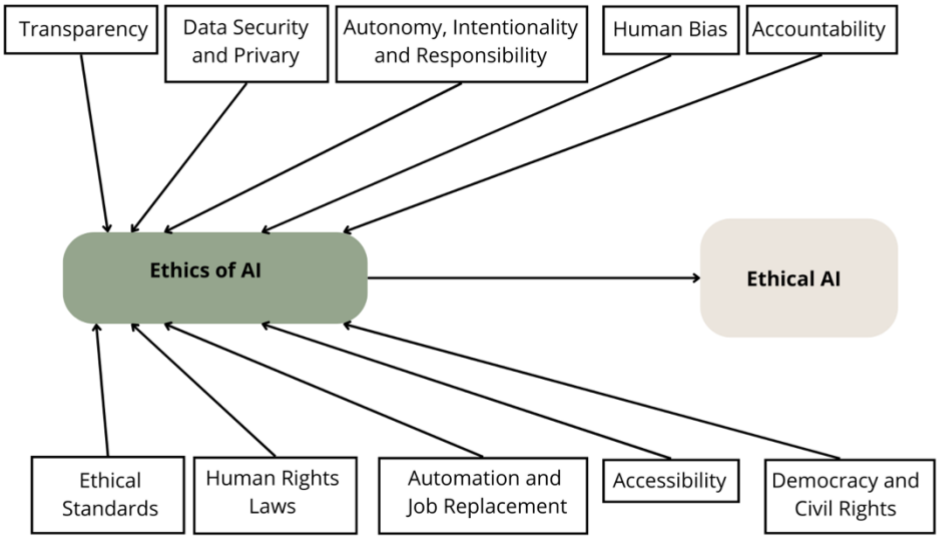

Figure 11. Drivers and components of Ethical Artificial Intelligence (Verma, S. et al. 2024)

One of the key issues with artificial intelligence is bias. The quality of the results and operation of artificial intelligence depends on the quality of the input data and algorithms used. Therefore, it is important to be aware that AI can produce biased results and lead to negative outcomes. People produce the data, and as people are not impartial, the data also contains prejudices and biases, which can affect the outcome in various ways. The most common causes of bias in AI are biased datasets, flawed algorithms, and the subjective decisions of data scientists and programmers. Bias in artificial intelligence is a significant problem that can lead to discriminatory outcomes. Discrimination can particularly affect minority groups and increase inequality in society. Examples of such decisions include credit assessments by banks, facial recognition programs, and recruitment decision-making programs (State, L. 2021; Aninze, A. & Bhogal, J. 2024; Cardenas, S. & Vallejo-Cardenas, S. F. 2019).

Another drawback of current deep learning models is their lack of transparency. Some AI solutions do not currently offer a way to examine the logic behind decision-making processes. This undermines the reliability of AI solutions and the ability to assess their decision-making capabilities objectively to ensure transparency (Aninze, A. & Bhogal, J. 2024).

Data security and privacy are also important considerations when using artificial intelligence, particularly for business purposes. This applies not only to companies' internal data processing, but also to customer data. This requires companies to understand how artificial intelligence works and how to process information securely, as well as being aware of open language models and the nature of data that can be given to artificial intelligence. Artificial intelligence itself can also expose companies to data security problems. In Europe, the strict GDPR regulation sets out strict requirements for data processing that must now be considered in relation to artificial intelligence. Legislation and guidelines for artificial intelligence are still in their infancy, so transparency and education are important when it comes to artificial intelligence, data security, and privacy protection. However, XAI (explainable artificial intelligence) models can help to solve GDPR-related problems in this area (State, L. 2021; Aninze, A. & Bhogal, J. 2024).

Researchers are currently working to make AI more impartial and address privacy concerns. The development of XAI models is one aspect of this work. Explainable AI produces explanations of the logic behind decisions, which can improve the logic and ethics and

reduce bias in AI decision-making. Additionally, teaching human-centered operating models and values to AI is another way to reduce the aforementioned problems. However, it should be noted that these operating models can negatively affect the accuracy of the results. Furthermore, the explanations produced by XAI are context dependent. In practice, this means that XAI explanations always respond to a specific problem and consider a particular user group and purpose (State, L. 2021; Aninze, A. & Bhogal, J. 2024).

2.2 Artificial Intelligence in B2B after-sales processes

As highlighted in previous chapter, artificial intelligence can be utilised in many areas of business to streamline processes, support decision-making, improve the customer experience, and increase data management. This section will examine the implementation of artificial intelligence in the B2B after-sales process, its various phases and the impact of after-sales service on the customer experience. It will also review previous literature and studies on the use of artificial intelligence in the B2B after-sales process.

2.2.1 Different areas of B2B after-sales processes

After-sales service refers to the key services and interactions with customers that companies provide after a purchase transaction in the post-purchase stage. This can include technical support, maintenance and repair services, spare parts services, and warranty matters. However, the scope of after-sales service varies depending on the nature of the product or service sold. (Galvani, S. et al. 2022; Rodríquez, R. et al. 2018). Furthermore, the type of customer relationships and their needs can vary significantly. Baines, T. & Lightfoot, H. W. classify customers into three categories based on their service needs: 1.) Customers who want to carry out all repairs themselves; 2.) Customers who carry out some work themselves, such as oil changes, and purchase some services as a bundle; and 3.) Customers who want all work, including maintenance services such as predictive maintenance and oil changes, to be carried out for them (Baines, T. & Lightfoot, H. W. 2014).

After-sales service is a critical part of business-to-business relationships and consists of several complex processes. The coordination and strategic implementation of these processes requires careful planning. In a B2B context, the need for and quality of after-sales service are often even more critical than in the consumer sector. Therefore, B2B after-sales service requires a more holistic approach and continuous development to meet customer expectations (Galvani, S. et al. 2022; Rodríquez, R. et al. 2018).

Baines, T. & Lightfoot, H. W. (2014) classify aftermarket services into three categories: base, intermediate and advanced. In this classification, base services include basic functions such as warranty services and spare parts. Intermediate services consist of a set of services that help maintain the product. These include repairs, overhauls and support services, for example. Advanced services, on the other hand, focus on maintaining product efficiency through various service agreements, such as customer support agreements and revenue-through-use contracts (Baines, T. & Lighfoot, H. W. 2014).

The emergence of Industry 4.0 has brought new technologies that have significantly impacted the potential of various functions and accelerated the development of service design. Industry 4.0 technology has not only enabled a new level of servitization, but also the development of product-service systems (PSS), in which the service is no longer directly linked to the product being sold. PSS can include consulting and training, for example. Industry 4.0 has enabled significant progress in the development of new services and/or the improvement of existing ones through the use of digital technologies (DS), thus creating new value for customers and deepening customer relationships. One of the most widespread examples is the Industrial Internet of Things (IIoT), which provides customers with a more advanced PSS offering that would not have been possible before. (Galvani, S. et al. 2022).

2.2.2 After sales process and customer experience

After-sales service plays a significant role in shaping customer experience, brand loyalty and reputation. As mentioned in previous sections, post-purchase processes have a significant impact on customer experience. Effective after-sales service increases overall customer satisfaction, often leading to word-of-mouth recommendations and new purchases, therefore positively contributing to customer retention (Nasir M. et al. 2021). Nasir M. et al. (2024) in a study evaluating the relationship between after-sales service and brand reputation in a case

study conducted in the kitchen appliance industry found that high-quality after-sales service not only helps to improve brand reputation but also builds longer-term customer relationships. In addition, high-quality after-sales service was found to have a significant relationship with customer attitude and purchase intention.

A case study by Jimenez-Delgado et al. (2024) shows in practice how the Lean Six Sigma process development methodology can be utilized in a key role in the development of after-sales services. This model helps to streamline processes, reducing service lead time. According to Jimenez-Delgado et al. (2024), adopting this methodology leads to, among other things, faster response times, lower error rates, and a well-structured model for handling customer contacts and needs, while also improving customer satisfaction. Moreover, according to Jimenez-Delgado et al. (2024):" *In the current changing and complex context, a good product or service is not enough; it must be complemented with agile response times, the ability to resolve doubts, concerns, and problems, as well as personalized and friendly attention, which can improve or worsen the customer's perception of quality"*.

The model created by Legnani, E. et al. (2007) emphasizes the importance of creating a standardized service model consisting of several elements, such as proactive maintenance, streamlined communication channels and continuous customer feedback mechanisms. All of these elements have a significant impact on customer experience and satisfaction. Clear processes enable companies to provide consistent service, thereby strengthening customer trust. According to Legnani, E. et al. (2009), after-sales service has become a significant means by which companies can differentiate themselves from competitors, as well as being a strategic way to increase customer retention. (Legnani, E. et al. 2007; Legnani, E. et al. 2009).

The Internal Customer Relationship Management (IntCRM) framework introduced by Eichorn (2004) presents a perspective that success in internal customer management helps lead to success in external customer management. The model focuses on improving and directing areas where there may be internal deficiencies, such as communication, training and resource allocation, which can help improve customer service. The purpose of well-managed Internal Customer Relationship Management is to ensure that employees have sufficient starting points to handle customer contacts effectively, thereby improving

customer satisfaction. From this perspective, internal processes play a significant role in the relationship between after-sales marketing and customer satisfaction.

According to Parasuraman et al. (1988), there exists five key key dimensions of service quality: reliability, assurance, tangibles, empathy, and responsiveness. (See the figure 12). SERVQUAL, the tool to measure customer perceptions of service helps the businesses to understand the most critical areas that form the customer experience in service sector, helps to measure it as well as develop the most critical touch points. (Parasuraman A. P. et al. 1988)

Figure 12. The five key dimensions of service quality according to Parasuraman A. P. et al. (1988)

Shokouhyar, S. et al. (2020) notes in their study that quality elements are sector-specific and that SERVQUAL itself does not identify quality elements suitable for different sectors. In their study, Shokouhyar, S. et al. (2020) summarizes the contributions of different researchers on quality elements dealing with after-sales service sector, dividing the quality elements into the five quality dimensions introduced above. These quality elements are presented in the appendices (See Appendix 4.)

2.2.3 The possibilities of using Artificial Intelligence in B2B after-sales service's processes

This section reviews the scientific literature and previous studies addressing the potential of AI in business, taking into account the quality elements introduced in the previous chapter. The implementation cases presented here serve as a secondary source for the study, enriching the results of the qualitative interviews.

Artificial intelligence has brought about significant innovations that can be utilized as part of various business processes. In their 2021 conference paper, Mesenzani and Di Massa discussed the use of artificial intelligence in sales, marketing, and after-sales services. The publication examined the possibilities of using virtual assistants, chatbots, vocalbots, robotic process automation solutions and analytics tools in customer relationship management, and in general, how artificial intelligence could be used to generate value in this area. Notable application areas include automatic complaint handling, personalized interaction, and predictive maintenance. While the study's conclusions highlighted the use of AI in customer management as a strategic path, the publication also states that much development of AI is still required to ensure sufficient service quality. Additionally, the publication emphasizes other considerations such as user experience, change management, design and adapting the identity of chatbots to suit customers (Mesenzani, M. & Di Massa, A. 2021).

In their 2023 conference paper, Juglan, K. C. et al. highlight several different applications, including in customer service and after-sales service processes. These areas include sentiment analysis, automatic summarization, language translation, voice recognition, intent recognition, knowledge bases, text generation and chatbots, as well as personalization. One of the applications of NLP in customer service is sentiment analysis, which can be used to categorize feedback. In this context, NLP can be used to identify and classify customer feedback as negative, positive or neutral. Based on the analyzed data, patterns in the feedback and areas in which the company could improve the customer experience can be identified. Artificial intelligence can also be used to speed up response times to feedback, which can improve customer satisfaction. Positive feedback can also be identified and used for marketing purposes to improve brand image, as well as for processing customer feedback (Juglan, K. C. et al. 2023).

According to Juglan, K. C. et al. (2023), automatic summarization can be used to process customer feedback and customer satisfaction survey results. Automatic summarization uses NLP to identify main points and helps to identify trends effectively. Automatic summarization can be used, for example, to identify areas for development from feedback. This also helps to summarize feedback, analyze it, and reduce human errors in data summarization, saving time for human processors (Juglan, K. C. et al. 2023).

According to Ghorbel, A. et al. (2024), the integration of artificial intelligence into, for example, bearing fault diagnosis and detection processes brings significant speed to fault detection. In particular, Machine Learning (ML) and Deep Learning (DL) can analyze significant amounts of data, learn very complex patterns, and predict and detect deviations and faults, according to Ghorbel, A. et al. (2024). The integration of artificial intelligence into the fault detection process enables diagnostic automation, early fault detection, and reduces the need for manual investigation, thus saving time (Ghorbel, A. et al. 2024). Several other studies have been conducted on the use of AI as part of fault diagnosis, including a study by Zhao, Y. et al. (2019), which surveyed Artificial Intelligence based fault detection diagnosis methods for building energy system. This study also identified significant potential in AI in fault diagnosis. (Zhao, Y. et al. 2019) A study by Jang, K. et al. (2025) that investigated explainable artificial intelligence for fault diagnosis of industrial processes also confirmed that AI can successfully locate both single and multiple faults in the industrial processes (Jang, K. et al. 2025).

NLP-based language translation can be used in many ways to offer customers service in their preferred language. The translation feature can be integrated into other systems, such as chatbots, to improve accessibility and provide service in the right language. Similar services include voice recognition, which, in addition to translation, can be integrated into systems such as chatbots. Speech recognition enables speech to be converted into text and processed alongside other NLP-based programs, such as translation features or sentiment analysis. Speech recognition can significantly improve the efficiency of customer service. As well as being used in chatbots, speech recognition can transcribe customer service calls for quality assurance and training purposes, as well as for virtual assistants (Juglan, K. C. et al. 2023).

Maintenance forms a significant part of after-sales service, particularly within the industrial equipment and machinery sector. Until now, maintenance and repair scheduling has often been based on random estimates, which may have resulted in maintenance being performed

too early or too late, wasting resources. Artificial intelligence predictive models are an excellent tool for optimizing maintenance planning and scheduling. In a recent study, Ibrahim, H. (2022) investigated the potential of AI to analyze a machine's condition and maintenance requirements. During the predictive maintenance process, sensors produced data which the model then collected, analyzed and modelled to produce predictions and inform measures that help avoid costly breakdowns and downtime. The study concluded that integrating artificial intelligence into maintenance prediction can provide economic benefits and improve efficiency (Ibrahim, H. 2022).

Dereci, U. & Tuzkaya, G. (2024) confirmed Ibrahim, H´s (2022) perspective on the benefits of predictive maintenance, while also introducing the concept of spare parts management. Their article briefly reviews several maintenance strategies, which they divide into three categories: reactive, proactive, and aggressive. Failed maintenance can result in significant financial losses, deterioration in product quality, and a significant increase in operational costs and possible downtime in the entire production chain. For this reason, choosing the right maintenance strategy is critical. The study utilized basic data analysis in the machine learning lifecycle, combined with previously introduced XAI tools that can produce explanations for the background to the predictions and decision-making process. The article presented a preliminary model for spare parts management as part of the predictive maintenance outcome, which would also help optimize spare parts inventory management (Dereci, U. & Tuzkaya, G. 2024).

As the previous chapter introduces the following topic, another significant area of predictive AI models is inventory management, particularly regarding spare parts and consumables in the after-sales service context. Artificial intelligence utilizes machine learning algorithms which can support the forecasting of storage needs and purchases. This helps to optimize inventory levels, and the amount of capital tied up in inventory. Additionally, predictive inventory helps to reduce overstocking and thereby improves overall inventory turnover. Efficient inventory management reduces costs and improves the efficiency of data analysis. Efficient inventory management can also improve service quality and customer satisfaction by ensuring the right products are in stock, taking delivery times into account. In this context, artificial intelligence can be used to forecast demand, identify patterns and generate supply chain strategy proposals. According to a study by Narne, H. (2021), AI-based inventory management optimization tools reduced forecasting errors by 25%, improved inventory

efficiency by 20%, and lowered operational costs by 15%. Challenges associated with AI-based inventory management include relatively high initial costs related to implementing the technology and hiring or training skilled personnel. Additionally, information security is a key consideration in inventory management (Narne, H. 2021; Ünal, Ö. et al. 2023; Hussain, M. Z. et al. 2024).

Both intent recognition and a knowledge base are effective ways to improve customer service. Intent recognition can identify the intent behind customer queries and feedback. For example, it can direct leads to the right person. To speed up customer service and provide an automated service, companies can utilize a knowledge base. Natural language processing (NLP) uses certain trained data sources to serve customers and answer questions. This reduces the workload of customer service representatives, and the number of times customers need to contact them for basic questions. A knowledge base may include user guides, spare parts documents and maintenance guides, for example. In addition to customer service, a knowledge base can also provide effective internal support for customer service personnel, speeding up the search for answers and the right information and making customer service more efficient (Juglan, K. C. et al. 2023).

Text generation uses NLP to write automated text responses. This can be used, for example, in customer feedback responses, chatbot responses, creating complaint tickets, and handling customer inquiries. This frees up customer service agents' time and improves customer service efficiency (Juglan, K. C. et al. 2023).

In their conference paper, Juglan, K. C. et al. (2023) also highlight the possibility of personalizing customer service according to individual customer needs and expectations. Natural language processing (NLP) utilizes data for personalization, such as historical data and customer information, to create a personalized experience. Identifying customer needs can support personnel by enabling customer service representatives to quickly gain an overview of the customer base, history and operating models, allowing them to take these factors into account when providing service. This can significantly improve the customer service experience (Juglan, K. C. et al. 2023). The possible AI-applications for B2B after-sales processes identified in this chapter are summarized in below in the table 2.

Table 2. Possible AI-applications for B2B after-sales processes

After sales service	Possible AI application	Source
Customer aftermarket support and technical assistance	Chatbots, virtual assistants, NLP, knowledge base	Juglan, K. C. et al. 2023; Mesenzani, M. & Di Massa, A. 2021
Maintenance services	Predictive maintenance	Ibrahim, H. 2022; Mesenzani, M. & Di Massa, A. 2021
Spare parts	AI Data driven inventory management (predictive analytics), GenAI assistant tool for finding right parts, knowledge base	Narne, H. 2021; Ünal, Ö. et al. 2023; Hussain, M. Z. et al. 2024
Repair services and troubleshooting	AI enabled diagnostics and internal AI assistant	Ibrahim, H. 2022; Zhao, Y. et al. 2019; Ghorbel, A. et al. 2024; Jang, K. et al. 2025
Returns management	AI can help to analyze feedback and generate possible improvement ideas	Juglan, K. C. et al. 2023
Operational efficiency	AI Inventory Management, data pipe,	Narne, H. 2021; Ünal, Ö. et al. 2023; Hussain, M. Z. et al. 2024
Customer feedback analysis	NLP; Sentiment Analysis, Automatic Summarize	Juglan, K. C. et al. 2023

Although knowledge of, and research findings on, artificial intelligence applications are constantly increasing, the field of research is still relatively new and there are many gaps in our understanding. This section discusses the potential after-sales applications identified so far based on previous research and literature, but it is worth recognizing that the possibilities of artificial intelligence are constantly expanding through new empirical research and experiments, as well as through the development of artificial intelligence infrastructure, human skills, and AI capabilities. The aim of this study is to generate more research data in

this field based on interviews conducted. The results of these interviews will be discussed in later sections of the study.

3 Theoretical framework of AI adoption in after-sales process to enhance customer experience

This section presents and summarizes the theoretical framework of this study, which is built around the following three frameworks: Technology-Organization-Environment framework originally introduced by Tornatzky and Fleischer (1990), later reviewed among all by Chong, J. L.L & Olesen, K. (2017), SERVQUAL framework by Parasuraman, A. P. et al. (1988) as well as Technology Acceptance Model (TAM) framework introduced by Davis, F. D. (1989) presented in the previous chapters. See the figure 13. below where the theoretical framework is visualized in the context of using AI to enhance after-sales processes. A revised version of the theoretical framework will be presented in chapter 6 (see the figure 15.)

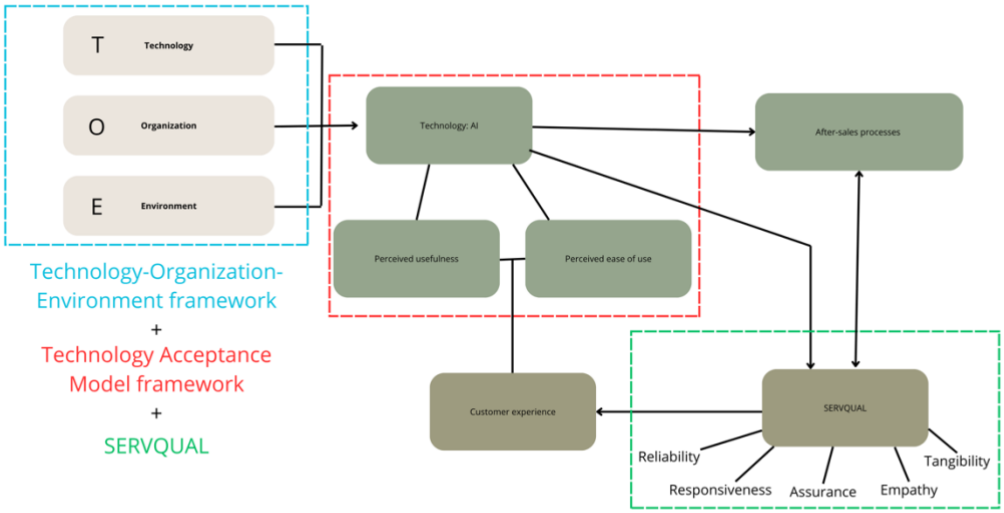

Figure 13. Theoretical framework of the study, which combines TOE and TAM -frameworks together with SERVQUAL framework (Chong, J. L. L. & Olesen, K. 2017; Parasuraman A. P. et al. 1988; Davis, F. D. 1989)

Combined, these three frameworks help to build a layered framework that considers all the entities that are essential for this research setting. The Technology-Organization-Environment framework helps to describe the context in which AI is implemented from the perspective of technology infrastructure, organizational readiness and operating environment. (Chong, J. L. L. & Olesen, K. 2017) The Technology Acceptance Model (TAM) framework helps to understand how both employees and customers who use technology accept new technology and how AI is perceived as useful (PU) and easy to use (PEOU) in this context. (Davis, F. D. 1989) The SERVQUAL framework brings a perspective on the five quality dimensions of service, which are, as already mentioned above: reliability, assurance, tangibles, empathy and responsiveness. These qualitative metrics help to understand the elements that influence the customer experience of a service and, in the study's context to understand how AI assisted after-service service impacts the service quality and thus customer experience (Parasuraman A. P. et al. 1988).

The three aforementioned frameworks were chosen as the theoretical framework of the study as none of the frameworks alone would suffice to cover the entire research setting. As

previously mentioned, the TAM framework focuses on examining how an individual adopts technology based on its perceived usefulness and ease of use, which ultimately leads to a behavioral intention to use or not use AI. Therefore, the TAM framework does not consider the context in which the AI is adopted including organizational factors such as organizational resources, management support, human resources or technological infrastructure, nor environmental factors. Furthermore, the TAM framework does not provide tools to understand the impact of AI adoption on service quality of after-sales processes.

TOE alone, on the other hand, only addresses the context of the adoption of innovative technology from three previously mentioned perspectives (technological, organizational and environmental factors), without explaining individual behavior and the individual's experience of the adoption of technology. Nor does TOE, like TAM, assess service quality dimensions thereby not fully understanding the impacts of AI on service quality and customer experience.

As mentioned above, the SERVQUAL framework focuses on the qualitative dimensions of the customer experience of services (reliability, assurance, tangibles, empathy, and responsiveness). This framework helps to outline the elements that affect the customer experience of after-sales service quality in relation to the implementation of artificial intelligence. The framework does not however consider the organizational context in which artificial intelligence is implemented or how/why artificial intelligence is accepted for use at the individual level.

For this reason, this study utilizes a combination of these three frameworks in which the artificial intelligence works as the tool or enabler to streamline activities in the operational context of after-sales service, thereby improving the service quality of after-sales service. The combined framework enables the holistic examination of the research topic from the perspectives of the individual service quality, the context of AI adoption (technological, organizational, and environmental factors), and the assessment of AI impacts, making it an excellent fit for this research setting.

3.1 AI adoption in technological context

In the TOE framework, one of the three main contexts is technological infrastructure, which can act as either a constraint or an enabler of the adoption of new technologies. As AI adoption expands significantly, it also places demand on technological infrastructure, requiring compatibility and sufficient computing power, among other things. (Chong, J. L. L. & Olesen, K. 2017; Agrawal, K. P. 2023)

According to Agrawal, K. P. (2023) the Diffusion of Innovation theory by Rogers identifies five key attributes in regard to the context of technology: relative advantage, compatibility, complexity, observability and trialability. **Relative advantage** in this context refers to the extent to which AI is perceived to be better than its predecessor technology and thus provides an advantage over previous technologies. **Compatibility** in this context refers to how well AI works with existing business processes and practices and how well it aligns with the values of end users. **Complexity** in this context assesses how easy or difficult it is to understand and utilize AI in practice. **Observability** in this context refers to how well the benefits of AI can be demonstrated in other organizations where the technology has been already adopted. And finally, as a final attribute, **trialability** in this context refers to how easily AI can be tested experimentally before it is integrated more widely within the organization. (Agrawal, K. P. 2023)

3.2 AI adoption in organizational context

According to Agrawal, K. P. (2023), the organizational context consists of the main characteristics of an organization, including: the **size**, **complexity of managerial structure**, **level of centralization**, **degree of formalization**, **quality of human resource**, and **level of existence of slack resources**. These characteristics and organizational elements help to explain the reason why some of the organizations are more innovative than others. Other key attributes that can influence the effectiveness of adoption of new technology include organizational resources such as the overall **technology infrastructure**, **managerial knowledge**, and also the **company's previous experiences with IT solutions**, which can also influence new experiences. Companies with promising leadership skills and good IT

skills in general have better capabilities to adopt AI efficiently and gain competitive advantage of the utilization of AI (Agrawal, K. P. 2023; Chong, J. L. L. & Olesen, K. 2017).

3.3 AI adoption in environmental context

The environmental context for AI adoption encompasses the various characteristics of the business environment in which a given company operates. These characteristics include the **competitive landscape**, the **industry** and **interaction with the government**, for example. It is recognized that a company's industry and competitive situation, as well as the extent to which competitors utilize artificial intelligence, have a significant impact on other companies' willingness to adopt it. These factors can be considered a form of institutional pressure. The environmental context considers how external pressures, as well as the company's ability to perceive different factors, affect its attitude and initiatives related to AI adoption (Agrawal, K. P. 2023).

The previously mentioned institutional pressures can be divided into three categories: normative, coercive and mimetic. Normative pressure can be seen, for example, in how other stakeholders in a key network have adopted AI, and in how much support is available from the government and other critical industry agencies for the use of AI. A critical factor is also the regulatory environment and the availability of support relating to AI adoption regulations. Coercive pressure arises when central companies with power influence dependent companies through their guidelines. Examples include parent companies in group companies or franchises, where main companies set policies for the introduction of new technologies. Mimetic pressure arises from modelling other parties. This pressure is usually linked to a company's own ignorance and its inability to perceive its strategic goals regarding the adoption of new technologies more broadly, or to an otherwise unstable operating environment. (Agrawal, K. P. 2023)

3.4 Perceived usefulness (PU) and Perceived ease of use (PEOU) in the context of AI-adoption

According to Baroni, I. et al. 2022, the perceived usefulness in the context of AI adoption refers to the individual level experience / belief on whether the adoption of AI will help to

improve the individual's performance. When it comes to perceived ease of use, in this context it refers to the individual level perception on whether the utilization of AI is perceived as easy to adopt and use. And overall, PU & PEOU impact the behavioral intention to use AI (Baroni, I. et al. 2022). If AI is perceived as easy to use and one believes that AI can help to improve the performance, it is more likely that the individual's behavioral intention will lead to the adoption and continuous use of AI.

3.5 Service quality dimensions and AI

The SERVQUAL framework introduced by Parasuraman et al. (1988) comprises five service quality dimensions also introduced in the previous chapters: tangibles, reliability, responsiveness, assurance, and empathy. However, according to Chen, Q. et al. (2022), these dimensions are not enough when applying the framework model to AI context. In the study by Chen, Q. et al. (2022), new multi-level dimensions are introduced as a AICSQ (AI chatbot service quality) model. Chen, Q. et al. (2022) justified the creation of new AI service quality dimensions with two arguments: 1. These five previously mentioned service quality dimensions do not help in evaluating the innovative technological characteristics of AI, and 2. The language intelligence and recognition capabilities of AI is not part of the previous studies. The study recognized seven multi-level dimensions of AICSQ, including: Semantic understanding, Close Human-AI collaboration, Human-Like, Continuous improvement, Personalization, Culture adoption and Efficiency. (See the table 3.) According to Chen, Q. et al. (2022), these identified dimensions may also help companies to assess whether the AI solutions are "competent employees" or assistants to the organization (Chen, Q. et al. 2022).

Table 3. Dimensions of AICSQ (Chen, Q. et al. 2022)

Semantic understanding	**Close Human-AI collaboration**	**Human-like**	**Continuous improvement**	**Personalization**	**Cultural Adaptation**	**Efficiency**

-Understanding query -Understanding emotional expression	-Accessibility -Easy to transfer -Memorability	- Human-like social cue -Human-like personality -Human-like empathy	-Self-learning -System update	-Identify customers -Personalized response -Personalized recommendations	-Non-language barriers -Culture understanding	-Always available -Responsiveness -Process simplify

4 Methodology

This section discusses the research methodology and the nature of the study, including the strategy adopted, the methods used to collect and analyze the data, and the ethical considerations involved. It also covers the structure of the interviews conducted for the study, the reliability and validity of the research, and the ethical considerations related to the study, in combination with the general principles of good research.

4.1 Research strategy and Approach

This research project is qualitative in nature. The chosen research strategy is a case study implemented through qualitative, semi-structured interviews, combined with a literature review. As previously mentioned, this research is being carried out as an assignment for a case company. To broaden the perspective, people outside the company were also interviewed to gain a more comprehensive overview. Consequently, the study comprises two sample groups: one consisting of key internal personnel from the case company, and the other of external AI experts. This strategy enables an in-depth study of the case company's processes and areas for development, as well as benchmarking based on the external interviews. From the author's point of view, this strategy helps to understand the case company's current challenges and areas for development, providing context of the bottle necks in after-sales service. It also allows ideas to be drawn from other experiences on how artificial intelligence could be utilized by the company in question to enhance its after-sales processes and service quality(Tuomi, J. & Sarajärvi, A. 2018; Eskola, J. & Suoranta, J. 2014).

This study adopted a qualitative approach because, from the author's perspective, this type of research design helps to gain an in-depth understanding of the phenomenon under study. As this study does not aim to measure different phenomena numerically, a quantitative approach would not be suitable. The research questions are formulated to investigate the phenomena in depth, further justifying the qualitative approach. This study aims to gain an in-depth understanding of the interviewees' experiences of how artificial intelligence could be implemented to streamline after-sales processes and improve the service quality. The novelty of the topic also justifies the selection of a qualitative approach. As the study focuses on the interviewees' experiences, the qualitative research method is appropriate. In addition to qualitative interviews, the study considers the results of previous studies and uses secondary data, such as internal company documents, to confirm interpretations (Eskola, J. & Suoranta, J. 2014).

This study employs an abductive approach, which is common in qualitative research and case studies. This method combines existing theory with collected data. Its aim is to help integrate theory and observations and understand their relationship. As the study does not seek to create a completely new theory or discover new phenomena, the abductive approach

is more suitable than the inductive approach. As the study does not seek to prove or test an existing theory with empirical data, the deductive approach is also not suitable. The abductive approach can therefore be seen as a combination of the previously mentioned inductive and deductive approaches. It builds on existing theories while providing new insights, as well as discovering new phenomena in research areas (Vila-Henninger, L. et al. 2022).

4.2 Data collection methods

This study primarily uses semi-structured interviews to collect data. According to Tuomi, J. & Sarajärvi, A. (2018), the advantages of semi-structured interviews over surveys include the ability to repeat questions, clear up misunderstandings and engage in discussion with interviewees. Interviews also allow the interviewer to ask questions in the order that feels most natural, unlike surveys. Eskola, J. and Suoranta, J. (2014) also point out that semi-structured interviews provide an excellent opportunity to obtain information in the interviewee's own words rather than from prepared alternatives. The interviews were conducted with two separate sample groups. The first group consists of key individuals from the commissioning company of this study who are interviewed about after-sales service processes and the possibilities provided by artificial intelligence. The second group comprises individuals from outside the case company who are specialized in artificial intelligence.

This approach aims to build a comprehensive picture of the case company's development opportunities regarding the implementation of artificial intelligence in B2B after-sales services. It also aims to map opportunities more openly from experts and benchmark what other companies have already done in this regard. This means that the study is not limited to the perspective of a single company, and the results are likely to be more useful at a general level. Based on the findings of this study and theoretical background, the author makes suggestions for management regarding AI implementation possibilities in after-sales services including a best practice guide regarding the considerations of AI implementation.

Both groups 1 and 2 were interviewed using a set of prepared semi-structured questions. As the topic under study is broad and the data is not intended to be quantified, data collection was not carried out based on fully structured questions. Considering the nature of the

research topic and the research questions, the author feels that this approach is the most suitable for this study. A semi-structured thematic interview gives the researcher the freedom to change the order of the questions if they feel it is necessary, which can help ensure a more reliable discussion. The aim of a thematic interview is to identify meaningful responses related to the research problem. (Tuomi, J. & Sarajärvi, A. 2018) The interviews were conducted in Finnish, as the interviewees are Finnish. Using the interviewees' mother tongue will ensure more natural responses.

The interviews were carried out partly on-site and partly remotely via Teams. Three people from group 1 (H1, H2 and H3) and three people from group 2 (H4, H5 and H6) were interviewed, making a total sample size of six. Group 1 consisted of key internal staff from the commissioning company, while Group 2 consisted of external AI specialists. See Table 4 for the basic information of the interviewees and the duration of the interviews. The transcriptions of internal interviews with interviewees H1, H2 and H3 together accounted for 9711 words, and external interviews with interviewees H4, H5 and H6 12,650 words.

The following roles were interviewed from the commissioning company: CEO, After-sales service manager and Spare parts manager. From the external companies, the following roles were interviewed: CEO, After-sales manager and AI responsible, and CEO. The diverse backgrounds help to provide a broad perspective on the implementation of artificial intelligence as well as the after-sales side.

Table 4. The basic information of the interviewees and the interview durations.

ID	**Sample group (1 or 2)**	**Industry**	**Job title**	**Duration of interview**	**Form of interview**
H1	1	Industrial wholesale	After-sales manager	32 min	On-site
H2	1	Industrial wholesale	CEO	43 min	On-site
H3	1	Industrial wholesale	Spare parts manager	17 min	Remote

H4	2	IT and program consulting	CEO	36 min	Remote
H5	2	OEM	After-sales manager, AI responsible	27 min	Remote
H6	2	Management Consulting	CEO	51 min	Remote

External interviewees were selected for the study based on the following criteria:

1.) The person works in a Finnish company in a position specializing in artificial intelligence, and/or has experience of implementing artificial intelligence as part of after-sales service processes

Internal interviewees were selected for the study based on the following criteria:

1.) The person has a good basic knowledge of the case company's after-sales service's processes and challenges as well as ideas for improvement

The interviews consisted of the following themes: current aftermarket processes and bottlenecks; the implementation of artificial intelligence (AI); opportunities for AI implementation in the aftermarket; the measurement of AI impact; the challenges and means to minimize the identified challenges of AI; and ethical perspectives. These themes were discussed with both groups of interviewees, but the internal processes and bottlenecks of the aftermarket were omitted from the discussion with sample group 2. The questions were otherwise divided into two groups: AI-related questions and general background questions concerning the interviewee. See Appendices 1 and 2 for the research questions used in this study.

This study also uses secondary data alongside interviews. This secondary data is drawn from previous literature and studies and aims to complement and confirm the findings of this study. Furthermore, the findings are compared with those of previous studies and literature

in Chapter 6. According to Eskola, J. & Suoranta, J. (2014), such secondary material is ready-made data that can help build a broader overall picture of the topic being studied. The purpose of this was to confirm the findings and provide broader context to support the analysis through triangulation. According to Patton, M. Q. (1999): *"Triangulation refers to the use of multiple methods and sources of data in qualitative research to develop a comprehensive understanding of the phenomena*". The idea behind data triangulation is that, as each study method reveals new perspectives and aspects of the phenomenon being studied, using multiple methods helps provide more information to the 'research mill' and can enhance the quality of qualitative analysis (Patton, M. Q. 1999; Eskola, J. & Suoranta, J. 2014).

4.3 Data analysis methods

In data analysis, Miles and Huberman's (1994) content analysis framework was used, which consists of the following four phases: 1. Data collection 2. Data reduction 3. Data displays and 4. conclusion drawing / verification. (See the figure 14.) This technique aims to outline and identify regularities, patterns, causalities and explanations in the data that are relevant to answering the research questions of this study and bridge the research gap in how artificial antelligence can be used to enhance after-sales processes. (Huberman, A. M. & Miles, M. B. 2002.)

The data analysis was conducted using Miles and Huberman's (1994) content analysis framework, supported by Tuomi, J. & Sarajärvi, A. (2018) guided steps for qualitative research analysis, which are as follows: 1. Decide what interests you in this material and MAKE A STRONG DECISION 2a.) Go through the material, separate and mark the things that are of interest to you 2b.) Everything else is left out of this study! 2c.) Collect the marked things together and separate from the rest of the material 3.) Categorize, theme or type the material 4. Write a summary. (Tuomi, J. & Sarajärvi, A. 2018)

Data analysis included several steps, from data collection to transcription, data reduction, identification of themes and categories, and construction of a code table and collection of codes under main themes.

The data processing involved comparing the data to the research design and recognizing themes that are relevant to this study and the research questions. Eskola, J. & Suoranta, J. (2014) emphasize the interaction between theory and empiricism in order to be successful in thematic analysis. According to them, isolated quotes alone do not allow for in-depth analysis and conclusions about the research topic. For this reason, the author has tried to tie the discussion together with the interaction of theoretical background and empirical findings.

The data was analyzed to exclude all irrelevant information, but with careful consideration to ensure that nothing essential was omitted. Before reducing the data, however, the author carefully reviewed the material and listened to all the interviews several times to gain the best possible overall understanding of them and the relevant findings. Tuomi, J. & Sarajärvi A. (2018) also highlight the importance of going through the material thoroughly, having decided what is relevant to the problem setting and leaving everything else out. In this way, the data was reduced to facilitate processing, focusing only on data that was found significant for the study. After data reduction, the author analyzed the data to identify recurring themes and outlined different main themes using a mind map. Identifying the themes required a few rounds of iteration and the themes evolved slightly during the analysis process. After identifying the main themes, the author began to outline Gioia diagram, under which these main themes identified from the data were raised to aggregate dimensions. This diagram was used to structure the data into first-order conepts and second-order themes and aggregate dimensions. First-order concepts consist of the informants' expressions, while 2nd order concepts and aggregate dimensions consist of the interpretations and entities formed and perceived by the author. (Gioia, D. A. et al. 2012; Clark, S. et al. 2010) Initially, the data from each interview was processed individually. After identifying main themes, the data was combined into a Gioia diagram. Under the main themes, first and second-order concepts and themes were identified from the data, which led to the construction of the final Gioia diagram. The code table can be seen in its entirety in the appendices (see appendix 3.) The code table helps to visualize the connection of the data to the identified main themes.

The research results of the study will be used in the chapter to reinforce understanding of the findings by referencing quotes from the interviews. As the theme interviews were conducted in Finnish, the quotes and other data have been translated as directly as possible into English, without altering the content to the best of the author's knowledge. However, the quotations

have been simplified, with colloquial expressions such as 'like' and 'that that', and `eeehm´ removed to make reading easier without otherwise modifying the content.

According to Eskola, J. & Suoranta, J. (2014), coding the results serve five different functions: "*1. They act as written notes, 2. They help to structure what the researcher thinks the material is about, 3. They serve as an aid to describing the text, 4. They can function as a tool for testing the structure of the material, and 5. They can be used to search for and check different parts of the text."* (Eskola, J. & Suoranta, J. 2014). As the quantity of research data is limited, Excel and notes were used as tools for coding and organizing the data into an easily analyzable format (Gioia diagram), rather than using separate data analysis tools.

Traditionally, data analysis is divided into inductive and deductive methods. Inductive analysis is a data-driven method aimed at producing a new theory, whereas deductive analysis is a theory-driven method aimed at testing a theory. This study uses a combination of inductive and deductive analysis, employing an abductive method that builds on existing theory and supplements it with new findings. The literature review and theoretical framework of this study provide the theoretical background, while the research results serve as the data compared with existing research data. The abductive approach enables the flexible combination of research findings and underlying theories, providing a means of generating insights that would not necessarily be possible through inductive or deductive analysis methods alone (Vila-Henninger, L. et al. 2022).

The Gioia approach Data structure diagram is used to present the data, in which the data is classified into three different groups: 1st order concepts, 2nd order themes and aggregate dimensions. The aim of using the Gioia data structure diagram is to build a clearly understandable and transparent way of presenting the themes of the research data. (Gioia, D. A. et al. 2012; Clark, S. et al. 2010) See the figure 14. where the Data analysis Method by Miles and Huberman (1994) is visualized.

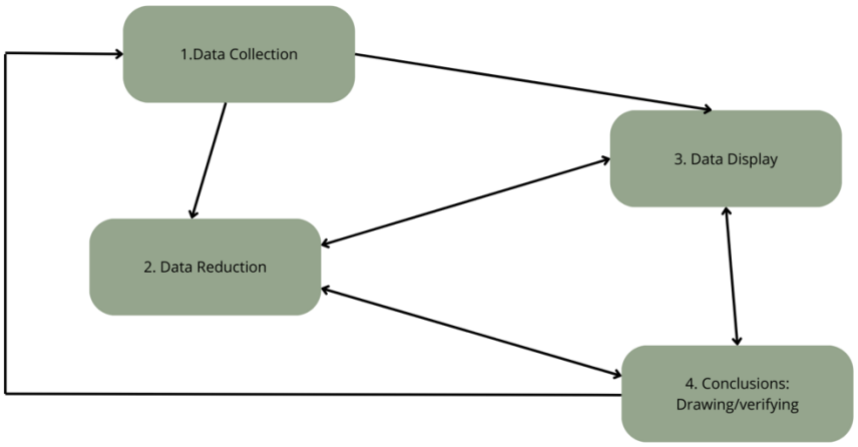

Figure 14. Data analysis method by Miles and Huberman (1994)

4.4 Reliability and validity

The reliability of research is based on two aspects: reliability, which refers to whether the results are consistent and repeatable, and validity, which refers to whether the research examines issues relevant to the research problem. Validity, in turn, refers to whether the research addresses issues that are relevant to the research problem. In other words, it is about whether the researcher was able to correctly limit the material and analysis only on those that are relevant to the research problem. (Tuomi, J. & Sarajärvi, A. 2018) Eskola, J. & Suoranta, J. (2014) also highlight confirmability, i.e. whether studies that have investigated the same phenomenon and their results support the results of the study in question as one criteria, and taking into account preconditions in assessing the reliability of the stud, increasing the overall certainty. According to Eskola, J. & Suoranta, J. (2014), one significant starting point in qualitative research and its reliability is the subjectivity of the researcher and the researcher him- or herself. The assessment of the reliability of qualitative research can therefore examine the entire research process, thus significantly differing from the assessment of the reliability of, for example, quantitative research. (Eskola, J. & Suoranta, J. 2014)

Eskola, J. and Suoranta, J. (2014) highlight other factors that affect the reliability of the study, namely the sufficiency of the data and the comprehensiveness of the analysis. In order to address these issues, the author prepared the interview structure to ensure sufficient data could be collected from different perspectives and set an appropriate sample size for the topic under study. As previously mentioned, the author has organized the review and discussion of the research results by theme to ensure that all issues related to the research topic are addressed consistently during the analysis phase. This approach was also adopted in processing the data, with the aim of ensuring that no relevant information was omitted from the research data.

As mentioned above, qualitative research emphasizes the objectivity of the researcher when analyzing results and data. To strengthen objectivity and transparency, the author presents concrete excerpts from the research data in the examination and analysis of the results and includes the Gioia code diagram of the study in the appendices. Additionally, the author has tried to describe the various stages of the research process in as much detail as possible to enhance reliability. The researcher has taken validity into account by formulating the interview questions around precisely defined research questions, limiting irrelevant matters in the data reduction stage, and ensuring that only matters relevant to the research problem are examined in the analysis stage. However, it should be noted that the estimated sample size does not necessarily correlate with the amount of data produced, as some interviewees may not produce as much data as expected or provide answers that could be utilized in the analysis phase.

Before the interview, each interviewee received comprehensive information about the issues to be investigated in the study, the research topics, and how the results would be utilized and stored. Each interview was carefully transcribed shortly afterwards to ensure that the data was recorded accurately and that the original recordings did not need to be kept for longer than necessary. The following section discusses how the ethical principles were taken into account in the study in more detail.

4.5 Ethical considerations

This study has taken into account ethical principles on many levels and has taken into account the Good Scientific Practice guidelines to ensure liable research. In addition, the

study has sought to ensure that the elements of reliable qualitative research are taken into account. This section discusses the ethical principles of the study and research practices in more detail.

Each interviewee has voluntarily agreed to participate in the study and has been asked for permission to record the interview. Each interviewee has also been explained the purpose of the study and purpose for which the interview material will be used. Each interviewee has also been informed that the interviews in the study will be anonymized, and no information will be revealed about any interviewee or their company that would make it reasonably easy to identify the company or person in question. The interview recordings were only be preserved for the duration of the transcription, after which the material was destroyed. The data was stored securely behind passwords so that no one other than the person conducting this research had access to them. The study considers European Union's GDPR and data protection policies.

The author has attempted to utilize only reliable sources in the literature review. The majority of the sources for this study consist of peer reviewed scientific articles or reliable literature sources, which are also used for educational purposes. The author has strived to remain impartial in the research and to handle the data neutrally, without leaving out any significant issues. The author has also strived in this study to honestly describe all stages of the research and thus ensure that the research is trustworthy and transparent. The author has added sources in all sections referring to other studies or literature. The research complies with the Finnish Research Integrity policies. (Suomen tutkimuseettinen neuvottelukunta 2023)

5 Empirical Findings

This section reviews the empirical results of the thematic interviews conducted as part of the study. As previously mentioned, this study was conducted as a case study, with a semi-structured thematic interview serving as the primary method of data collection, involving two distinct groups of interviewees. The results are organized into themes, which are derived from the research data during the data analysis, also forming the aggregate dimensions of the Gioia diagram, presented in the Appendix 3. The findings relating to each theme are then discussed under each identified theme.

The main themes that were identified while analyzing dataset were the following:

1. Considerations related to the adoption of artificial intelligence
2. The perspectives of the personnel on AI adoption
3. Opportunities of artificial intelligence in after-sales service
4. After-sales service challenges
5. Measuring the impact of AI
6. The drawbacks and limitations of AI
7. Minimizing the challenges and risks of artificial intelligence

In the following sections the empirical findings of this study will be discussed under each of the aforementioned themes. In the later discussions phase, the results will be discussed in more depth, analyzing the results with conclusions and comparing the results to existing research data and the theoretical framework of this study. The Gioia data diagram, on which the results of this chapter are based on, can be found in Appendix 3. The first-order concepts in the Gioia data diagram are presented in a no particular order. Overlapping themes have been identified from the first-order concepts, which have been derived as second-order themes in the data diagram, finally from which the final aggregate dimensions have been derived. The most critical finding in this chapter are highlighted in bold.

5.1 Considerations related to the adoption of artificial intelligence

One of the key themes that arised from interview data was the considerations and prerequisites for the implementation of artificial intelligence. Among the responses, the following was emphasized regarding the implementation of artificial intelligence: the artificial intelligence applications should be able to be **integrated into existing systems**, rather than being standalone solutions. In addition, several interviewees also emphasized that the artificial intelligence solution should be **compatible with the company's technology infrastructure**. In addition, according to interviewee H5, the artificial intelligence solution should be able to be implemented in an expanded manner in different functions.

H5: "We need to make sure that the AI solution is in line with the rest of the company's IT infrastructure. Things get complicated if each application has different solutions. It should be possible to harmonize solutions, for example through integrations, but there should definitely not be separate stand-alone solutions." (H5)

".. It should then be possible to implement and extend it to other functions as well. So perhaps the challenge in implementing artificial intelligence is how or whether the artificial intelligence solution can be implemented in the future and also work in other functions and areas in the company or is it just a stand-alone implementation. (H5)

" We don't like to develop stand-alone solutions and should take the IT infrastructure into account more broadly..." (H5)

Also, informant H1 addressed the compatibility of IT infrastructure as an important enabler of AI adoption. The informant mentioned that the old systems define certain protocols within the case company slowing down development. The informant sees that **further integration of AI applications requires technology infrastructure updates.**

"*... The challenge is probably more in being able to move to the next level here... It certainly requires updating our information systems... It's kind of like this accumulated thing… That a new system has been put on top of the old and the base is still old, so in a way, that agility has been lost at the same time, because this base defines that we follow certain protocols, so it's a brake on our development. Yes, this base needs to be rethought so that we can develop these..."* (H1)

The interview results also highlighted the fact that the results of artificial intelligence must be **verifiable** and **editable**. Verifiability was raised as an important factor by interviewees H5 and H6. The auditability of results and the transparency of decision-making logic help prevent mistakes made by AI from being passed on to business and also support a possible feedback mechanism that helps AI in continuous development and iteration.

H5: "The most critical factors are the verifiability of the results, for example whether a person can check whether they are correct or whether the artificial intelligence in the background is hallucinating."

"*There should always be the... so called checker."* (H5)

"*Well, it's like a hallucination, you have to take into account what it produces, you can't just pass it on as it is, you have to read everything through, check it, and fact check it again..."* (H6)

H6 also considered it important to review and compare results. H6 also emphasized the importance of resolving resistance to change and ensuring that staff and management are on the same page: "*However, it is important that management and personnel look in the same direction and that efforts are made to resolve the resistance to change that will arise there anyway, because the person is afraid for their own job. That is the root cause. And now it must then take into account the risk so that it actually becomes a supporter of artificial intelligence. And that is not an easy process."* According to the informant, one of the key reasons for resistance to change related to the introduction of artificial intelligence is the fear of losing one's job.

One of the interviewees (H4) also emphasized that in order for AI to be implemented, **existing processes, such as customer processes, must be in order**. Without proper processes, according to informant, AI cannot be implemented unless the basic parameters are in order. Without clear processes, AI cannot be implemented in a controlled and managed manner.

"*…That first of all, we get a proper customer service process. A digital workflow that is controlled, that of course improves it. And you can't do artificial intelligence unless you have these basic parameters clear and the basic things in order, so that it's like a controlled and managed implementation."* (H4)

H5 mentions, for example, guided workshops and appointing people responsible for AI as ways that could help in the implementation of AI, as well as appointing AI working groups, which are responsible for obtaining and communicating the latest information within the organization: "*Someone would be responsible for that working group. Weekly meetings every 2 weeks where they would go over how it was used, give training on how to use it. They would go through the work in a workshop-like manner. The leader of the working group should be responsible for staying on top of AI applications and solutions as they develop, and new things emerge. The leader should bring the most relevant information to the pilot project or to the attention of AI users through this workshop."* (H5)

H4 identifies data management and data quality as one of the critical challenges for the implementation of AI. The informant emphasizes that if the quality is poor, the quality of the AI output will also be poor. According to the informant, data management and quality as well as data management skills are important areas in which companies should invest in.

" *I would see that they are primarily challenges related to things like data management and data quality. 90% of this is garbage in, garbage out, and it works here too, whether it's produced with artificial intelligence or whatever. It comes from there, but in my opinion, these are the kinds of things that a company should invest in."* (H4)

"*Data literacy skills are critical skills... And then there's just something like resourcing, like for example related to data management, that's something that's desperately needed. Oh, but it's like data quality has never been invested in in the history of the company... It's time to learn the prerequisites for success but still want to do it rather than get the basics right..."* (H4)

The results highlighted various areas to consider when implementing AI, including **effective processes**, **IT infrastructure compatibility**, **data quality**, and **investing in data management expertise**. These factors were seen as prerequisites for successful AI implementation and enablers of achieving better quality results.

5.2 The perspectives of the personnel on AI adoption

Introducing new technology into an organization significantly impacts personnel and existing processes. The research findings identified several areas that should be considered

from a personnel perspective when introducing artificial intelligence, including the importance of change management and training in encouraging the acceptance of new technology (artificial intelligence).

One of the interviewees from Group 1 highlighted how critical it is for the personnel to be able to identify both the benefits and risks. The informant also expressed the view that the implementation of AI requires new skills that have not been needed before: "*Making sure everyone is aware of the benefits and risks of artificial intelligence is also one thing, which then requires new skills that have not been needed before."* (H1)

Interviewee H3 identified **training and justification of the need and usefulness** as the most critical factors from the staff perspective in adopting AI. Interviewee H3 also emphasizes the significance of engaging individuals in the implementation process thereby enabling users to gain first-hand experiences and a chance to experience benefits themselves to better understand the rationale behind its utilization. Interviewee H3 also addresses **easiness to use and fastnes**s as qualities that may promote the use of artificial intelligence.

"*… Well, it's probably something that we can see as a clear benefit for us. And through that, of course, for our customers… And so that it's fast, fast and easy to use...:"* (H3)

".. That how do we train people to use it and justify the need and benefits of it...?" (H3)

" So, who is affected by this in principle, so get involved in that development as early as possible…" (H3)

Interviewee H4 has not encountered much resistance to change in relation to the implementation of artificial intelligence among personnel within the company the informant works in or by client organizations. However, the informant states that there are always people who resist change and state that things were better before. According to the informant, how new things are experienced depends very much on the person and if there are 7 people in a room, there is always one opponent among them.

H2 predicts that some staff may fear that artificial intelligence will take their jobs. Informant emphasizes the importance of giving examples of the benefits of artificial intelligence and how it makes everyday life easier and that the introduction of assistive devices does not mean that someone will become unemployed: "*...let's give examples that it really speeds up and makes everyday life easier, that it does not mean that it will lead to... Such systems or*

aids are introduced so that someone will become unemployed. We get more sales or more gross euros with the help of such aids." Clear communication can help to prevent possible fears that may arise within the personnel regarding the implementation of AI.

H2 also supports the idea that **providing proven concepts** as example so that other personnel take example from them. According to the informant, concrete model examples help encourage personnel to adopt artificial intelligence and lower the threshold when considering the applications is not the responsibility of the individuals themselves: "*And yes, through those examples, people often take example from them if they have been proven to be good and then discover it through that. Then they don't have to think so much about where they would use it, so when some more experienced user just shows the examples, they say, look, this is how it works, and this is how it can work. Then they get to try it out themselves in their own operating environment*."

As elements supporting the implementation of personnel, H4 mentions, based on both research and the informant's own experience, that **support** and **sparring** within the personnel play an important role. Moreover, the informant addresses the necessity to **prioritize the implementation of artificial intelligence in projects in which tangible results and can be achieved in the early stages of adoption**. Reaching relatively quick and concrete benefits in the beginning of the project seems to be correlated with personnel's higher motivation to adopt new solutions. The informant also emphasizes the importance of **clear goal setting** for the projects. **Data management**, **data literacy capabilities** and **resourcing** for them also play an important role, according to the informant.

"There, teams and technical and peer support are in place, so these solutions have been implemented in the organization... If not, then it's completely up to personal effort." (H4)

" *Very easily implemented applications and automation that are demonstrated with this kind of proof of concept that it works. Then it works. The customer knows. We then just know how to complete the implementation*." (H4)

" It's also about knowing how to prioritize the project so that something concrete comes out of it pretty quickly…" (H4)

As a different perspective, H6 presents the view that instead of AI replacing people, AI should be seen as a part of the team. Furthermore, according to the informant, when AI is used wisely, people also need to develop their skills. When a customer's processes are

carefully reviewed and the most easily accessible problem areas are addressed, the organization gains momentum combined with change management: ”*So, we specifically go through the customer's processes and then we assess where there is room for efficiency improvement and now that it is being done in stages, we take the low-hanging fruits first so that the customer gets a good momentum, then we get the organization involved, that is related to change management, so we get the whole organization involved.”* (H6)

Almost every interviewee stressed how important it is for staff to recognize the key benefits of AI in order to ensure that it is implemented across the organization. The identified benefits were considered to be clearly linked to greater motivation to adopt AI more widely. In addition to highlighting the benefits, several interviewees stressed the **importance of training** and **the role of change management**. It was recognized that training was key to lowering the threshold for adopting artificial intelligence, as well as for increasing know-how, identifying risks and finding adoptable use cases.

5.3 Opportunities of artificial intelligence in after-sales service

Data management and structuring emerged as one area among the results where the use of artificial intelligence was seen as beneficial as part of streamlining after-sales processes. According to interviewee H1, artificial intelligence could help manage and structure large data sets. According to the informant, structured data could help, among other things, target measures correctly in the field.

”*Artificial intelligence could help manage and, in a way, structure large amounts of data. It would help manage the huge amount of data we have, so that we could then target those measures correctly on the site…*” (H1)

Utilizing data in the form of virtual assistants, internal chatbots or AI agents to improve and speed up the availability of internal information was also essentially related to data processing and structuring. Several interviewees (H1, H2, H3, H5) identified the potential of artificial intelligence in identifying the necessary spare parts in relation to various fault conditions. Informant H1 felt that this type of solution would help to speed up customer service significantly, as currently finding the necessary spare parts requires the foreman to utilize several systems, slowing down customer service. Several interviewees

from the case company also identified finding the prices and delivery times of spare parts as a challenge and, for example, internal chatbots and virtual assistants as artificial intelligence-based solutions that could help both in finding the right spare parts and in assessing prices and delivery times. H5 and H2, in turn, saw similar solutions as important for the performance of service technicians. According to informant H5, improving the availability of information helps to improve the skills of service technicians. In addition to identifying spare parts, AI was seen as having potential in providing maintenance instructions, once the AI had learned the manuals for different devices. H2 also emphasized the potential of AI to support the service technician by providing instructions based on manuals for performing various repair procedures. H1 and H2 also identified the potential for similar solutions to enable additional sales if the AI could also recommend other ancillary products that the work packages required.

” *If that system could even give that foreman a spare parts list from a specific document or spare parts documentation...”* (H2)

”*.. This would improve the customer service experience across the board when mechanics or service technicians of different levels go into the field and if that information is easily accessible for everyone to quickly dig into. The information found in this artificial intelligence solution is relevant and accurate, then it is as if through active fault situations the output of the service guys improves despite that level of expertise and then the customer experience also improves, in my opinion.”* (H5)

”*.. For an installer, it could also mean providing instructions from the manual, giving quick instructions on how to perform a repair, or giving an estimate based on some information as to what is wrong with the device.”* (H2)

” *That we could perhaps get this entire supply chain better under control, so that it could automatically search for and suggest these and these spare parts, so that we would now have a work package and spare parts coming from this. That would speed up what we do quite a bit and probably improve our inventory management."* (H1)

”*.. Of course, we have our own spare parts sales department, so that when a customer asks them, but if the customer asks about the water pump, for example, it can remind you and tell you that it's okay, you need these three seals in addition to the water pump...”* (H1)

Several interviewees (H2 and H4) also recognised the potential of AI for **fault identification** and **diagnostics**. In addition, **predictive maintenance** was recognized as one key area in which AI could help streamline after-sales processes. According to the informants, AI could identify faults with varying probabilities based on specific symptom sets. H2 noted that a feedback mechanism would help refine possible diagnoses in future. H4 also stated that AI is an effective tool for predictive and well-timed maintenance planning.

" *For example, if you have information loaded into the system that if this machine is acting this way, then seventy-three percent of the time this is the fault. So you can build something like this there too... It speeds up the installer's everyday life. Well, the probability is this, we do this and that first and then in a way the database and intelligence in the system grows all the time, and then you can even mark that yes, it was exactly that, and so.."* (H2)

"*… että se on niinku se ennakoiva huolto. Mun mielestä yks ihan selkeä..”* (H4)

In addition to improving the structuring and availability of information internally, a **24/7 AI-based chatbot** was also identified as an essential solution in the customer interface that could help improve the availability of customer service by utilizing the company's internal data such as service records. H2, among other things, raised the idea that the chatbot could support customers as technical support. In addition, the chatbot could also help recommend necessary ancillary products for solutions found in the shopping cart. H4, in turn, raised the idea that the chatbot can work in both directions, both internally and externally.

".. *For example, would it be able to refine for the customer what the fault is with certain symptoms? ... To get technical support through a bot like this…"* (H2)

" *If there is an online store where customers can order, then give recommendations that if you are ordering this part, you will probably need this and that and that in addition to that..* (H2)

" *Utilizing different bots at different stages of the process, for example to produce product information. For example, producing information for repairers, installers or the customer, and not having to wait for product information inquiries from others, but getting the information directly...”* (H4)

" *Then there are chatbots and 24/7 customer service.…*" (H6)

Inventory management was one of the central after-sales processes where AI was identified as having potential. Inventory management emerged in the interviews with informants H1, H2, H3 and H4. AI-based inventory management was seen as helpful in optimizing inventory levels, performing inventory analyses, forecasting demand and planning purchases. According to the informants, AI-based inventory management would help improve inventory turnover and return on capital objectives in the organization.

"*Artificial intelligence in inventory management could make suggestions, like, hey, this part has been ordered so many times, should we place an order for that and this hasn't moved, so suggest selling it at a discount or some kind of campaign or deducting it, and so on, that in a way it would help us achieve our inventory turnover and thus our return on capital target.* (H1)

" *If it can analyze, for example, the situation of the warehouse and predict, for example, things like order quantities or predict when something should be ordered and, for example, perform inventory analyses to see if the inventory is circulating well and whether it is worth lowering the price of some products..."* (H2)

" *Well, it could be inventory management, for example.*" (H3)

" *When to maintain and what goods need to be purchased and when which components. In other words, for inventory management... Artificial intelligence-based inventory management can make forecasts and then order goods and optimize inventory balances accordingly.…*" (H4)

H1 also highlighted the possibility of utilizing artificial intelligence in route planning optimization of service vehicles. According to the informant it would help to optimize and estimate working time more efficiently. This would also help to **improve the resource efficiency of both service vehicles and service technicians** and would therefore **support work planning.**

"*We could also utilize it in our route planning for our service vehicles. So we just put that these services are coming up in the calendar and it automatically plans the route and which way to go, which we can utilize to use working time as efficiently as possible... Then through that we would be able to get the utilization rate higher...*" (H1)

According to H1 and H2 artificial intelligence could also help to **estimate the time spent on different work task**s and thus **refine working time estimates and pricing process**. Artificial intelligence was seen to have clear potential in supporting the resourcing of maintenance personnel, as well as in preparing more accurate offers and pricing.

"*… When we have basic information about the equipment there and determine how much time it will take for annual maintenance, and then when we get that information from there, we can use it for future maintenance offers, how much we should get for it and how much time it will take, it gives us a precise tool for determining what kind of price we should offer it at."* (H1)

" *Can quickly provide work time estimates..."* (H2)

H4 identified broad opportunities for AI in **automating several types of operational processes.** Examples include the automatic creation of orders in systems, the automation of postings, and the automation of financial processes.

" *The processes on the financial side. How can they be automated there, but really, all of this stuff like invoice processing, reconciliations, payments."* (H4)

" *And then generally all those things like operational processes like the implementations, or automation, artificial intelligence can help with those too. I mean, for example, creating an order document directly in the system or something like that..."* (H4)

Handling service requests such as tickets was also identified as one area where artificial intelligence could be utilized. H5 emphasizes that artificial intelligence could handle maintenance tickets and fault descriptions if the databank is in good condition: "... *Processing tickets... Mass processing of maintenance requests and fault descriptions, as long as the underlying data bank is already in good condition*." (H5)

Processing customer data enables several types of processes in which data can be utilized. H6 lists customer **segmentation** as one area, among others. Artificial intelligence can also be utilized to **identify potential buyers** and to **personalize communications** according to buyer personas. Interviewee H5 also recognizes the potential of artificial intelligence to support customer communications. In addition, artificial intelligence can identify, according to the informant H6, when a customer is ready to buy again which can be used in **remarketing** purposes. As a less explored possibility, artificial intelligence algorithms can

also **predict customer churn.** The algorithm can predict the risks that a customer is leaving based on various signs, according to the informant.

"*… For communication and customer contact, let alone for this kind of marketing text production, content production. Of course, you always have to read it as I said earlier, so that human has gone through it."* (H5)

" *So, I can use it to quickly segment the market and of course, if we think about online shopping, I can see who the potential buyers are. I can do analyses on that data to see what type of customers buy from this segment and then I can improve their communication."* (H6)

" *Then there's the optimization of the purchase path. Making re-marketing work. That's how artificial intelligence identifies when a customer is ready to buy again. And then what kind of offer works best*." (H6)

" *…this… Like predicting disappearing customers. In other words, the algorithm identifies the risks, what signs would that customer have that they are now leaving.* "(H6)

According to H2, artificial intelligence could also be used to automate the collection of customer feedback. In addition, the informant emphasizes that artificial intelligence could also be used to analyze feedback:" … *Automatically asking how the maintenance work went or how the transaction went overall... And analyzing the feedback...* (H2)

H5 also sees potential in artificial intelligence for internal training. H5 says that artificial intelligence can be utilized, for example, through VR simulations in training maintenance procedures. In addition, the informant adds that by utilizing speech recognition, it is possible to ask the artificial intelligence for instructions and the artificial intelligence can give directions.

" *Simulations for maintenance training using VR technology are also an interesting possibility...And oh, speech recognition and utilizing it with manuals… It can be used to guide how to use a machine.*" (H5)

In the course of the research, it was found that several interviewees identified the same possibilities for the use of artificial intelligence in the aftermarket sector. It is noteworthy that a few of the identified possibilities were also ascertained through the contributions of a single interviewee. This finding supports the notion that the interviewees contemplated the practical implications of AI from a variety of points of view, underscoring the heterogeneity

of their experiences with the technology. This diversity of perspective contributes to the richness of the findings, thereby enriching the variability of the results.

The potential of artificial intelligence to enhance efficiency in a variety of processes, including data processing and coordination, is a subject of considerable interest. Furthermore, it has the potential to establish novel avenues for customers, thereby enhancing accessibility. For instance, providing customer support through 24/7 chatbot. These solutions can also be used to develop earlier purchase stage processes. The following list enumerates the applications that are more purely focused on after-sales processes: **the identification of spare parts**, the **troubleshooting of mechanical faults**, the **implementation of predictive diagnostics**, the **use of virtual reality (VR) for the purposes of maintenance simulations.** However, the majority of the solutions presented in the interviews have the potential to be utilized more extensively within the companies besides in after-sales processes. The most prevalent themes identified during the course of the interviews were the **integration of 24/7chatbots into websites**, the utilization of artificial intelligence in **data processing and coordination**, **inventory management and optimization solutions**, **the production of text content and documentation**, **remarketing and customer data analysis, troubleshooting**, the **identification of the correct spare parts** and the **generation of quotations**.

The majority of solutions proposed aimed to improve **operational efficiency**, thereby reducing costs and enhancing overall service efficiency. Streamlining internal processes was considered to provide a better, more efficient service, thereby also affecting the quality of service and customer experience. However, only some of the proposed solutions were directly connected to the customer interface. AI was also seen as having the potential to automate operational processes such as invoicing. Additionally, AI was considered a valuable tool for creating customer personas and supporting sales through personalized remarketing. One example of a solution that operates directly in the customer interface that was introduced in the results was a 24// AI chatbot integrated into a company's website or web store. Improving the availability of information, for example in the form of a virtual assistant or artificial intelligence agent, was found to improve the perceived expertise of service technicians and the quality of customer service. In addition to improving operational efficiency, several solutions were proposed to improve **data processing** and **analyzing customer data**. These solutions were also considered to contribute to improving service

quality and, consequently, the customer experience. Therefore, another clear theme that emerged from the results was **data management and coordination**.

5.4 After-sales service challenges

In internal interviews several bottlenecks and challenges of the case company's after-sales services were identified. Interviewee H1 identified **communication and information transfer** as the biggest challenges in the company's after-sales service, from initial customer contact onwards. It was concluded that **sufficient information must be recorded** to give the installer the best chance of success in the field. The communication and coordination chain between different people should work effectively to ensure that the installer has all the necessary information to be in the right place at the right time with the right parts and an existing preliminary fault diagnosis. It would be beneficial to identify the location of the fault in advance, to avoid the need for extensive fault searches or diagnoses in the field.

"We *still have some practice in communication and in a way in conveying that information, mainly in taking control of the customer. So that we basically record the customer's needs, for example, when there is a fault situation, we take the sufficient information from there and process the work order so that the installer has the opportunity to succeed there in the field. So that we have this chain working together...*" (H1)

" *And then this that we find the spare parts and we are on time with the right parts in the right place and then the product is delivered. Whatever it is, it will definitely be when this information is passed on, so that we can get the fault diagnosis."* (H1)

" *Then it would be good if we knew in advance that there is probably a fault there. So that we could do it right the first time, and we wouldn't have to do any major searches and fault diagnoses in the field..."* (H1)

Interviewee H2 identified several bottlenecks in the company's after-sales processes. One of these is the **challenging role of supervisors**, who are required and expected to be able to **identify faults and necessary spare parts** and their **prices** and **delivery times** quickly, often with insufficient information. Finding the right spare parts, checking their availability and determining their prices requires **using different systems**, which takes time. **Delivery times are also often uncertain**. Another identified bottleneck is **invoicing**, especially in

situations where hours have to be calculated separately or changes have occurred to the initial estimation, as this causes delays. According to the informant **internal warranty process** is another challenging and time-consuming process that causes delays in the after-sales process.

"*It's a difficult for a foreman because the customer is very unclear about the task. Whatever the problem is, the foreman should be able to quickly find out the necessary spare parts, their prices and delivery times."* (H2)

"*… What are the necessary spare parts, it sometimes takes quite a long time. I mean, there are many systems, where do they come from or the main systems, where do we look at the parts and find out the part numbers and then see if we have them in stock…"* (H2)

"*.. If it still happens that they are not in stock, then we should find out when we will get them..."* (H2)

"*…Especially when the customer contacts us for the first time, especially during maintenance, they have an acute need for service and if we can't be reached properly, or the customer or the foreman or no one in the company answers the phone, or if they don't receive an acknowledgement in their email that the matter is being worked on or the message has been read... Often, that's how it goes, if we can't be reached, the customer calls another company very, very quickly*." (H2)

"*Once the work has been completed and reported, it seems that the invoicing phase of those invoices is sometimes delayed for one reason or another… Especially if it turns into warranty work, then it starts to slow down, because then the information has to be transferred to the warranty processor so that the customer doesn't get billed for this, but it goes into the internal warranty processing process. Our warranty process is also a bit slow, so whenever you have to give information to another person, it always seems to slow down a bit*." (H2)

Interviewee H3 identified one of the key bottlenecks as maintaining an **adequate service level** and **having enough stock in the warehouse, but not too much**. The interviewee mentioned that the inventory level should be optimized as well as possible and that a balance should be found in the stock levels.

“How can we maintain... such a proper level of service... And that there is enough goods in stock, but on the other hand, we don't want to keep too much goods in stock so that we can optimize it as best as possible...” (H3)

Interviewee H1 identifies the most critical touchpoints in after-sales customer experience the **first impression** and **how fast and accurately the customer's need is identified**. Other areas identified as most critical are the **scheduling and resourcing people effectively**, especially in acute situations, and the **level of responsiveness**.

“Yes, it's always how everything starts, so the first impression is certainly one thing and how accurately the customer's needs are identified. And what kind of implementation schedule, especially in these acute situations, will enable us to effectively resource for them, and what will be our responsiveness?” (H1)

Internal interviewee H2 highlights the importance of **accessibility** and **reachability** in the initial contact. At the same time, the importance of **speed** is also emphasized when assessing the situation, producing a **cost estimate** and providing a **preliminary fault diagnosis**. At this stage, the interviewee emphasizes that providing prompt answers and estimates in these stages gives the customer a more professional image of the company.

"*And also, the fact that once that first contact is already in place, a) we can reliably and quickly say when we will be there and b) give a cost estimate for the job.”* (H2)

Internal interviewee H3 also highlights the **first contact point** with the customer as the most critical point of contact, especially from the perspective of **being able to identify the customer's need and respond to it**: *“Well, it probably starts from the very beginning that when we identify the customer's need and know how to respond to it properly, that's probably the most critical point.”*

The interviews strongly emphasized the most critical touchpoints as the **first encounter** with customers, how well one can **identify customer needs**, and how quickly one can respond to customer needs and come up with **preliminary fault diagnoses** and **cost estimates**. In terms of customer experience, several respondents' comments emphasize the i**mportance of speed** in after-sales service. This applies to both diagnostics and cost estimates, as well as general resourcing and response time to repair the fault. These areas were identified as the most critical areas in aftermarket processes from a customer experience perspective.

The results of the interviews highlighted the most significant problems as being related to **internal processes**, **retrieving information from multiple sources** and **optimizing inventory levels**. To reduce customer machine downtime, which can have significant financial impacts, customers should be given a preliminary fault diagnosis, cost estimate, and information about when a service technician will arrive and what spare parts are needed as quickly as possible. Searching for information from various documents and systems slows down the response time and prolongs the fault repair. Furthermore, information exchange between individuals can also slow down processes impacting the productivity, and efficiency.

5.5 Measuring the impact of AI

Interviewee H1 states that no metrics or operating models have yet been implemented to evaluate the impact of AI. However, Informant lists the following possible metrics that could be used for internal assessment of the impact of AI: **throughput time measurement**, **success rate assessment before and after AI implementation**, and **work productivity** (euro per presence). From a customer perspective, H1 highlights **customer satisfaction surveys** as a means of measuring the impact of AI.

"*Well, definitely some kind of lead time or something like that... Did it get fixed right away or did it have to be refixed... Success rate metric. If we started measuring our success rates now and then when having implemented artificial intelligence applications, like diagnostic usage and other things like that, we would probably see a considerable improvement in the success rate through that."* (H1)

"*How has our work productivity improved and what is our euro per attendance at the moment and what will it be once these have been implemented..."* (H1)

" Customer satisfaction surveys... Maybe it would be possible to utilize it..." (H1)

Interviewee H2 highlighted different types of metrics, such as **chatbot feedback surveys after a transaction**. Regarding chatbots, the informant added that the **number of leads or deals generated by a chatbo**t could be one metric of its effectiveness. H2 also mentioned **throughput time measurement** as a metric to assess the internal impacts of AI adoption. From an inventory management perspective, the informant stated that the effects of artificial

intelligence could, for example, be measured by assessing how **inventory turnover** or age distribution has changed since the implementation of artificial intelligence. From a customer perspective, in addition to chatbot feedback surveys, H2 highlighted **customer satisfaction surveys**, as did most of the other interviewees.

"*If we take the warehouse as an example, have we been able to optimize the warehouse, for example using these instructions or tips provided by artificial intelligence, and then compare it with current results, such as how inventory turnover or age distribution has changed?"* (H2)

"*Well, then you can count how many deals it has brought to a close or directed you to the right path and then to a request for quotation."* (H2)

" *If websites have bots that help them, then they will probably always ask at the end if there was anything useful I could do."* (H2)

Interviewee H3 identified two areas in which the internal effects of adopting artificial intelligence could be measured: the **reduction in manual work** and the **speeding up of processes.** From a customer perspective, the informant identified **customer satisfaction surveys** as a possible metric for measuring the impact of AI.

"*It's certainly pretty easy to measure based on how our manual work is reduced quite a bit, and things are made faster and easier...*" (H3)

" *Different customer satisfaction measurements and so on. That could perhaps clarify whether there has been an impact and what kind..."* (H3)

H4 mentioned key metrics to measure the internal impacts as **time savings**, **resource and money savings**, and **reduction of error**s. One type of additional metric how artificial intelligence can facilitate processes by **replacing manual typing** was also mentioned. Furthermore, the informant also considered **solution capabilities** and **whether the right products are in stock at the right time** to be valid metrics to measure the impacts of AI.

"*You have a process where you need things ABC as a starting point and DEF as a result. And there is time in between, there are resources and there are people and machines, whatever. So yes, if it is well planned for the target process, then yes, it is worth it and there should be a metric for it. Saving time, saving resources and money, reducing errors. Making*

the process easier, for example, by technical means, by reading something automatically instead of manually typing something into Excel." (H4)

"*And of course, customer service metrics like lead times and resources, solution capabilities and such are one thing..."* (H4)

" Balances, availability, how much is there... The right products in stock at the right time..." (H4)

H5 proposed a method of measuring the effects of AI internally by measuring the **lead time before and after AI implementation**. For example, this could involve measuring the processing time of quotation enquiries from when they are received to when they are sent out. From a customer perspective, H5 highlights the measurement of the **Net Promoter Score**, which allows results to be compared before and after the implementation of AI, thus enabling **indirect measurement** of the impact.

"*In practice, the lead time could be measured, for example when a request for quotation is received, what was the time from the receipt of the request for quotation to the sending of the quotation, or the time elapsed in between before and then now, perhaps due to the influence of this kind of artificial intelligence..."* (H5)

"*A lot of companies use this Net Promoter Score NPS measure and that, although it certainly doesn't necessarily distinguish directly whether things are working well now because of this artificial intelligence tool or not, I would see that if artificial intelligence solutions are implemented in a company and then these are implemented, such as this maintenance enhancement tool or something else, then it is perhaps indirectly noticeable from there, if such Net Promoter Score calculations are made, even if 5 years ago and then again after the introduction of artificial intelligence tools, which areas have been the influential factors and but this assessment measurement would require and does require a person who is quite well versed in that business.*" (H5)

H6 identified **interim checkpoints** as a means of internal measurement, which can be used to assess progress. According to the informant, these interim checks can be carried out using surveys, for example. The results of these checks also help assess what still needs to be done. Like other informants, H6 mentioned customer satisfaction surveys to measure the impact on customer experience.

"… *It involves things like intermediate checkpoints, where we conduct surveys to see where we are going, and then based on those surveys, we assess whether we have made progress and what else needs to be done...*" (H6)

"There *are customer satisfaction surveys and other things like that. But you have to be really careful with that too, because there are a lot of them for those customers, so it has to be really well done...*" (H6)

The interview results, particularly among interviewee group 1, highlighted that the topic is still very new, and that ready-made metrics or operating models have not yet been established, since the implementation of artificial intelligence is still in its infancy and is currently at the planning stage within the organization. The interviewee group was still able to come up with multiple metrics that would help to estimate the impact on operational efficiency and customer experience.

Suggestions for measuring the internal effects of AI integration included calculating the **lead time of various processes before and after AI integration**. Furthermore**, cost savings** and **improved inventory turnover** were also key metrics that emerged from the results, among interviewees. Several interviewees suggested using **NPS** and **customer satisfaction surveys** to measure the impact on customer experience. For example, in the case of chatbots, collecting immediate feedback as part of their operations was suggested.

5.6 The drawbacks and limitations of AI

All interviewees except H3 raise **data security** and **data privacy** as two of the key limitations and ethical issues of AI. Interviewees emphasized the **importance of consideration regarding what information is imparted to AI**. Confidential information should not in any circumstance be imparted into AI solutions with an open language model. H4 also emphasizes that even though some AI solutions operate in so-called closed environments (such as Microsoft Copilot), one should still carefully consider what information is fed into the system. H1 highlights the fact that everyone recognizes not only the benefits associated with the use of artificial intelligence, but also its risks, which requires new skills from users of artificial intelligence that have not been needed before.

"Yes, information security is certainly one thing, because if we keep circulating that internal company information, how do we make sure that we keep the information to ourselves?" (H1)

"*Everything secret, everything sensitive, everything subject to confidentiality, that I would completely leave out feeding to these systems. As far as I understand, especially when operating on a Microsoft platform for instance, these entities are isolated in themselves, but yes, it is always when dealing with systems that are connected and I don't remember who originally said it, but someone once said that hey X, that it is human that everyone makes mistakes. It is quite human, but a computer is needed for unnecessary mistakes, so I think it is a bit the same here. The same thing, that I would be careful, careful and yes, that is, however, with all kinds of data protection and information security, according to research, the most vulnerable part is the human being. So, you should just be careful in these things."* (H4)

" *There's a lot of well... Many of these new services at the moment are completely unprotected or there are many that have been done, but these service environments and everything are technically very raw in terms of protection and there are a lot of challenges there too, so you should be careful with these."* (H4)

"*Of course, there are challenges or risks, such as very personal matters or confidential material. The information security..."* (H2)

As another challenge, H1 also highlights **resistance to change**, which is always present in change according to the informant. According to the informant, it feels like some people are afraid of IT-systems.

"*There is certainly a reserve for change now, which is the same every time a change is made, so there is always the feeling that maybe people are a little afraid of the systems...*" (H1)

The issue of whether the utilization of artificial intelligence will result human labor being redundant is also raised by H1. However, the informant emphasizes the continued value of personal customer interactions and the ongoing necessity of human involvement in the aftermarket.

"Customer service is a skill. You must be present in the process. A robot can't do that." (H1)

"*If we can effectively replace inventory management, for example, with artificial intelligence, will it cause jobs to be reduced and humans to be replaced with machine intelligence? Yes, that will certainly happen to some extent. The safest position is probably a technician who works in the field. That's not what artificial intelligence can do. But then all information management related tasks and to a certain extent even spare parts sales. Overall, I think that customer service could certainly be largely replaced by artificial intelligence. Will artificial intelligence make some roles useless? I think so.."* (H1)

One of the identified limitations of artificial intelligence introduced from the findings was also the **inaccuracy of the outputs** produced by artificial intelligence. Several interviewees therefore emphasized the **verifiability of the results** and the **need to be critical of the output** produced by artificial intelligence. In addition, several informants also emphasized that, for example, in content production, one's own persona disappears from the text and therefore it would be a good idea to modify the artificial intelligence text slightly so that the text does not look directly produced by artificial intelligence.

"*Well, yes, it's like hallucination, you have to take into account anything there, what it produces, you can't put it forward as such, you have to read through everything and check it. And and fact-check again, that's just how it is, because the whole internet is there. If you use the general language model, there's also the Vauva.fi, stories and others. It's like malarkey, that it might then take from there if it doesn't come up with anything else. That's why you have to fact-check it."*

"... That's where the personal identity disappears along with the text, making it look like it was made with artificial intelligence, and I don't want that..." (H1)

There are currently many AI solutions on the market, with new ones emerging every day. H6 highlights that this makes it difficult for customers to decide which tool to choose, and that using external experts could be beneficial: "*But now the problem becomes, for customers, how can they know which of the thirty thousand that come out every day, like 1000 more every day, are good tools that will still be on the market in a year. So that's it. Now, customers, they should hire a consultant for it and now in Finland that consultant word is bad, so it's worth hiring help for it. I use a word here that there is an expert who is involved in choosing the tools with which the customer process is developed there."*

H6 also emphasizes that **bias and programmed preconceptions** must be considered when interpreting the results. According to the informant, most AI solutions reflect Western bias. Additionally, political perspectives may have been predefined in the AI. The informant also states that the amount of bias varies significantly between different AI solutions. Some AI models may favor the user too much, even when the user's own ideas are poor. This can lead to worse results.

"*Artificial intelligence has been tuned to this western bias system, and then efforts have been made to influence it so that there are certain political ideas behind it. This has to be taken into account when evaluating the artificial intelligence's response.* (H6)

"*Then if you take ChatGPT for example, it's too pleasant. It tries to please you all the time, even if you have bad thoughts, it always praises you and other things like that... These are practical problems in those language models."* (H6)

H4 found **liability** related matters challenging in relation to artificial intelligence. The informant provided an example of a scenario in which artificial intelligence makes a deal with a person, and everything does not work as it should. Who is held accountable in such a situation? So far, liability issues are still challenging in relation to artificial intelligence. Legislation and insufficient precedents may cause ambiguity in situations where a company would normally be liable for compensation if a human rather than a machine were the culprit. However, legislation and liability issues surrounding artificial intelligence are constantly evolving and being clarified. Furthermore, liability related to artificial intelligence can also pose challenges with a company's liability insurance, and it is therefore important to consider liability issues in advance.

"*Someone has to take responsibility for the business... If a machine starts making a trade and makes an offer or an order with seven numbers, then if everything doesn't work, then what then? So what about these liability issues…"* (H4)

H6 highlights that current solutions do not take into account the human side, such as empathy, enough.: "...*The customer experience is positive if it is implemented correctly. The artificial intelligence solution, for example a chatbot solution in customer service, you have to think carefully about how it is built there. It is nice for the customer that the quick answer comes immediately. It is most often the right answer and so on, but the human side and*

empathy and things like that have not been taken into account enough in these types of solutions."

The most important challenges with artificial intelligence highlighted were **information security** and **data privacy**. The threat that **artificial intelligence will replace people** and **lead to a reduction in jobs** was also experienced as an ethical challenge in several interviews. Additionally **bias** and **liability concerns** were highlighted among the results. One of the interviewees in sample group 1 was not able to comment at all on the possible challenges or ethical problems related to the implementation of artificial intelligence. This may be because the informant's experience with artificial intelligence is still limited.

5.7 Minimizing the challenges and risks of artificial intelligence

In the study, multiple challenges are drawbacks was identified regarding the implementation of AI. H5 highlighted the role of a responsible person to minimize the identified challenges and risks.

"… *In order to minimize these challenges, the person in charge should be someone who has an understanding of the company's IT infrastructure and is an operating system-oriented person."* (H5)

" *Is there a person responsible for this at the company where these are being implemented?"* (H5)

"*That there would be such a working group... Someone would be responsible for that working group. Weekly meetings every 2 weeks where they would go over how it was used, give training on how to use it. They would go through the work in a workshop-like manner...* (H5)

Several other interviewees also highlight **training** as the most important way to manage risks related to the use of AI, such as information security related risks. Training personnel on how AI should be used and what information can be provided to AI solutions can help minimize information security risks. **Clear responsibilities and roles** in implementation were also interpreted as important means of preventing risks from the perspective of several informants.

One practical method to reduce risks suggested by H6 was to **compare responses in several different AI tools**. According to the informant, this reduces the risk of errors and hallucination.

"*Yes, I guess now, by discussing them and sharing information. Information security, awareness and increasing it are really important at the stage when and if such tools are introduced in a company or companies."* (H2)

" *Well, probably with personnel training and so on, whoever is affected by this issue should participate in that training as early as possible."* (H3)

" Yes... training guidance, discussions, instructions, responsibility, role-playing..." (H4)

"*...What comes out of it, I test them with a few different models to see what comes out of it.. The human is an important part of this. That you test with several models, not just use one and then blindly believe... That it is the practical way to reduce those risks..."* (H6)

The most important ways to combat potential risks and challenges were clearly identified among the results: **the importance of training**; **assigning responsible persons** and **cross-comparing results in multiple AI tools** to reduce errors were addressed.

6 Discussion

This section addresses the study's research questions and presents the most relevant findings in relation to them. These results are then examined in relation to the theoretical framework and previous literature and research.

The starting point of this study was to find out: "**How can artificial intelligence be used to enhance after-sales service processes?**". As mentioned above, although artificial intelligence has been studied extensively in recent years, particularly since the introduction of ChatGPT in late 2022, research has focused heavily on the early stages of the purchase process, i.e. the pre- and purchase phases, with less attention paid to the post-purchase phase. Grewal, D. et al. (2023), among others, emphasize in their study how research focuses heavily on mapping the pre-purchase stages, and argue that more research should be prioritized to explore how AI implementation can benefit post-purchase stage. (Grewal, D. et al. 2023). The author found only scattered previous studies related to the integration of artificial intelligence into after-sales service processes. Thus, the aim of this study was to generate more research data in this field. Additionally, to be able to answer to the primary research question, the following sub-questions were formed:

- *What are the problems in customer relationship management in B2B after-sales processes that AI can solve?*
- *How to measure and assess the impacts of adopting AI?*
- *What are the drawbacks and limitations of AI applications?*
- *What needs to be considered in the implementation of AI?*

The research utilized the framework presented above, which combines 3 frameworks: Technology Acceptance Model (TAM) by Davis, F. D. (1989) Technology-Organizational-Environmental framework introduced by Tornatzky, L. G. and Fleischer, M. F. (1990) and SERVQUAL service quality dimensions framework by Parasuraman, A. P. et al. (1988). This integrated framework facilitated comprehension of the factors influencing the acceptance of new technology (artificial intelligence in this context) for use by individual customers and/or staff, the contexts in which artificial intelligence is employed (TOE), and

the factors affecting its utilisation (TAM), as well as the dimensions of service quality (SERVQUAL) that impact customer experience.

The research was conducted through semi-structured thematic interviews with two separate groups: the first consisting of selected key personnel from the commissioning company, and the second of individuals who can be defined as artificial intelligence experts. In this section, the results obtained through the interview method are supplemented by utilizing previous literature and research data, and the results are compared with those of previous research. The subsequent subsections are derived from the research questions in which the research results and their relationship to previous literature and the theoretical framework presented in the chapter 3. The examination of research questions commences with the formulation of subsidiary research questions and culminates in an evaluation of the primary research question. Finally, an updated version of the presented theoretical framework will be introduced.

Overall, the issues raised in the interviews regarding the impact of after-sales service on the customer experience were consistent with previous literature and research. The results of the interviews revealed several key quality elements of after-sales service that Shokouhyar et al. (2020) had compiled from various sources of literature using the SERVQUAL dimensions. However, not all of the themes presented in the table emerged in the results. The results revealed themes from all of the SERVQUAL dimensions (tangibility, reliability, responsiveness, assurance and empathy). This confirms the suitability of the SERVQUAL dimensions as a framework for understanding service quality related elements impacting the customer experience.

6.1 Problematic areas of B2B sales that AI can solve

One of the clearest problem areas identified in the commissioning company's after-sales processes was communication, which caused a slowdown in internal processes. Information retrieval from multiple systems, internal warranty processes and, to a certain extent, invoicing were also identified as areas that slowed down the flow of processes, especially in situations of change. These areas align with the Internal Relationship Management (IntCRM) framework presented by Eichhorn (2004) and the model created by Legnani et al. (2007). These frameworks emphasize the significant role of internal processes in shaping the

after-sales customer experience and the importance of a standardized service model in this context. Improving the efficiency of internal processes can enhance the reliability and responsiveness of service quality in the after-sales context.

In the commissioning company, making work time estimates and calculating quotes was also identified as one of the challenges of after-sales servicd. However, artificial intelligence was seen as having the potential to overcome these challenges. Furthermore, artificial intelligence was considered to have the potential to support work management in creating work time estimates, and therefore in calculating quotes and scheduling maintenance in a timely manner. Previous literature and studies have also identified these areas of development, such as Ibrahim (2022), who observed that artificial intelligence can assist with planning and scheduling maintenance, as well as supporting predictive maintenance.

One of the key challenges identified was the ability of the foreman to provide a preliminary fault diagnosis quickly, often based on incomplete information. Artificial intelligence was seen to have strong potential in this area, as it can help to ensure correct fault diagnoses and suggest the right spare parts for different work packages, thereby supporting the foreman in their challenging task and shortening the response time. Previous studies and literature have also identified the strong potential of artificial intelligence in diagnostics, as in the study by Ghorbel, A. et al. (2024). Ibrahim (2022) also identified the potential of artificial intelligence, particularly regarding predictive maintenance. According to the study, artificial intelligence helped reduce failures and downtime, leading to financial savings. Improving the efficiency of the aforementioned areas has an impact on among others on the following after-sales service quality elements of SERVQUAL framework identified by Shokouhyar et al. (2020): immediate identification of defects; time taken for servicing; consistency of service quality; good customer service during the warranty period; time taken to resolve complaints; and prompt service to customers.

Besides quick fault diagnosis and making a good first impression, challenges were experienced in customer service accessibility. In acute fault situations, customers are not kept waiting if the company cannot be reached; however, in similar situations, customers quickly contact competitors instead. The results revealed that one of the key AI-based solutions for improving accessibility is AI-based chatbots, which can serve customers 24/7 and offer technical support. This field of AI has been studied from many different perspectives as a development target. For example, Juglan et al. (2023) emphasize that

chatbots utilize the natural language production model to improve the efficiency of customer service and save customer service representatives' time. In the context of after-sales service, the quality elements identified from the various factors of service quality in the SERVQUAL framework include convenient operating hours and the availability of information and advice. Improving accessibility in the form of a well-designed 24/7 chatbot thus helps to expand service access and operating hours, as well as the availability of information and advice thereby contributing to the several central elements impacting the service quality (Shokouhyar, S. et al., 2020).

In addition, the commissioning company identified the management of large volumes of data, particularly the acquisition of information, as a challenge. For example, it was found to be time-consuming and slow to find spare part numbers and price information from several different systems and sources within the case company and it’s after-sales service. Artificial intelligence was identified as having potential in processing and analyzing large amounts of data, particularly in supporting the acquisition of information related to spare parts. Easy access to the necessary information was considered to have a significant impact on service speed and, consequently, customer experience. Data processing is a well-researched area of artificial intelligence applications, not only in the context of after-sales service. AI has significant potential compared to human performance. Improved data processing and access to information can speed up internal processes, enhance customer service, and improve the external perception of professional services. The time taken for servicing and the professionalism of service personnel are also quality elements identified through the SERVQUAL framework in after-sales service in the areas of responsiveness and service assurance. (Shokouhyar, S. et al., 2020).

Inventory management was highlighted as a clear problem area by several interviewees, but also as an opportunity to utilize artificial intelligence to optimize inventory levels, predict demand and plan purchases. According to Narne (2021), the use of artificial intelligence in inventory management has been shown to reduce forecast errors by 25%, improve inventory turnover by 20%, and reduce operational costs by 15%. AI-based inventory management has thus been found to significantly impact the efficiency of inventory management in previous studies and literature. Optimizing inventory levels and the availability of spare parts has been identified as affecting the reliability of a company's after-sales service when examining the SERVQUAL framework in the context of after-sales marketing (Shokouhyar et al., 2020).

(Shokouhyar et al., 2020). Optimizing inventory levels therefore clearly impacts the customer experience.

In addition to working time estimates, producing estimates of when a service technician will arrive at the site (i.e. resourcing and work planning) was perceived as areas where the supervisor may face challenges. In addition to artificial intelligence-assisted working time planning, route planning for service vehicles supported by artificial intelligence was seen as one way to improve the assessment of the required working time and optimize the utilization rate of both service vehicles and service technicians. This topic has been extensively studied, particularly from a logistics and transportation perspective, as part of supply chain optimization. For example, Paul et al. (2025) examined the effects of AI-based route optimization on the efficiency of the logistics chain and cost reduction. However, the author could not find any previous literature or studies that examined artificial intelligence-based route planning in relation to improving the utilization rate of service vehicles and human resources. According to Shokouhyar et al. (2020), the availability of service technicians affects service quality in the empathy and reliability dimensions of the SERVQUAL framework.

Overall, the study reinforced the perspective of how multidimensional and versatile the potential of artificial intelligence as part of after-sales processes is. The possible use cases that emerged in this study follow themes that have already emerged in scattered studies, gathering use cases together. The results of the study did not reveal any significant findings that previous literature had not already brought to light. However, the aforementioned artificial intelligence-based route planning in this context would seem to be a relatively new area of artificial intelligence's potential in after-sales service, or at least a very little-studied area as the author was not able to find any previous research on the subject.

However, as the sample was limited and the results were limited to the views of the interviewees, not all possible options emerged in the results. However, this is natural considering the scope of the use of artificial intelligence. However, the results revealed several possible use cases in terms of after-sales service, which can be used in the development of after-sales services processes. It must also be noted that the possibilities of artificial intelligence are constantly expanding as research knowledge increases and people's expertise in the possibilities of artificial intelligence increases. The computing power of artificial intelligence is also constantly increasing, which will open completely new

opportunities to utilize artificial intelligence in business. Several solutions emerged from the results that contributed to the identified quality elements of after-sales servuce compiled by Shoukouhyar, S. et al. (2020). Overall, the results revealed solutions that affect service quality in all five dimensions identified in SERVQUAL: tangibles, reliability, responsiveness, assurance and empathy. Most of the solutions that emerged contributed to the **reliability** and **responsiveness** quality dimensions, while the solutions that emerged had less impact on tangible and empathy quality dimensions. This is likely because the solutions that emerged in the results essentially focused on improving service efficiency by speeding up internal processes and improving service availability. These areas have the most significant impact on the reliability and responsiveness quality dimensions of the service.

The following chapter presents a table (see table 5.) that brings together the possible use areas of artificial intelligence identified from both the literature and this study to enhance the efficiency of after-sales service processes.

6.2 Measuring and assessing the impacts of AI adoption

In the study, the approach to measuring the impact of AI was divided into two perspectives in terms of interview questions: measuring internal impacts and measuring the service quality improvement considering the impact on customer experience. This is because it is important to understand not only the benefits of AI to the company internally, but also how the implementation of AI affects the service quality and thereby customer experience.

The results particularly highlighted the fact that ready-made metrics have not yet been created, as the implementation of artificial intelligence is still at such an early stage. Internal metrics suggested by both interviewee groups included measuring the lead time before and after the implementation of artificial intelligence. Other key metrics suggested were the acceleration of work tasks, the reduction of manual work, the efficiency of work, the reduction of errors, and, among other things, how much economic benefit, for example, a chatbot can produce in the form of leads and deals. In addition, the saving of time, money, and resources was also highlighted as one possible way to measure the effects of artificial intelligence. These presented metrics are in line with the metrics presented in previous literature and studies, such as the study by Garg, V. et al. (2025), which specifically focused on performance-type metrics when assessing the effects of artificial intelligence.

From a customer perspective, the strongest suggestions for measuring the effects of AI were **customer satisfaction surveys** and, as an indirect measure, **Net Promoter Score** measurements. These are in line with, among others, a study by Wei, H. & Prentice, C. (2022), where customer satisfaction surveys and Net Promoter Score were mentioned as the most central means for measuring the customer perspective or, more precisely, the customer experience.

Overall, the proposed metrics for measuring both internal impacts and the customer perspective were in line with previous literature, and thus the results did not reveal any new perspectives or anything surprising. The metrics that emerged in the results thus confirm the findings of previous studies and literature on possible metrics for measuring the impacts of AI.

6.3 Limitations and drawbacks of AI applications

State, L. 2021; Aninze, A. & Bhogal, J. (2024) emphasize that information security is one of the key challenges of AI. Based on this, verifying information security requires the company to understand how AI operates and how to handle information securely. Concerns related to the information security and data privacy were matters that all interviewees in this study highlighted except one. Data privacy and especially the storage of classified data within the organization is a challenge with AI solutions. Problems related to information security and data privacy concern both internal company data and customer data. In particular, open and general language models and the information entered into them help should be carefully considered.

Among the responses, the potential error of the results was also identified as a significant problem area, which is why the auditability of the results and thus transparency were found important. According to Aninze, A. & Bhogal, J. (2024), in particular some Deep Learning solutions are not transparent. The need for auditability and transparency supports the need for XAI models under development, which helps to explain AI decision-making process and thus improves the transparency of AI solutions. Gupta,V . (2024) addresses that the quality of AI-generated outputs depends on the quality of input data and the prompts. Rather than using the results as such, AI should be seen as a collaborative partner whose outputs could be seen as hypotheses that needs to be confirmed. (Gupta, V. 2024)

In addition to potential errors or hallucinations, the bias of artificial intelligence was seen as a problem that needs to be recognized. Many artificial intelligence solutions are biased and have adopted preconceptions. Bias in artificial intelligence can affect the fairness of the results and how artificial intelligence treats, for example, different groups of people. At worst, artificial intelligence can discriminate against, for example, minority groups. Verma, S. et al. (2024) It is important to be aware of the potential bias of artificial intelligence when using artificial intelligence.

Besides data security and output quality, one of the key ethical challenges and concerns highlighted in the results was the impact of artificial intelligence on the labor market. The results highlighted perspectives on whether artificial intelligence will replace humans and whether artificial intelligence will lead to a reduction in jobs. These perspectives are also in line with previous literature, such as the conference paper by Anurag & Das, P. (2023) "AI Technology Minimizes the Need for Manual Labour and Potentially Displaces Workers from Jobs". The same theme also emerges in numerous other studies regarding the negative effects of artificial intelligence on employment.

Moreover, the results also highlighted the view that AI cannot completely replace humans in customer service, as AI is not able to be present in the same way as humans. The results also highlighted the lack of human-like empathy in solutions like ChatGPT. Human-like empathy is one of the dimensions of AICSQ introduced by Chen, Q. et al. (2022). The framework highlighted seven multi-level dimensions of service quality concerning AI chatbots where the human-like dimension was one. Empathy has thus also been identified in previous research as one of the key quality elements when assessing the service quality of AI-assisted services like chatbots. (Chen, Q. et al. 2022)

Overall, the drawbacks and limitations of artificial intelligence that emerged in the study were well in line with the findings of previous literature. The study did not reveal anything unusual or surprising.

6.4 Considerations regarding the AI implementation

One area of research was to map out what a company should consider when implementing artificial intelligence. The research results revealed numerous perspectives that consider elements related to the smooth implementation of artificial intelligence.

One key element in the results was the compatibility of AI with the rest of the organization's IT infrastructure. An outdated IT infrastructure was seen as weakening development opportunities and also the implementation of AI. Instead of implementing AI as a separate stand-alone solution, integrating AI into existing systems was seen as important for implementing AI. From a technical perspective, the results also highlighted the fact that an AI solution should be expandable and developable as part of operations so that it does not limit development. Choosing an AI solution was seen as challenging due to the constantly increasing number of tools available in the market. For people who are not AI experts, making a decision on the right solution can be challenging. However, choosing the wrong tool can cause problems and, in the worst case, the work done can be wasted if the AI solution is not on the market for a long time. The compatibility of IT-infrastructure is also addressed as one the organizational context factors impacting the implementation of new technology in TOE-framework. (Agrawal, K. P. 2023)

In the aforementioned problem of choosing the right AI solution and as a common factor for the successful implementation of AI in general, the use of an external expert was found important, especially in the first pilot(s). In addition to an external expert, the results widely emphasized the point of view that AI should have a clear person responsible in the organization or even a working group focused on AI and its development. The appointed person and the working group would be responsible for coordinating AI projects, identifying new opportunities, increasing organizational knowledge, providing training and establishing best practices. Finding a competent working group or person in the organization requires the new technology to be implemented in line with the company's organizational context as set out in TOE framework. These organizational factors includes for instance the quality of human resources and IT capabilities, as these have been found to be linked to the more efficient adoption of AI and gaining a competitive advantage through its implementation. (Agrawal, K. P. 2023; Chong, J. L. L. & Olesen, K. 2017).

In order to implement artificial intelligence in an organization, change management is required. This study found that implementing artificial intelligence can make employees fear losing their jobs and generally cause resistance to change, particularly among those who have been accustomed to doing things a certain way for a long time. However, the way in which individuals react to new technologies depends on the individual. Important elements of change management and employee commitment to the implementation of artificial intelligence were considered to be sufficient communication, management and peer support, training, use case examples and emphasizing the benefits. Leaving the implementation to the personnel alone without guidance was not seen as an effective way to implement AI more broadly within the organization. The results highlighted the need for support and training to facilitate the implementation. According to the results, rather than replacing humans, artificial intelligence should be seen as a team member that helps to achieve common goals and makes work easier by replacing manual processes. Management and staff support as promoters of AI adoption correlate with the organizational factors of the TOE framework, where management support and staff quality/competence are mentioned as key factors shaping and promoting the context of adoption. Cubric, M. (2020) also identified competence challenges and resistance to change as sole barriers or factors challenging the adoption of AI.

Within the results, training was found important in both facilitating the implementation and improving the knowledge and awareness of the benefits of artificial intelligence. Emphasizing the benefits and use cases have a clear impact on the attitude of the personnel towards the implementation of artificial intelligence. The results also emphasized the importance of achieving rapid benefits in the early stages of projects, which was considered as an important factor impacting the attitude of personnel and building momentum to the implementation. The speed and ease with which AI applications can be used were also considered to be significant factors in influencing their use. The view of emphasizing the benefits and the competence brought by training impacting the easiness of use clearly correlates with the Technology Acceptance Model framework presented earlier. In the TAM framework, perceived ease of use (PEOU) and perceived usefulness (PU) were key factors impacting the acceptance of new technology, influencing the person's behavioral intention (Davis, F. D. 1989). Comparing new technology (artificial intelligence) and its benefits to previous technologies highlights the relative advantage of artificial intelligence. Relative

advantage is also one of the identified factors in TOE framework's technological context. (Agrawal, K. P. 2023)

Data management and data quality, as well as clear processes, also play a significant role in the implementation of artificial intelligence. The results highlighted that good data management is a key element for the implementation of artificial intelligence as the quality of output is just as good as the quality of the input. The same applies to the company's internal processes, which must be clear so that artificial intelligence can be implemented in a controlled manner as part of different processes. In his study, Cubric, M. (2020) identified the availability of data as one of the barriers to the implementation of artificial intelligence.

The areas identified as risks of artificial intelligence, including potential errors, hallucinations and bias, were mainly related to the fact that responses emphasised the importance of being able to check the decision-making process and logic of artificial intelligence during implementation, in order to improve transparency and identify potential errors or biased perspectives. Additionally, this enables the performance and impact of AI to be measured against its own performance criteria. Furthermore, the study's results emphasised that implementing artificial intelligence will create new demands for human competence and skill development. Also according to Gupta, V. (2024) the quality of artificial intelligence outputs is only as good as the input data and prompts. Instead of utilizing the results as such, the results should be viewed as hypotheses and as an opportunity to develop the dynamic capabilities of people, which is required while using artificial intelligence. (Gupta, V. 2024)

The results emphasized several areas identified in the TOE framework, but the responses did not assess the effects of the external environment due to the nature of the research design and the formulation of the research questions. Thus, environmental factors from the TOE framework did not emerge at all in the study's results. However, the results further reinforced the usefulness and ease of use of the Technology Acceptance Model framework, which plays a key role in the acceptance of new technology.

6.5 Revised theoretical framework

Based on the results of the study, it was found that the theoretical framework presented earlier in chapter 3 was reasonably well suited to the research setting. The TOE framework helped to understand the context in which artificial intelligence is introduced from several different perspectives. Due to the setting of this study and the questions in the interview frames, the results did not identify environmental factors in accordance with the TOE framework. The aim of the study was primarily to identify internal factors within the company, so environmental factors were excluded from this study. The Technology Acceptance Model, in turn, helped to observe how artificial intelligence is experienced from the perspective of both customers and staff, through the perceived ease and usefulness of use. Third and finally, the SERVQUAL model helped to understand the quality dimensions sales service quality and analyze the impact of implementing artificial intelligence on service quality.

From these perspectives, this framework enabled an overall examination of the research setting. Artificial intelligence was considered a technological enabler and tool, after-sales processes were considered an operational activity with challenges, and service quality and customer experience were considered an area that could be indirectly improved by implementing artificial intelligence to streamline after-sales processes and improve service quality.

One of the sub-research questions of the study sought to find out how the effects of artificial intelligence could be assessed or measured. In the interview, this was taken into account by mapping both internal and external metrics or evaluation methods. This is because the greatest impact on service quality and thereby customer experience was expected to occur indirectly, through streamlined processes and improved service quality. While improving service quality and customer experience was important, streamlining internal processes and achieving business benefits through it was of paramount importance. For this reason, in addition to using the SERVQUAL model to measure the effects of artificial intelligence on the service quality and customer experience, it was considered very important to measure its effects internally. Among the results, the importance of measurement as part of the AI iteration process was also highlighted. The previously presented theoretical framework considers measurement as part of the research setup from the perspective of the customer

experience of the SERVQUAL service entity. However, in order for a company to be able to assess the benefits of artificial intelligence as part of business processes, it is essential to also measure the effects of artificial intelligence internally. Therefore, the author felt that it was necessary to supplement the previously presented theoretical framework to cover the measurement of both internal and external impacts and to add a feedback mechanism to the framework, where the metrics interact with the AI iteration process. The new revised theoretical framework can be found below, see figure x.

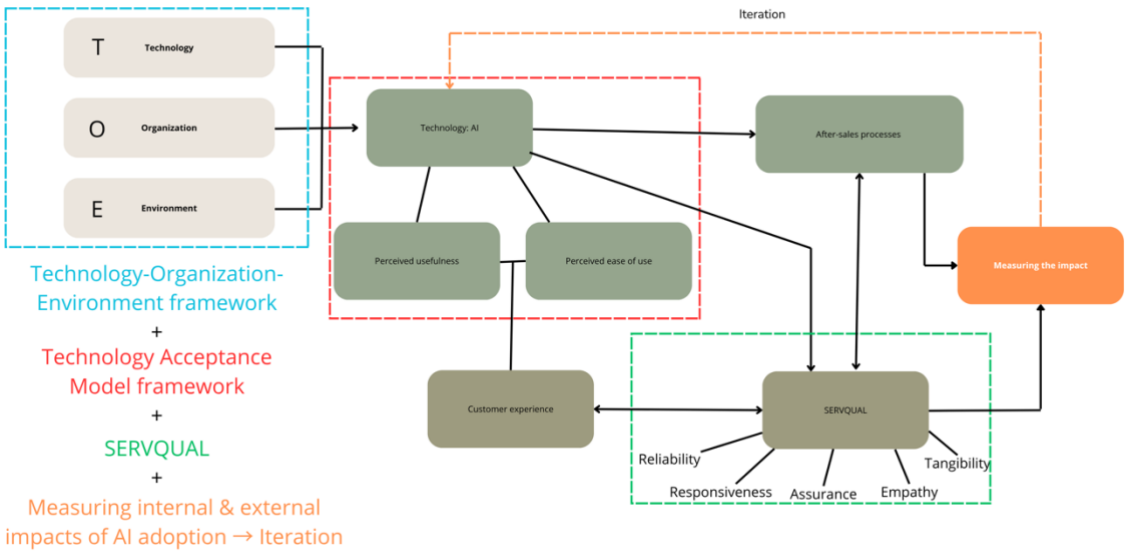

Figure 15. Revised theoretical framework

7 Conclusions

This section summarizes the research results obtained from Chapters 5 and 6, providing concise answers to the research questions of this study. Based on the research results obtained and the literature reviewed in the theory section, best practices for AI implementation for executives are presented. These recommendations cover the implementation of artificial intelligence in B2B after-sales processes and consider the issues, limitations and challenges regarding AI implementation. The latter section briefly discusses the study's limitations and proposals for further research. Finally, the last section concludes the study's scientific contribution.

7.1 Findings

The starting point of the study was to map the possibilities of artificial intelligence in streamlining B2B after-sales processes. The study used semi-structured interviews as a data collection method, in which a total of 6 different people were interviewed. In addition to the interview results, the study used previous literature and research data on the topic as secondary data.

The research found that artificial intelligence has numerous applications in streamlining B2B after-sales processes and thus improving the service quality. Only some of the presented solutions were of a nature that would be directly connected to the customer interface and thus the focus was on applications that would improve the service quality through improving internal processes. The results highlighted several solutions, including artificial intelligence-based **warehouse/inventory management** and **data processing**, a**rtificial intelligence for calculating offers** and **planning working time and resources**, **optimizing the routes of service vehicles**, **using simulators for internal training** and an **internal chatbot**, and **improving information retrieval** through the use of AI agents. The results also highlighted the potential importance of AI in **predictive maintenance** and fault diagnostics. A **chatbot** that can be integrated into websites and online stores to provide technical support and advise and recommend products to customers was presented as a solution that improves a company's accessibility.

Multiple metrics and KPIs were presented as indicators of the internal impacts of artificial intelligence implementations: **lead time**, **success rate**, **reduction of manual work**, **savings in terms of time, money and resources**, and **reduction in errors**. Other metrics proposed for measuring the impact of chatbots included the **number of leads and deals** generated by the chatbot. **Customer satisfaction surveys** were suggested as a means of measuring the impact on customer experience, with **Net Promoter Score** being proposed as an indirect indicator. Direct feedback surveys of chatbots were also mentioned as a means of measuring their usefulness.

Several elements were considered when planning the implementation of artificial intelligence. The most important issues that was highlighted in the results was compatibility of the artificial intelligence solution with other IT infrastructure, the auditability of the decision-making logic and results of the artificial intelligence and the integrability of the artificial intelligence into existing systems instead of stand-alone solutions. Change management and management/peer support were seen as important elements in supporting personnel's commitment to adopting artificial intelligence. Training and providing practical case examples were seen as significant factors in reducing risks, emphasizing benefits and facilitating competence. In accordance with the perceived ease of use & perceived usefulness, these factors were found to influence personnel attitudes, thus supporting the Technology Acceptance Model introduced by Davis, F. (1986). In addition, the appointment of a clear responsible person or establishment of working groups were perceived as important factors considering the implementation of AI. As the number of artificial intelligence solutions is constantly growing, and sufficient in-house expertise is not always available, using external artificial intelligence experts was found to be a reasonable alternative, particularly in the initial implementation phase. The results also emphasized the importance of achieving quick results from the outset of the project. This was considered important in terms of demonstrating the usefulness of the solution and thus building momentum for implementation and engaging staff.

In addition to the numerous identified benefits of AI, the study also identified several limitations, challenges, and ethical issues related to the implementation of AI. The most significant of these were the **inaccuracy of the results** and **bias**. The importance of consideration of **information security** and **data privacy** especially related to the management of classified information was also stressed. One key ethical challenge identified

in the study was the potential for AI to replace humans and reduce job opportunities. Furthermore, the fact that AI cannot fully replace human contact due to a lack of human-like skills such as empathy was also addressed. For this reason, it was suggested that humans are still needed for customer service and to monitor AI responses. Rather than replacing humans, AI should be seen as a new team member.

7.2 Practical implications

This section presents practical recommendations for management on implementing artificial intelligence (AI) as part of after-sales processes, based on the research and findings. It also highlights critical implementation factors that should be taken into account when planning and implementing AI in after-sales processes. This section thereby presents the practical contributions of this study. The results of the study help to more concretely outline the possibilities of utilizing artificial intelligence in streamlining B2B after-sales service processes and to understand the business benefits of artificial intelligence and its impact on the service quality. The purpose of this section is to provide a guide on best practices related to the implementation of AI and to summarize the AI application possibilities in B2B after-sales processes.

First, general guidance on the implementation of artificial intelligence is presented, which is built on research results and previous literature, followed by a summary of the possible applications of artificial intelligence in B2B after-sales service:

General guide for AI implementation:

1. **Create a strategy for AI implementation**

Create an AI strategy that defines the goals for AI utilization, its scope, desired impacts and phases. Ensure that AI implementation is aligned with the organization-wide strategy and, if possible, include AI as part of the company-wide strategy. Assess the current state of the company (strengths, weaknesses, opportunities, threats, environmental factors such as the competitive situation and legal and political factors) and the resources available (personnel,

expertise, budget, technological infrastructure, high-quality data) for the AI implementation. Additionally consider other prerequisites for the implementation and consider whether AI solutions are compatible with the current technology infrastructure and organizational culture. If needed, utilize an external expert specializing in AI to support in the first pilot(s). Also identify potential obstacles or challenges in AI implementation and consider how these challenges can be circumvented or eliminated and how they are considered in the strategy. Moreover, create a plan for change management and employee engagement.

Create a concrete action plan for the coming years and establish an AI-focused working group that will be responsible for developing and mapping the company's AI solutions. Make the working group responsible for helping other personnel implement AI and to gather development ideas from the rest of the organization.

As part of AI strategy, target the most critical areas in after-sales processes and leverage employee and customer feedback to support use case design. Also, plan appropriate metrics before implementation to assess both the internal and external impacts of AI implementation.

2. **Create company-wide policies for the use of AI, and engage key people and staff ensuring they are committed to the implementation of AI**

Before AI implementation, draw up company-level rules and practices for utilizing AI that consider the challenges of AI such as information security. Ensure that personnel have sufficient instructions on how AI tools should be used and what to consider. Provide personnel with sufficient training for implementing AI and, in cooperation with the AI working group, justify the benefits of implementing AI. When personnel receive enough information and feel that they understand how AI can be utilized, the threshold for starting implementation is lowered. Emphasizing usefulness also helps to motivate personnel to utilize the tools. In change management, consider possible backlash and resistance to change, as well as fears that the adoption of new technology may arouse in personnel. Also communicate clearly what the implementation of AI means in the company and what it aims to achieve. Personnel may fear that the implementation of AI will take away their jobs.

3. **Implement AI gradually and start with pilots**

Start implementing AI in stages and on a pilot basis. Favor solutions that do not require significant investments or integrations into new systems before testing the functionality of the solutions (ensure the trialability). Utilize an external AI expert for the first pilots as needed. Create a high-quality data pipe in connection with the first pilot(s), which can also be utilized in future solutions. This will speed up and streamline the implementation of future projects and significantly shorten the lead time.

Track the success of the pilot, measure its impact, and learn from any mistakes. Use the lessons learned from the pilot in future projects and iteration.

4. **Create a model for continuous demos**

After the pilot(s), create a model for continuous demos that can utilize the data pipe created during the pilots. Instead of utilizing external expert consultants, invest in internal expertise that enables significant cost savings for implementing tests and low-threshold demos. Create a model of continuous demos that can effectively test various development projects even with fast cycles. Engage personnel in planning the development ideas. Last but not least, regularly update organization's AI strategy and invest in personnel skills ensuring that key personnel are informed about new solutions and opportunities by providing the necessary training. Keeping the company up to date with opportunities will prevent it from falling behind its competitors and help maximize the competitive advantage gained through the use of artificial intelligence. Also, consider interdisciplinary collaboration with other companies and joint pilot projects, for example with customers or principals.

Application possibilities of artificial intelligence in B2B after-sales service:

Table 5. Application possibilities of artificial intelligence in B2B after-sales service

Intended use	**AI applications**
Operational efficiency & reduction of manual work	AI agents, GenAI, virtual assistants, automation of financial processes, order automatization, internal chatbots, automatization of manual processes

	Sources: Juglan, K. C. et al. 2023; Mesenzani, M. & Di Massa, A. 2021
Repair services and diagnostics	AI enabled diagnostics, predictive maintenance, virtual assistants, AI agents, VR simulations, handling maintenance tickets Sources: Ibrahim, H. 2022; Mesenzani, M. & Di Massa, A. 2021; Zhao, Y. et al. 2019; Ghorbel, A. et al. 2024; Jang, K. et al. 2025; Dereci, U. & Tuzkaya, G. 2024; Shivahare, B. D. et al. 2022
Data management and coordination	AI agents, internal chatbots, virtual assistants, prediction of customer churn Sources: Juglan, K. C. et al. 2023; Mesenzani, M. & Di Massa, A. 2021
Customer feedback analysis	NLP, Sentiment Analysis, Automatic Summarize Sources: Juglan, K. C. et al. 2023; Shivahare, B. D. et al. 2022;
Customer service and technical support	Chatbots, virtual assistants, AI agents, automatic summarize, translation, Sources: Juglan, K. C. et al. 2023; Shivahare, B. D. et al. 2022
Personalization	Chatbots, internal AI assistant, GenAI, remarketing, translation, segmentation, identification of possible buyers Sources: Juglan, K. C. et al. 2023; Ameen N. et al. 2021; Chen, Y. & Prentice, C. 2024

Communication	GenAI Sources: Juglan, K. C. et al. 2023
Resourcing	Work planning estimations, AI based service vehicle route planning, pricing tools Sources: Juglan, K. C. et al. 2023
Documentation	Speech recognition, automatic summarize Sources: Juglan, K. C. et al. 2023
Inventory management	AI enabled inventory management Sources: Narne, H. 2021; Ünal, Ö. et al. 2023; Hussain, M. Z. et al. 2024

7.3 Scientific contribution

The scientific contribution of this study helped to support the existing research base on the use of artificial intelligence to enhance B2B after-sales processes. This study brought together existing literature and previous studies on the topic and presented a new framework built on three different reference frameworks, which was suitable for assessing the background context related to the adoption of technology that affects internal processes and service quality, and the impact of process enhancements on service quality. Also, a revised theoretical framework was introduced, supplemented with impact measurement and feedback mechanism.

In some respects, the research succeeded in identifying concrete possibilities for streamlining B2B after-sales processes that, to the author's knowledge, had not already been presented in previous research or literature. One such refinement was related to artificial intelligence-based route optimization for service vehicles, for which the author could not find any previous research or literature. Route optimization itself has been extensively studied, primarily from the perspective of streamlining logistics and supply chain management. Building on this, the potential of AI-based solutions for service vehicle route planning could be further explored in post-purchase stage research on B2B sales processes.

7.4 Limitations and suggestions for further study

The most significant limitation of the study is the small sample size. A total of 6 people were interviewed in the study. This small sample size limits the generalizability of the study results. The study also only interviewed Finnish companies, so the results cannot be generalized to foreign companies.

The issues that emerged from the interviews, and the conclusions drawn from them, cannot necessarily be generalized to all companies. It should be noted that companies' internal processes, resources, and openness to adopting new technologies, such as artificial intelligence, can vary significantly depending on factors such as company size, industry, country, culture, the nature of operations, and personnel readiness. In this respect, this study represents the perspective of one company only and may or may not reflect the perspectives of others. However, the results cannot be generalized directly.

Another noteworthy thing about the interviewees in research group 1 is that those interviewed within the case company in question (H1, H2 and H3) are not AI professionals. Their views are therefore based only on what they have heard and read, as well as their own opinions. Consequently, the views of this research group on the potential applications of AI in after-sales processes, for example, are limited and heavily influenced by generative AI (GenAI), despite this being just one form of AI.

On the other hand, the second group in this study's interview sample, consisting of AI experts, is not huge and the observed findings may not cover everything. Therefore, the results obtained represent the interviewees' current knowledge impacted by their previous experiences. It should also be noted that significant aspects may not be mentioned in an interview for various reasons. These reasons may include tension in the interview setting or simply forgetting something, which is natural. For this reason, the author has also highlighted issues that have emerged from literature and previous studies, in order to complement the empirical results of this study.

As mentioned above in the scientific contributions section, the use of artificial intelligence in route planning for service vehicles was found to be a new or at least little-studied application for artificial intelligence as part of streamlining aftermarket processes. The author was unable to find direct literature or research on the topic. Therefore, as one area of

research, the author proposes investigating the potential benefits of artificial intelligence in optimizing route planning for service vehicles as a further research areas.

This study did not consider external factors related to the adoption of AI, such as environmental aspects according to the TOE framework. A further research proposal would be to investigate the impact of external factors on Finnish companies' adoption of AI.

References

Agrawal, K. P., 2023, Towards Adoption of Generative AI in Organizational Settings, [Online]. [Cited 2025-05-08]. Available: https://www-tandfonline-com.ezproxy.cc.lut.fi/doi/full/10.1080/08874417.2023.2240744#abstract

Ameen, N. et al., 2024, Customer experiences in the age of artificial intelligence, Science Direct. [Website]. [Cited 2025-02-24]. Available: https://www-sciencedirect-com.ezproxy.cc.lut.fi/science/article/pii/S0747563220302983

Aninze, A. & Bhogal, J., 2024, `Artificial Intelligence Life Cycle: The Detection and Mitigation of Bias´. *Conference proceedings: International Conference on AI Research*. [Online]. [Cited 2025-04-21]. Available: https://www.researchgate.net/publication/386501524_Artificial_Intelligence_Life_Cycle_The_Detection_and_Mitigation_of_Bias

Anurag & Das, P., 2023, `AI Technology Minimizes the Need for Manual Labour and Potentially Displaces Workers from Jobs´. *2023 3rd International Conference on Technological Advancements in Computational Sciences (ICTACS),* [Online]. [Cited 2025-05-18]. Available: https://ieeexplore.ieee.org/document/10390011/authors#authors

Baines, T. & Lightfoot, H. W. 2014 ´Servitization of the manufacturing firm: Exploring the operations practices and technologies that deliver advanced services´. *International journal of operations & production management,* Vol. 34, No. 1. [Online]. [Cited 2025-03-07]. Available: https://www-emerald-com.ezproxy.cc.lut.fi/insight/content/doi/10.1108/ijopm-02-2012-0086/full/html

Baroni, I. et al., 2022, `AI-TAM: a model to investigate user acceptance and collaboration intention inhuman-in-the-loop AI applications´, *Human Computation,* 9(1):1-21, [Online]. [Cited 2025-05-09]. Available: https://www.researchgate.net/publication/360817594_AI-TAM_a_model_to_investigate_user_acceptance_and_collaborative_intention_inhuman-in-the-loop_AI_applications

Bearden, W. O. & Netemeyer, R. G. 2012, SERVQUAL (Parasuraman, Zeithaml and Berry 1986, 1988), in Handbook of Marketing Scales: Multi-Item Measures for Marketing and Consumer Behavior Research. 3rd Edition. Thousand Oaks, Sage. [Online]. [Cited 2025-03-

07]. Available: https://methods-sagepub-com.ezproxy.cc.lut.fi/book/mono/handbook-of-marketing-scales/toc

Cardenas, S. & Vallejo-Cardenas, S. F., 2019 `Continuing the Conversation on How Structural Racial and Ethnic Inequalities Affect AI Biases´. *2019 IEEE International Symposium on Technology and Society (ISTAS).* [Online]. [Cited 2025-04-21]. Available: https://ieeexplore-ieee-org.ezproxy.cc.lut.fi/document/8937853

Chen, Q. et al., 2022, `Classifying and measuring the service quality of AI chatbot in frontline service´, *Journal of Business Research,* Vol. 145, [Online]. [Cited 2025-05-10]. Available: https://www.sciencedirect.com/science/article/abs/pii/S0148296322002272

Chen, Y. & Prentice, C., 2024, Integrating Artificial Intelligence and Customer Experience, Vol. 33(2), [Online]. [Cited 2025-05-03]. Available: https://journals.sagepub.com/doi/10.1177/14413582241252904

Chiarello, F. et al., 2024 ´Future applications of generative large language models: A ata-driven case study on ChatGPT´. *The International Journal of Technological Innovation, Entrepreneurship and Technology Management,* Vol 113. [Online]. [Cited 2025-02-22]. Available: https://www.sciencedirect.com/science/article/pii/S016649722400052X

Chong, J. L. L. & Olesen, K., 2017 `A Technology-Organization-Environment Perspective on Eco-Effectiveness: A Meta-analysis´ *Australasian Journal of Information Systems 21,* [Online]. [Cited 2025-05-05]. Available: https://www.researchgate.net/publication/314190773_A_Technology-Organization-Environment_Perspective_on_Eco-effectiveness_A_Meta-analysis

Clark, S. et al., 2010, `Transitional Identity as a Facilitator of Organizational Identity Change during a Merger´, *Administrative Science Quarterly,* 55(3), [Online]. [Cited 2025-05-12]. Available: https://www.researchgate.net/publication/254078683_Transitional_Identity_as_a_Facilitator_of_Organizational_Identity_Change_during_a_Merger

Cubric, M., 2020, ´Drivers, barriers and social considerations for AI adoption in business and management: A tertiary study´. *Technology in society,* Vol. 62. [Online]. [Cited 2025-03-07]. Available: https://www-sciencedirect-com.ezproxy.cc.lut.fi/science/article/pii/S0160791X19307171

Davis, F. D., 1989, Perceived Usefulness, Perceived Ease of Use, And User Acceptance of Information Technology, ParsModir. [Online]. [Cited 2025-04-21]. Available: https://parsmodir.com/wp-content/uploads/2018/11/TAM-Davis-1989.pdf

Deng, L., 2018, Artificial Intelligence in the Rising Wave of Deep Learnin: The Historical Path and Future Outlook [Perspectives], IEEE Signal Processing Magazine. [Website]. [Cited 2025-02-21]. Available: https://ieeexplore-ieee-org.ezproxy.cc.lut.fi/document/8253597

Dereci, U. & Tuzkaya, G., 2024, An explainable artificial intelligence model for predictive maintenance and spare parts optimization, Supply Chain Analytics, Vol. 8, [Online]. [Cited 2025-05-03]. Available: https://www.sciencedirect.com/science/article/pii/S2949863524000219

Eichorn, F. L. 2004, Internal Customer Relationship Managemetn (IntCRM): A Framework for Achieving Customer Relationship Management from the Inside Out, Problems and Perspectives in Management. [Online]. [Cited 2025-03-07]. Available: https://www.researchgate.net/publication/279898378_Internal_Customer_Relationship_Management_IntCRM_A_Framework_for_Achieving_Customer_Relationship_Management_from_the_Inside_Out

Eskola, J. & Suoranta, J., 2014, Johdatus laadulliseen tutkimukseen, Tampere, Vastapaino.

Garg, V. et al., 2025, `The impact of strategic performance measures on performance: The Role of artificial intelligence and machine learning´, *Transportation Research Part E: Logistics and Transportation Review,* Vol. 198, [Online]. [Cited 2025-05-18]. Available:

https://www-sciencedirect-com.ezproxy.cc.lut.fi/science/article/pii/S1366554525001140

Ghorbel, A. et al., 2024, `Bearing Fault Diagnosis Based on Artificial Intelligence Methods: Machine Learning and Deep Learning´, *Arabian Journal for Science and Engineering,* [Online]. [Cited 2025-05-12]. Available: https://link-springer-com.ezproxy.cc.lut.fi/article/10.1007/s13369-024-09488-3

Gioia, D. A. et al., 2012, Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology, Vol. 16(1), [Online]. [Cited 2025-05-13]. Available: https://journals-sagepub-com.ezproxy.cc.lut.fi/doi/full/10.1177/1094428112452151

Giordano, V. et al., 2024 `The impact of ChatGPT on human skills: A quantitative study on twitter data´. *Technological Forecasting and Social change,* Vol. 203. [Online]. [Cited 2025-02.22]. Available: https://www.sciencedirect.com/science/article/pii/S0040162524001859

Grewal, D. et al., 2009 ´Customer experience management in retailing: and organizing framework´. *Journal of retailing,* Vol. 85, No. 1, [Online]. [Cited 2025-02-23]. Available: https://lut.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_proquest_journals_228655765&context=PC&vid=358FIN_LUT:LUT&lang=en&search_scope=LUT_CAMPUS_CDI&adaptor=Primo%20Central&tab=Everything&query=any,contains,customer%20experience%20management%20in%20retailing:%20an%20organizing%20framework&offset=0

Grewal, D. et al., 2023 `Leveraging In-Store Technology and AI: Increasing Customer and Employee Efficiency and Enhancing their Experiences´. *Journal of Retailing,* Vol. 99(4), [Online]. [Cited 2025-05-02]. Available: https://www.sciencedirect.com/science/article/pii/S0022435923000507

Gupta, V. et al., 2022, An overview of Supervised machine Learning Algorithm, 2022 11th International Conference on System Modeling & Advancement in Research Trends (SMART). [Website]. [Cited 2025-02-22]. Available: https://ieeexplore-ieee-org.ezproxy.cc.lut.fi/document/10047618

Gupta, V., 2024, An Empirical Evaluation of Generative Artificial Intelligence Technology Adoption Model from Entrepreneurs' Perspectives, Systems, Vol. 12, no.3, [Online]. [Cited 2025-07-03]. Available: https://www-proquest-com.ezproxy.cc.lut.fi/docview/3003522745?pq-origsite=primo&accountid=27292&sourcetype=Scholarly%20Journals

Haefner, N. et al., 2023 `Implementing and scaling artificial intelligence: A review, framework, and research agenda´. *Technological Forecasting and Social Change,* Vol. 197, [Online]. [Cited 2025-05-02]. Available: https://www.sciencedirect.com/science/article/pii/S0040162523005632

Haenlein, M. & Kaplan, A., 2019 `A brief history of artificial intelligence: On the past, present, and future of artificial intelligence´. *California Management Review*, Vol. 61, no.

4, [Online]. [Cited 2025-02-21]. Available: https://journals-sagepub-com.ezproxy.cc.lut.fi/doi/full/10.1177/0008125619864925

Huang, M. & Rust, R. T., 2018. `Artificial Intelligence in Service´ *Journal of Service Research,* 21(1), [Online]. [Cited 2025-05-02]. Available: https://www.researchgate.net/publication/322958062_Artificial_Intelligence_in_Service

Huberman, A. M. & Miles, M. B., 2002. *The Qualitative Researcher's Companion.* Thousand Oaks, SAGE Publications, Inc. [Online]. [Cited 2025-03-19]. Available: https://doi.org/10.4135/9781412986274

Hussain, M. Z. et al., 2024. *Understanding Artificial Intelligence in Supply Chain and Innovation Performance,* Research Gate. [Online]. [Cited 2025-04-21]. Available: https://www.researchgate.net/publication/381806434_Understanding_Artificial_Intelligence_in_Supply_Chain_and_Innovation_Performance

Ibrahim, H., 2022, `Artificial intelligence for predictive maintenance´, *Journal of Physics Conference Series,* 2299(1), [Online]. [Cited 2025-05-03]. Available: https://www.researchgate.net/publication/362100787_Artificial_intelligence_for_predictive_maintenance

Jang, K. et al., 2025, Explainable Artificial Intelligence for Fault Diagnosis of Industrial Processes, *IEEE Transaction on Industrial Informatics,* Vol. 21(1), [Online]. [Cited 2025-05-12]. Available: https://ieeexplore-ieee-org.ezproxy.cc.lut.fi/document/10032092

Jiménez-Delgado, G. I. et al., 2024, Lean Six Sigma to Improve Customer Service Processes: A Case Study. Digital Human Modeling and Applications in Health, Safety, Ergonomics and Risk Management, Vol, 14709. Switzerland, Springer. 259-278. [Online]. [Cited 2025-03-07]. Available: https://link-springer-com.ezproxy.cc.lut.fi/chapter/10.1007/978-3-031-61060-8_19#citeas

Juglan, K. C. et al., 2023, Exploring the Effectiveness of Natural Language Processing in Customer Service, 2023 3rd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE). [Website]. [Cited 2025-02-22]. Available: https://ieeexplore-ieee-org.ezproxy.cc.lut.fi/document/10183107

Kuhl, N. et al., 2022, Artificial intelligence and machine learning, Electronic Markets. [Website]. [Cited 2025-02-21]. Available: https://link.springer.com/article/10.1007/s12525-022-00598-0

Kumar, R. & Manash, E B K., 2019 ´Deep learning: a branch of machine learning´. *Journal of physics,* Vol. 1228, Iss. 1, [Online]. [Cited 2025-02-22], Available: https://www.proquest.com/docview/2566184759?accountid=27292&parentSessionId=0ambUgpT%2FvfalOKpDy%2BuHBDKxBfq7Bhpi5bcqq5kUNQ%3D&pq-origsite=primo&sourcetype=Scholarly%20Journals

LeCun, Y. et al., 2015 ´Deep learning´. *Nature Research Journals,* Vol 385, Iss. 6611, [Online]. [Cited 2025-02-22] Available: https://www-nature-com.ezproxy.cc.lut.fi/articles/nature14539

Legnani, E. et al., 2007, Towards a Reference Model for After-Sales Service Processes, IFIP International Federation for Information Processing. [Online]. [Cited 2025-03-07]. Available: https://www.researchgate.net/publication/221336959_Towards_a_Reference_Model_for_After-Sales_Service_Processes

Legnani, E. et al., 2009, A Framework for the configuration of after-sales service processes. Production Planning & Control, Vol. 20(2), 113-124. [Online]. [Cited 2025-03-07]. Available: https://www-tandfonline-com.ezproxy.cc.lut.fi/doi/full/10.1080/09537280802707522#d1e306

Lemon, K. N. & Verhoef, P. C., 2016 ´Understanding customer experience throughout the customer journey´. *Journal of marketing,* Vol. 80, no. 6, [Online]. [Cited 2025-02-23]. Available: https://research-ebsco-com.ezproxy.cc.lut.fi/c/g35a6j/viewer/pdf/x3huellg2r?route=details&proxyApplied=true

McCartrhy et al., 2006, A proposal for the Dartmouth Summer Research Project on Artificial Intelligence, AI Magazine. [Website]. [Cited 2025-02-21]. Available: https://ojs.aaai.org/aimagazine/index.php/aimagazine/article/view/1904

Meyer, C. & Schwager, A., 2007, Understanding customer experience, Harvard business review, Vol. 85. [Website]. [Cited 2025-02-23]. Available: https://research-ebsco-com.ezproxy.cc.lut.fi/c/g35a6j/viewer/pdf/xivdm6bf4n?route=details

Mesenzani, M. & Di Massa, A., 2021, `Artificial Intelligence in Customer Management Processes: A Design Perspective´. *Italian Workshop on Artificial Intelligence and Applications for Business and Industries 2021.* [Online]. [Cited 2025-04-21]. Available: https://www.researchgate.net/publication/359636074_Artificial_Intelligence_in_Customer_Management_Processes_a_Design_Perspective

Mnih, V. et al., 2015 ´Human-level control through deep reinforcement learning´. *Nature Research Journals,* Vol. 385, no. 6611, [Online]. [Cited 2025-02-22], Available: https://www-nature-com.ezproxy.cc.lut.fi/articles/nature14236

Mogili, U. & Mohamed, A., 2023, Artificial Intelligence and machine learning in the fields of education, medical, and smart pohone, AIP Conference Proceedings. [Website]. [Cited 2025-02-21]. Available: https://www.researchgate.net/publication/375243627_Artificial_intelligence_and_machine_learning_in_the_fields_of_education_medical_and_smart_phones

Narne, H., 2021 `Artificial Intelligence – Enabled Demand and Supply Planning: Revolutionizing Forecasting and Optimization in Supply Chains´. *International Journal of Science and Research (IJSR),* 10(7):1556-1560. [Online]. [Cited 2025-04-21]. Available: https://www.researchgate.net/publication/385957106_Artificial_Intelligence_-_Enabled_Demand_and_Supply_Planning_Revolutionizing_Forecasting_and_Optimization_in_Supply_Chains

Nasir, M. et al., 2021 ´The synergetic effect of after sales service, customer satisfaction, loyalty and repurchase intention on word of mouth´. *International Journal of Quality and Service Sciences,* Vol. 13, No. 3, [Online]. [Cited 2025-02-28]. Available: https://lut.primo.exlibrisgroup.com/discovery/fulldisplay?docid=cdi_emerald_primary_10_1108_IJQSS-01-2021-0015&context=PC&vid=358FIN_LUT:LUT&lang=fi&search_scope=LUT_CAMPUS_CDI&adaptor=Primo%20Central&tab=Everything&query=any,contains,the%20synergetic%20effect%20of%20after%20sales%20service,%20customer%20satisfaction&offset=0

Nasir, M. et al., 2024 ´After-sales service and brand reputation: a case of kitchen appliance industry´. *International Journal of Quality and Service Sciences,* Vol. 16, No. 3, [Online]. [Cited 2025-03-07]. Available: https://lut.primo.exlibrisgroup.com/discovery/search?query=any,contains,nasir%20rajkum

ari%20adil%202024&tab=Everything&search_scope=LUT_CAMPUS_CDI&vid=358FIN_LUT:LUT&offset=0

Paiva, J., 2024, Exploring the Drivers of AI Adoption: A Meta Analysis of Tecnological, Organizational and Environmental (TOE) factors, [Online]. [Cited 2025-05-07]. Available: https://www.researchgate.net/publication/387089017_Exploring_the_Drivers_of_AI_Adoption_A_Meta-Analysis_of_Technological_Organizational_and_Environmental_TOE_Factors

Parasuraman, A. P. et al., 1988 `SERVQUAL: A multiple- Item Scale for measuring consumer perceptions of service quality´. *Journal of retailing.* [Online]. [Cited 2025-04-20]. Available: https://www.researchgate.net/publication/225083802_SERVQUAL_A_multiple-_Item_Scale_for_measuring_consumer_perceptions_of_service_quality

Patton, M. Q., 1999, Enhancing the quality and credibility of qualitative analysis, [Online]. [Cited 2025-05-03]. Available: https://europepmc.org/backend/ptpmcrender.fcgi?accid=PMC1089059&blobtype=pdf

Paul, J. et al., 2025, AI-powered Route Optimization Reducin Costs and Improving Delivery Efficiency, [Online]. [Cited 2025-05-18]. Available: https://www.researchgate.net/publication/389987796_AI-Powered_Route_Optimization_Reducing_Costs_and_Improving_Delivery_Efficiency

Rodríquez, R. et al., 2018 ´Teleological sales and purchase approaches in complex business relationships- customers' expectations before and perceptions after purchase´. *Journal of business & industrial marketing,* Vol. 33, No. 4, [Online]. [Cited 2025-02-28]. Available: https://www-emerald-com.ezproxy.cc.lut.fi/insight/content/doi/10.1108/jbim-11-2016-0262/full/html

Saponaro, M. et al., 2018, Challenges and Opportunities of Artificial Intelligence in the Fashion World, 2018 International Conference on Intelligent and Innovative Computing Applications (ICONIC). [Website]. [Cited 2025-02-28]. Available:

https://ieeexplore-ieee-org.ezproxy.cc.lut.fi/document/8601258

Schembri, N., n.d., Gioia Methodology. [Online]. [Cited 2025-04-21]. Available: https://sites.google.com/view/dr-neville-schembri/discussion-topics/gioia-methodology

Shivahare, B. D. et al., 2022, Survey Paper: Study of Natural Language Processing and its Recent Applications, 2022 2nd International Conference on Innovative Sustainable Computational Technologies (CISCT). [Website]. [Cited 2025-02-22]. Available: https://ieeexplore-ieee-org.ezproxy.cc.lut.fi/document/10046440

Shokouhyar, S. et al., 2020, `Research on the influence of after-sales service quality factors on customer satisfaction´ *Journal of Retailing and Consumer Services,* 56(3), [Online]. [Cited 2025-05-02]. Available: https://www-sciencedirect-com.ezproxy.cc.lut.fi/science/article/pii/S0969698919313311

Sikandar, M. A., 2022, A Systematic Literature Review of the Impact of Artificial Intelligence on Customer Experience, Machine Learning For Business Analytics (117-127). [Website]. [Cited 2025-02-28]. Available: https://www.researchgate.net/publication/360730299_A_Systematic_Literature_Review_of_the_Impact_of_Artificial_Intelligence_on_Customer_Experience

Statista, 2025. Number of Artificial Intelligence (AI) tool users globally from 2021-2031. [Website]. [Cited 2025-04-04]. Available:

https://www-statista-com.ezproxy.cc.lut.fi/forecasts/1449844/ai-tool-users-worldwide

State, L., 2021 `Logic Programming for XAI: A technical perspective´. *CEUR Workshop Proceedings.* [Online]. [Cited 2025-04-21]. Available: https://ceur-ws.org/Vol-2970/meepaper1.pdf

Tuomi, J. & Sarajärvi, A., 2018, Laadullinen tutkimus ja sisällönanalyysi. Uudistettu laitos. Helsinki, Kustannusosakeyhtiö Tammi.

Tutkimuseettinen neuvottelukunta, 2023, Hyvä tieteellinen käytäntö ja sen loukkausepäilyjen käsitteleminen Suomessa. [Online]. [Cited 2025-04-21]. Available: https://tenk.fi/sites/default/files/2023-03/HTK-ohje_2023.pdf

Ünal, Ö. et al., 2023, ´Applications of Artificial Intelligence in Inventory Management: A Systematic Review of the Literature´. *Archives of Computational Methods in Engineering,* 30(1). [Online]. [Cited 2025-04-21]. Available: https://www.researchgate.net/publication/368345493_Applications_of_Artificial_Intelligence_in_Inventory_Management_A_Systematic_Review_of_the_Literature

Verhoef, Peter C. et al., 2009 ´Customer Experience Creation: Determinants, Dynamic and Management Strategies´. *Journal of Retailing,* Vol. 86, No. 1, [Online]. [Cited 2025-02-23]. Available: https://www.proquest.com/docview/228627521?parentSessionId=Yt1hLO6V5v5la3DHvrgEiqHu9W5hXhEJdPXygTTlvZ8%3D&pq-origsite=primo&accountid=27292&sourcetype=Scholarly%20Journals

Verma, S. et al., 2024, Ethical Considerations of Bias and Fairness in AI Models, International Conference on Disruptive Technologies (ICDT), [Online]. [Cited 2025-03-07]. Available: https://ieeexplore-ieee-org.ezproxy.cc.lut.fi/document/10489577

Vila-Henninger, L. et al., 2022, Abductive Coding: Theory Building and Qualitative (Re)Analysis, Vol. 53(2), [Online]. [Cited 2025-05-03]. Available: https://journals.sagepub.com/doi/full/10.1177/00491241211067508

Wei, H. & Prentice, C., 2022, `Addressing service profit chain with artificial and emotional intelligence´, *Journal of Hospitality Marketing & Management,* 31(2), [Online]. [Cited 2025-05-18]. Available:

https://www-tandfonline-com.ezproxy.cc.lut.fi/doi/full/10.1080/19368623.2022.2058671

Xu, N., 2019 ´Understanding the Reinforcement Learning´. *Journal of physics,* Vol. 1207, iss. 1, [Online]. [Cited 2025-02-22]. Available https://www.proquest.com/docview/2566117051?accountid=27292&parentSessionId=JTYFZxptbOds1zcQfauVGNUFnCBdE2K1IWOsj7%2FzVyA%3D&pq-origsite=primo&sourcetype=Scholarly%20Journals

Zhao, Y. et al., 2019, `Artificial intelligence-based fault detection and diagnosis methods for building energy systems: Advantages, challenges and the future´ *Renewable and Sustainable Energy Reviews*, Vol. 109, [Online]. [Cited 2025-05-12]. Available: https://www.sciencedirect.com/science/article/abs/pii/S1364032119302333

Appendices

Appendix1. Semi-structured interview questions for sample group 1

The following interview questions were used in the study:

AI Related questions:

1. *What are the customer touchpoints in after-sales processes? (only for the case company)*
2. *Which of these touchpoints do you think are the most critical for the customer experience in after-sales? (only for the case company)*
3. *What are the challenges or so-called bottlenecks in after-sales processes? (only for the case company)*
4. *What kind of AI-based tools or applications does your company already use and for what purpose?*
5. *What kind of user experiences have you had with AI so far?*
6. *How has the staff reacted to the adoption of AI?*
7. *In what way has AI and its use impacted the customer experience so far, or has it?*
8. *How has the use of AI helped to make the customer process more efficient, or has it?*
9. *In which areas does AI bring the most value in after-sales processes?*
10. *How effortlessly has AI been adopted?*
11. *Has there been any resistance or challenges with lack of knowledge related to the use of AI?*
12. *What kind of opportunities do you see in the use of AI in the future, especially in terms of business and after-sales?*

13. *What kind of AI applications do you see that improve after-sales processes and the customer experience?*
14. *What factors do you think are most critical in AI adoption from the perspective of the company's personnel?*
15. *What factors do you think are most critical in adopting AI as part of the business from the customer perspective?*
16. *What kind of challenges or ethical problems do you identify related to the implementation of AI?*
17. *How have you considered the challenges and ethical problems identified?*
18. *How would you assess and measure the impact of AI internally, and are there any metrics or operating models in use for this?*
19. *How would you assess and measure the impact of AI from a customer perspective, taking into account the customer experience, and are there any metrics or methods already in use for this?*

General background questions:

1. *What is your job description and areas of responsibility?*
2. *How long have you been working for the company?*

Appendix 2. Semi-structured interview questions for sample group 2

The following interview questions were used in the study:

AI Related questions:

20. *What kind of AI-based tools or applications does your company already use and for what purpose?*
21. *What kind of user experiences have you had with AI so far?*
22. *How has the staff reacted to the adoption of AI?*
23. *In what way has AI and its use impacted the customer experience so far, or has it?*
24. *How has the use of AI helped to make the customer process more efficient, or has it?*
25. *In which areas does AI bring the most value in after-sales processes?*
26. *How effortlessly has AI been adopted?*
27. *Has there been any resistance or challenges with lack of knowledge related to the use of AI?*
28. *What kind of opportunities do you see in the use of AI in the future, especially in terms of business and after-sales?*
29. *What kind of AI applications do you see that improve after-sales processes and the customer experience?*
30. *What factors do you think are most critical in AI adoption from the perspective of the company's personnel?*
31. *What factors do you think are most critical in adopting AI as part of the business from the customer perspective?*

32. *What kind of challenges or ethical problems do you identify related to the implementation of AI?*
33. *How have you considered the challenges and ethical problems identified?*
34. *How would you assess and measure the impact of AI internally, and are there any metrics or operating models in use for this?*
35. *How would you assess and measure the impact of AI from a customer perspective, taking into account the customer experience, and are there any metrics or methods already in use for this?*

General background questions:

3. *What is your job description and areas of responsibility?*
4. *How long have you been working for the company?*

Appendix 3.

Code table.

1st order concepts	2nd order themes	Aggregate dimension
- AI should be integrated into existing systems instead of standalone solutions - The answers produced by AI must be verifiable - Successful implementation requires a responsible person and continuous coordination - The system infrastructure must support development - The benefits of AI must be clear - The implementation of AI requires change management and training - AI must have a responsible person and a working group in the company - The results must be able to be reviewed and modified - AI must be aligned with the rest of the IT infrastructure - The AI solution must support the expansion of use to other functions - Clear customer service process and digital workflow are prerequisites for the controlled and guided implementation of artificial intelligence - Most challenges are related to basic data management and data quality - Management and personnel must be looking in the same direction and it is important to try to resolve resistance to change	- The importance of integration compatibility - Quality control of AI results - Coordinated deployment - Compatibility with IT infrastructure - The role of change management and training in AI deployment - Transparency of AI results - The importance of the possibility of iteration - The possibility of extending the AI solution - The importance of foundation of functioning processes - Data quality and data management prerequisites for high-quality outputs - Resolving resistance to change	Considerations related to the adoption of artificial intelligence
1st order concepts	**2nd order themes**	**Aggregate dimension**
- It is important to train personnel to see the benefits of AI - It is important that everyone is aware of the benefits and risks - The use of AI requires new skills that have not been needed before	- The importance of training staff - Leading by example - Addressing fear and resistance to change	The perspectives of the personnel on AI adoption

- Resistance to change and fear of systems must be considered - Personnel must be given examples of the benefits and applications to take example from - Personnel must be told that AI does not mean they will become unemployed - With AI, it is important for the role of the salesperson to develop into a more consultative one - Raising awareness of risks is important - Artificial intelligence must be fast and easy to use - Resistance to change depends on individual and there is always someone resisting the change in a group - AI becomes a part of the team - Wise AI adoption requires people to develop their skills - Implementation should start with easily achievable results to build momentum	- The role of speed and ease of use in the acceptance of artificial intelligence - AI as a team member rather than replaces of humans - Need for humans to update their skills - Fast and easiness of technology - Calming personnel's fears - Learning from examples - Addressing risks	
1st order concepts	**2nd order themes**	**Aggregate dimension**
- Artificial intelligence enhances the design of marketing texts and communications in after-sales marketing - Artificial intelligence can analyze fault descriptions and suggest measures - Artificial intelligence can provide suggestions for faults and spare parts during the fault description phase - Artificial intelligence can help produce working time estimates - Artificial intelligence provides quick instructions for performing repair measures from manuals - Artificial intelligence can automatically collect feedback on maintenance work or customer service	- Improving communication in after-sales service - Analyzing fault descriptions - AI-based diagnostics - Using AI in work planning - AI in handling maintenance requests - AI in simulation-based training solutions - AI in support of maintenance operations - Data-driven pricing - Streamlining processes and reducing manual work - Streamlining documentation	Opportunities of artificial intelligence in after-sales service

- Artificial intelligence can process maintenance tickets, as long as the data bank is of a sufficient level - Artificial intelligence combined with VR technology can support maintenance in the form of simulators - AI could help with pricing - AI can speed up and reduce manual work - AI agents can search for information from manuals - AI can help with internal training - AI makes recording easier and helps with information work - AI could help with managing and structuring large amounts of data - AI makes text production and communication more efficient - AI could analyze inventory turnover and provide order suggestions - If a machine exhibits a certain symptom, artificial intelligence can analyze that with a certain probability this is the fault and the database grows all the time - AI could help with inventory management and supply chain - Route planning for service vehicles could be done with AI - AI could automatically suggest spare parts for work packages - AI could provide order and removal suggestions for the warehouse - AI enhances communication and customer contact management - AI solutions could process service tickets and fault descriptions - AI could suggest spare parts lists based on documents - AI could automatically ask for service feedback - AI could support customer troubleshooting via chatbot - AI could support the spare parts team in providing peripherals - AI could recommend other necessary products in the online store - AI could advise the user according to the manual using speech recognition and speech production	- Data management and analysis - Improved communication - The potential of AI in optimizing inventory management and purchasing - Data-based decision-making and inventory management using AI - Resource efficiency - Communication and customer contact maintenance become more efficient - Support in diagnostics - Feedback collection automation - Automated technical support - AI's ability to support technical support - AI's ability to cross-recommend products - Utilizing speech recognition to support usage - Automatic export of orders to systems - Personalized communication - Customer segmentation through AI - AI based customer service - Customer churn prediction	

- Operational process implementations such as automation artificial intelligence can help read the order documents directly into the systems - Utilization of bots to produce product information - Automatization of financial processes such as invoicing, reconciliations payments - Artificial intelligence can be used to quickly segment and identify potential buyers based on customer analytics - Artificial intelligence can help personalize ads for different segments - Artificial intelligence recognizes when a customer is ready to buy again - AI based remarketing produces effective results - 24/7 chatbots in customer service - Prediction of customer churn		
1st order concepts	**2nd order themes**	**Aggregate dimension**
- Finding a balance for the quantities to be stored - Difficult for the foreman to provide a quick cost estimate - Spare parts and prices are determined from several systems - Information transfer slows down invoicing - Inadequate flow of information from customer to installer - How to accurately determine the customer's needs - Challenges in the communication chain in transmitting information - The fault should be known before leaving for a fault diagnosis - Problems in customer accessibility by email and phone - Challenging to provide a cost estimate and repair time quickly - Insufficient initial information should produce an expert view - The warranty process is slow as information moves from one person to another	- Challenges in optimizing inventory levels - Foreman challenges - Information fragmentation as a slowdown in operations - Communication breakdowns slow down operations - Challenges in determining customer needs - Accessibility problems - Challenges in making diagnoses and cost estimates - Slow warranty process - Challenges in service level adequacy - Lack of information availability - Quality and delivery reliability are important	After-sales service challenges

- Challenges in maintaining an adequate service level - Identify the customer's need at the beginning - The first impression with the customer is decisive - Maintenance must be successful at once and on schedule - What kind of implementation schedule to react, especially in acute situations	- The importance of speed of response - The role of first impressions in customer experience is important	
1st order concepts	**2nd order themes**	**Aggregate dimension**
- Impacts can be assessed by how much it speeds up tasks - The impact of AI can be measured, for example, by the -turnaround time of quotation processes - Success rate measurement would likely see a significant improvement with AI - How will work productivity improve - Has AI succeeded in optimizing inventory turnover or has the age distribution changed - How many deals or leads has the AI chatbot generated - How much manual work will be reduced - The impacts of AI use are not currently measured - There are no metrics yet to measure the impacts of AI - Customer satisfaction surveys can be used to assess impacts - Net Promoter Score can be used as a direct measure of changes in customer experience - AI could measure the usefulness of online bots after a transaction - The impacts of AI could be measured with customer surveys - Analyzing customer data as a means of measurement - Saving time, resources and money, reducing errors and making processes are ways to measure the impact - Customer service metrics such as turnaround times and resolution capabilities	- KPI-based evaluation - Success rate - Work productivity measurement - Inventory cycle optimization monitoring - AI lead and deal generation - Manual work reduction - Lead time monitoring - Lack of metrics - Customer satisfaction measurements - Net Promoter Score as an indirect metric - Chatbot feedback surveys - Customer data analysis - Time, resource and money savings - Reduction of mistakes - Automatization of processes - Inventory and demand balance - Resolution capabilities - Interim measurements to assess the progress	Measuring the impact of AI

- Balance availability, whether the right products are in stock at the right time - Traditional NPS is also one metric - Interim check measurements help assess where you are going and what still needs to be done		
1st order concepts	**2nd order themes**	**Aggregate dimension**
- Information security is important in the development of artificial intelligence and data should not be leaked - Information security risks prevent some use of AI - Information security and competitive advantage are a concern - Artificial intelligence can make some job roles unnecessary - There is always the possibility of error, so you must be critical - In e-mails, for example, the person's own personality disappears, and it is noticeable that the text was made by artificial intelligence - Information security is important, and that secret information does not leak - Artificial intelligence can replace humans - Artificial intelligence can reduce jobs - How to handle liability issues in relation to artificial intelligence should be considered - All confidential materials should not be fed into artificial intelligence systems - Hallucinations must be taken into consideration and all the outputs need to bet fact-checked - It's hard for organizations to know which solution to pick, therefore external experts should be used - The artificial intelligence is tuned to the Western bias system - A person must be in the background	- The importance of considering information security risks - The effects of artificial intelligence on the labor market - Criticality of artificial intelligence's outputs - Text produced by artificial intelligence recognizable - Ambiguity of liability in commercial situations dealing with AI technology - Hallucination must be taken into consideration - Need for external experts - Necessity to have humans in the background - Lack of empathy in AI systems	The drawbacks and limitations of AI

- Current solutions do not sufficiently take into account empathy - The most demanding questions require a human		
1st order concepts	**2nd order themes**	**Aggregate dimension**
- Training can teach what to consider when using artificial intelligence - Risks can be minimized by having a professional person in charge of AI implementation - Training, discussion and responsibilities ja clear roles can help prevent risks - Raising awareness of risks is important - Comparing responses in multiple AI tools is a practical way to reduce risks	- The importance of training and raising awareness - Significance of having appointed responsible person and clear roles - Comparison of results to minimize errors	Minimizing the challenges and risks of artificial intelligence

Appendix 4.

Quality elements of After-sales service (Shokouhyar, S. et al. 2020)

SERVQUAL dimensions	**Quality elements**
Tangibles	- Availability of information and advice at service center (Parasuraman et al., 1985) - Proximity of service centre (Levesque and Boeck, 2017) - Modern looking equipment and fixtures (Ahmad et al., 2014) - Visually appealing service material (Ahmad et al., 2014) - Convenient operating hours (Kumar et al., 2017; Ahmad et al., 2014) - Price performance ratio of services rendered (Kumar et al., 2017; Kasper and Lemmink, 1989)
Reliability	- Provision of service as promised (Wilson et al., 2012)

	- Availability of spare parts during service calls (Kasper and Lemmink, 1989; Pakdil et al., 2012; Saccani et al., 2014) - Availability of technical services staff (Kasper and Lemmink, 1989; Pakdil et al, 2012; Saccani et al., 2014) - Consistency of service quality (Seth et al., 2005; Pakdil et al., 2012) - Choice and range of service (Haywood-Farmer, 1988; Kasper and Lemmink, 1989) - Good customer service during the warranty period (Pakdil et al., 2012)
Responsiveness	- Immediate identification of defects (Pakdil et al., 2012) - Time taken in servicing (Kumar et al., 2016; Kasper and Lemmink, 1989) - Time taken for resolving the complaint (Van Birgelen et al., 2002; Kasper and Lemmink, 1989) - The store employee gives prompt service to customers (Ahmad et al., 2014) - Reasonable warranty policy (Pakdil et al., 2012) - Responsiveness to customer complaints (Parasuraman et al., 1985)
Assurance	- Competency and experience of employees (Pakdil et al., 2012) - General attitude and behavior of technician (Kasper and Lemmink, 1989) - Handling customers (Parasuraman et al., 1985) - Professionalism of service people (Parasuraman et al., 1985) - Interpersonal behavior of service people (Parasuraman et al., 1985)
Empathy	- Individuated interactions between service front liners and customers (Hau et al., 2016) - Personalized attention of staff (Kumar et al., 2017)

	- Availability of service people (Ahmad et al., 2014) - Service contract options (Kasper and Lemmink, 1989)