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Development of a Partially Digitalized Communication Concept for Industrial Customer Service: Modelled and Simulated on the Example of KWB GmbH

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Danksagung

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Schwarz, 06.02.2019

Kurzfassung

Das Thema „Digitalisierung" beeinflusst gegenwärtig die Unternehmensumwelt und damit Unternehmen aller Branchen sowie deren Organisation wie kein anderes. Unternehmensintern ist aus diesem Grund das Kundenservice, beginnend beim klassischen Call Center bis hin zum After Sales Service gefordert, sich der Herausforderung und der Entwicklung hin zu sogenannten Multichannel Contact Centern zu stellen. So werden in der Praxis derzeit den Kunden eine Vielzahl von Kommunikationskanälen angeboten. Angefangen beim klassischen Telefon Service bis hin zu Chatportalen bzw. Messaging-Diensten. Kunden wird so die Möglichkeit gegeben, ihre Anfragen durch den für sie idealen Kommunikationskanal an Unternehmen zu stellen. In vielen Fällen werden von Unternehmen auch „Chat Bots" zur automatisierten Anfragebearbeitung eingesetzt, um als „künstliche Intelligenzen" mit den Kunden voll automatisch zu kommunizieren. Im Bereich des After Sales Service ist es durch die Digitalisierung u.a. möglich, die Ausfallswahrscheinlichkeit von Maschinen, welche über eine Sensorik und einen Internetanschluss verfügen, zu berechnen und mögliche Ausfälle frühzeitig zu erkennen. Die Literatur nennt die Möglichkeit zur Vorhersage von Ausfällen „predictive maintenance". Werden konzeptionell die Entwicklungen im Bereich „predictive maintenance" und der automatischen Kommunikation kombiniert, können die Prozesse innerhalb der Unternehmen verkürzt und damit die Effizienz gesteigert werden.

Das Ziel der vorliegenden Masterarbeit besteht im Entwurf sowie der Erstellung eines Kommunikationskonzeptes am Beispiel der KWB, in dem die aktuellen Entwicklungen im Bereich der Call Center und des After Sales Service zusammengeführt werden. Auf Basis einer detaillierten Analyse der Prozesse in der KWB Servicehotline und der aktuellen KWB Kundendienstprozesse, werden digitale Kommunikationskanäle sondiert und ausgewählt. Digitale Kommunikationskanäle werden sowohl für allgemeine Anfragethemen als auch für ausgewählte Anfragethemen vorgesehen, wodurch eine effizientere Bearbeitung ermöglicht wird und so der Kundennutzen steigen soll. Teil des erstellten Kommunikationskonzeptes sind die zur Umsetzung benötigten Kundendienstprozesse, welche im Rahmen dieser Masterarbeit operativ entwickelt und mit der „Business Process Modelling Notation" abgebildet werden. Um eine Aussage über die Effekte als Folge einer Umsetzung zu treffen, wird abschließend eine Simulation des Konzeptes durchgeführt und die Resultate präsentiert.

Im Ergebnis zeigt sich, dass durch die Verwendung von digitalen Kommunikationskanälen die Auslastung der unternehmensinternen Mitarbeiter gleichmäßiger gestaltet und geplant werden kann. Der Grad der Gleichmäßigkeit hängt unmittelbar mit der Nutzung der digitalen Kommunikationskanäle zusammen. Umso mehr Kunden digitale Kommunikationsformen wählen, umso effizienter können die Anfragen bearbeitet werden und umso gleichmäßiger ist die Mitarbeiterauslastung. Diese Arbeit zeigt auch, dass sich durch die Kombination von „predictive maintenance" und einer automatischen Anfragebeantwortung die Anzahl der zu bearbeitenden Anfragen durch Kunden reduzieren lassen kann. Die Effizienzsteigerung schlägt sich im Falle der KWB durch eine Erhöhung der bearbeiteten Kontaktanfragen pro Mitarbeiter nieder.

Abstract

The topic of "digitalization" currently influences the corporate environment and companies of all industries as well as their organization like no other. Within the companies the customer service, from the classic call centre to after sales service, has to face the developments and evolve into multichannel contact centres. Currently some companies offer consumers a wide range of communication channels. Starting with the classical telephone service up to chat portals or messaging services. Consumers are given the opportunity to submit their inquiries to companies through the communication channel that is ideal for them. Many companies use "chat bots" for fully automatic communication with consumers. In the area of after sales service, digitalization makes it possible to calculate the failure probability of machines, which has electrical sensors and an internet connection, to detect possible failures before they occur. The literature calls the possibility of predicting failures "predictive maintenance". If the developments in the area of predictive maintenance and automatic communication are combined conceptually, the processes within the companies can be shortened and so efficiency increased.

The aim of the present master thesis is to create a communication concept using the example of KWB, in which the current developments in the area of call centres and after sales service are brought together. Based on a detailed analysis of the KWB service hotline and the current KWB customer service processes, digital communication channels are explored and selected. Digital communication channels are provided for general inquiry topics and chosen inquiry topics, enabling more efficient processing and increasing the consumer benefit. Part of the communication concept are the consumer service processes required for implementation, which are developed within the scope of this master thesis and mapped with the "Business Process Modelling Notation". In order to make a statement about the effects as a result of an implementation, a simulation of the concept is finally presented.

The results show that the use of digital communication channels makes it possible to create a more uniform utilisation of internal company employees. The degree of uniformity is directly related to the use of digital communication channels. The more consumers choose digital communication channels, the more efficient inquiries can be processed and the utilisation is more uniform. This work also shows that the combination of predictive maintenance and automatic inquiry processing can reduce the number of customer inquiries. In the case of KWB the increase in efficiency can be achieved by increasing the number of processed inquiries per employee.

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1 Introduction

Chapter 1 gives an provides an introduction to the initial situation at the Kraft und Wärme aus Biomasse GmbH [KWB] and how the company is structured. It describes the departments and the performed tasks within the department. Afterwards the actual problem situation within the KWB is described. In the following the research questions derived out of the displayed problem situation. Then the goals are defined and a project plan is set up.

1.1 Initial situation at KWB

KWB is an Austrian solution provider for heating systems from renewable energies and specialises in pellet, log wood and wood chip heating systems. Its customers are private and business customers.

The head office is located in St. Margarethen an der Raab in Styria/ Austria and there are further locations in Germany, Italy and France. KWB is also represented by sales partners in other European countries and in Japan. At the beginning of the twenty-first century the KWB management assumed that the market for renewable combustible materials would develop into a mass market. The mass market assumption did not materialise and the market for heating systems with renewable combustible materials developed into a niche market. The structures of KWB were geared to a mass market and in recent years the structures and processes have been adapted to the changed conditions. Thus, tasks were centralised from the foreign locations in St. Margarethen an der Raab. For example, parts of the German customer service were relocated to St. Margarethen an der Raab.

1.1.1 Communication concept of KWB

In order to give an overview of the communication concept of KWB, it is first necessary to understand the tasks of corporate communication. Zerfaß understands corporate communication to mean:

"[...] all communicative actions of members of an organization that contribute to the definition and fulfilment of tasks in profit-oriented business units."[1]

He distinguishes between three areas:[2]
- Firstly, organisational communication which usually takes place in direct communication between the members of a company and also encompasses the entire process of service provision.

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1 Zerfaß, A.; (1996); p. 287
2 Zerfaß, A.; (1996); p. 289

- Secondly, market communication, which involves the coordination processes between suppliers, customers and competitors.
- Thirdly, public relations, which is concerned with the integration of the company into the socio-political environment and, above all, with its image.

The present master thesis examines (i) the organizational communication and (ii) the market communication.

The communication concept of KWB in organisational communication includes the telephone system, email and direct verbal communication between the employees. Market communication comprises the service hotline and communication via E-mail. Communication takes place mainly via the communication channel service hotline.

1.1.1.1 Communication at KWB customer service

Customer Service is responsible for market and organisational communication as explained in chapter 1.1.1. The most frequent communication partners, as showed in chapter 3.1.1.3, are end customers, KWB service technicians and employees of partner companies. In the case of KWB's customers, a further distinction must be made between consumers and business customers. Within KWB, consumers (B2C) are also referred to as "end customers". Business customers and partner companies are B2B customers and they must be distinguished. Business customers are customers who operate KWB heating systems and partner companies can be sales and installation companies, but within KWB both are called internally "partners" or "SHK (Sanitär, Heizung, Klima)".

Contact takes place mainly via the service hotline channel. Reasons for the market communication can be for example a malfunction of a heating systems, date appointments or spare part orders.

Contact with KWB service technicians is part of the organisational communication and is also handled via the service hotline. As an example, an employee of the technical support helps a service technician who is at the heating system and don´t know how to "repair the heating system".

Two sub-departments are responsible for market and organizational communication in Customer Service of KWB, which work closely together.

- **Scheduling department at the KWB**

The scheduling department is responsible for scheduling maintenance and repair missions. Maintenance missions are scheduled long term, up to two months in advance. Repair missions in the case of a malfunction have to be scheduled in the short term. The communication can be started form customer site, technical support department or form the employee within the disposition department.

Employees of scheduling department has a number of other tasks, ranging from arranging appointments for assembly and commissioning to invoicing of missions. At KWB the

scheduling department is called disposition department. In the following, the scheduling department is also called disposition department.

- **Technical support department at KWB**

The employees of the technical support are responsible for the technical assistance of customers but also of service technicians and partners. For example, if an end customer makes an inquiry because of a malfunction, he is directed to an employee of the technical support.

Technical support also deals with all other technical inquiries. For example, service technicians or employees of partner companies, who are on site at a heating system, can contact the technical support by telephone if they need a technical assistance.

Technical support has also a number of other tasks to perform. They range from the preparation of an offer to the ordering of spare parts. In chapter 3.1. all tasks are listed in detail.

1.1.1.2 The KWB service hotline

As shown in chapter 1.1.1, the communication of is mainly carried out via service hotline. The service hotline represents the interface between scheduling department, technical support department and the "outside world". As mentioned in chapter 1.1.1, end customers, service technicians and employees of partner companies are the most frequent inquiring persons. When a person calls the service hotline, they first reach the mediation and then are forwarded to the department responsible for the inquiry of the person. Depending on the inquiry of the person making the call, certain processes are carried out.

It is important to understand, that within the KWB the service hotline is some kind of a "virtual department" and it is also the telephone system alone meant. Every inquiry, no difference what communication channel is used comes into the "service hotline" (virtual department). A person used the communication channel service hotline (telephone).

For better understanding, it makes a difference if the word "call" or "inquiry" is used. If the word "call" is used, it means a person calls by using a telephone, an employee of the service hotline. If the word "inquiry" is used, no specific communication channel is meant. It can also be the telephone system.

1.1.1.3 Problem situation at the KWB service hotline in detail

Especially during autumn and winter months of a year, a high number of persons calls the service hotline. Mainly due to malfunctions, because ambient temperatures drop down and customers start their heating systems. In some cases, it comes to an overload at the service hotline. In this case, the number of employees in technical support department is to low to process all the incoming calls. This leads to longer waiting times for callers. Since the callers also include employees of partner companies and service technicians, the situation may arise that they cannot continue their work without technical assistance and that service technicians and employees of partner companies can maybe have therefore downtimes.

KWB's management wants to prevent downtimes from occurring. Therefore, a new telephone system is currently being introduced, i.e. the telecommunications technology behind the telephone system is being modernised. The callers are recognized and prioritized on the basis of their telephone number. Partners and service technicians will receive a higher priority than end customers, so they can be served faster.

1.2 Research questions

The following guiding research question now arises from the initial situation:

"How should a communication concept for KWB be designed that prevents overloads at the service hotline and takes future developments in the field of digitisation into account?"

In order to be able to answer this leading research question, the following three partial research questions arise.

The first research question deals with the topic of the different possible communication channels and which are suitable to be integrated into the communication concept:

"Which communication channels should the concept include, against the background that the number of callers on the service hotline should decrease in the medium term?"

The second research question focuses on the processes behind the communication concept and how they can be integrated into the existing structures:

"Which processes are standing behind the existing communication channels and how should the processes for the new communication channels have to be designed in order to be integrateable into the existing structures?"

The third research question deals with the consequences of the designed communication concept and how the effects of an implementation of the concept can be estimated in advance:

"What are the possible consequences of a realization of the designed communication concept, and how can the consequences be showed in advance?"

1.3 Goals of this master thesis

Based on the leading research question and the sub-research questions, one main objective and three subobjectives emerge.

The main goal of this master thesis is the development of a new communication concept for KWB. The concept should be based on the existing structures and, if necessary, additional communication channels should be provided. The required target processes for all new communication channels have to be designed.

- The included communication channels have to be listed and explained why it is included.

- The designed target processes have to be modelled with an adequate Notation.

- In order to be able to give an estimation of the effect, that the realization of the concept can have on the number of inquiries, especially the number of calls at the service hotline, an MS Excel file has to be created with a simulation of the concept.

1.4 Research areas and literature basis

In order to create the communication concept, it is necessary to look at several areas within KWB and in the literature.

1.4.1 Detailed investigation of the customer service at KWB

The first area is customer service, especially disposition department and technical support department. The actual processes are investigated in order for better understanding of the working methods performed from the employees. The knowledge gained in this process, flows both into the target process modelling as well as into the selection of suitable new communication channels.

1.4.2 Detailed investigation of the service hotline at KWB

Secondly, the service hotline is considered separately. The aim is to determine which person call the service hotline, what are the reasons for their calls, how long a call lasts on average and how the calls are distributed over the day. The actual situation will show existing potentials for redirecting to new communication channels and which channels are suitable for the concept. The findings also flow into the simulation.

1.4.3 Initial literature overview

The current literature in the area of process management, process modelling and in the area of call centres will be studied and used for during survey and design phase, described in chapter 1.5.

1.5 Applied method

In the following, the used method to reach the goals are described. The used method base on process design methodology from Weske. The process design methodology from Weske starts with the "survey phase". During the survey phase, the goals are defined and information on the business environment is gathered. Phase two is the "design phase". Based on the gathered information the target processes are designed. After the design phase, the phases "platform selection", "implementing and testing", "deployment" and "operation and controlling" follow.[3] These following phases are combined to the "simulation phase", which is the third phase. During simulation phase, an estimation of the effects from the designed processes is made.

1.5.1 Survey phase

The first phase is the survey phase. During this phase the goals are defined (see chapter 1.3) and the needed information is gathered. For information gathering the survey phase is divided into two sub phases.

1.5.1.1 Analysis of the actual situation at the KWB service hotline

The first survey sub phase deals with an analysis of the actual situation at the service hotline. Among other things, parameters such as number and processing time of calls as well as further information such as person type and reason for call are to be recorded in order to subsequently show potentials for which new channels can be created. To perform the analysis data about the service hotline are needed. Therefore a MS Excel form is created for data capturing. By using the Excel form, the employees can document all inbound telephone calls in a systematic manner.

1.5.1.2 Process modelling in the technical support and disposition department

The second survey sub phase deals with the actual process modelling, to understand the actual tasks performed by the employees of technical support and disposition department.

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3 Weske, M.; (2012); pp. 345

1.5.2 Design phase

The design phase deals with the definition of the communication channels and the target process design.

1.5.2.1 Definition of needed communication channels

The first design sub phase deals with the definition of the communication channels based on the results of the analysis of the service hotline and the modelling of the actual processes.

1.5.2.2 Design of the target processes

The second design sub phase is the modelling of the target processes at technical support and disposition department. The processes are modelled on the basis of the information gained during survey phase and the defined communication channels.

1.5.3 Simulation phase

The last phase of the master thesis is the simulation phase. During this phase a simulation will be created in order to present the effects of the new communication concept. The simulation base on the modelled target processes during design phase and gained information during survey phase.

2 Literature background

Chapter 1 explains the research questions and the goals of the present master thesis. In order to be able to deal with the topic of communication concepts, one must first understand how companies communicate with their customers and other persons. Communication mainly takes place via a "call centre". Therefore, the definition and description of a call centre is a major part of this chapter and explained in more detail. It explains how call centres have evolved into multichannel contact centres and the challenges they face.

The fundamentals of processes are the second important part of this chapter. Questions such as: what constitutes a process and how is a process delimited are answered. A number of rules must be observed. Finally, the possibilities of process modelling are discussed and which notations are suitable for different requirements.

2.1 Call centres

In order to be able to deal more closely with the call centre, it must first be clarified how a call centre is defined. Mehrotra defines call centres as:

"[…] any group whose principal business is talking on the telephone to customers or prospects."[4]

Henn defines it in the sense of:

A call centre is an operational unit whose task it is to establish and maintain contact with customers or potential customers by telephone, email, chat, etc.[5]

In a call centre, employees also known as agents[6], computers and telecommunications technology are used. The interaction of these resources enables the processing of customer contacts. Most call centres operate Interactive Voice Response (IVR) units. IVR units are industrial answering machines, including the ability to interact with the customer. An example is the automatic query for the reason of the call.[7]

Another important technology is the Automatic Call Distributor (ACD). An ACD system automatically routes calls to free agents according to pre-programmed settings. The allocation from calls to agents can also be based on "skills". Chapter 2.1.3.2. describes this in more detail.[8]

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4 Mehrotra, V.; (1997); pp. 18
5 Henn, H.; Kruse, J. P.; Strawe, O. V.; (1998); p. 15
6 Fojut, S.; (2008); p. 12
7 Koole, G.; Mandelbaum, A.; (2001); p. 2
8 Fojut, S.; (2008); p. 23

The general definition of a call centre results in criteria according to which they can be divided into different types. The boundaries between the types are not always clear, and a call centre can also combine the properties of different types.[9]

2.1.1 Forms of communication - the contact centre

The name "call centre" indicates that mainly telephone inquiries are served. However, different types of requests have always been processed in the relevant departments. In the past, letters were sent and answered, and FAX inquiries were added due to technical development. Nowadays there are many other ways to get in touch with a call centre. The current trend shows that call centres are developing into "contact centres". Contact centres are call centres in which the classic telephone is extended by multimedia communication channels. Multimedia communication channels are e. g. email, chat, contact forms or messenger services.[10, 11]

Depending on the chosen communication channel, the inquiring person expects different reaction times from the company. A response time of one to a maximum of two minutes is expected for calls. Whereas emails are expected to respond within one day. This is referred to as waiting time tolerances, which people have depending on the chosen communication channel. If the waiting time tolerance is exceeded, the person aborts the contact attempt and usually starts a new contact attempt at a later time. The new inquiry is often carried out via a different communication channel. Whether a new inquiry takes place depends on the type of inquiry. In the event of a technical problem, the person is highly likely to ask again. For example, if it was a pizza order, the person will switch to a competitor sooner if the pizzeria has a poor availability. The mistake should not be made and customers with technical problems should be given a lower priority than customers with orders. Although the order has an immediate impact on profits, poor availability of technical inquiries leads in the medium term to customers migrating and profits being lost. Emails, contact forms and inquiries via comparable communication channels are non time-critical because they do not have to be answered immediately. A call and inquiry via a chat are referred to as time-critical requests, since the employee is usually supposed to answer the requests immediately. If there are only time-critical communication channels in a contact centre, the situation can occur that the agents are not fully utilized with a low number of inquiries. By the use of time-critical and non-time-critical communication channels, an optimization of the utilization of the agents can be achieved. If there are no time-critical requests at a time, the agents can answer the non time-critical requests.[12]

9 Herzog, A.; (2008); p. 5
10 Koole, G.; Mandelbaum A.; (2001); p. 4
11 Herzog, A.; (2017); p. 11
12 Herzog, A.; (2017); p. 12

2.1.2 Categorization of contact centre systems

Contact centres can be categorized according to different properties. For example, they can be categorized according to the type of communication form or the communication direction. A more detailed categorization would be e.g. according to the topics to be worked on.
In the following, the properties of contact centres are described and the different types are explained.

2.1.2.1 Communication directions of a contact centre

The most important distinguishing feature for a contact centre is the communication direction. A distinction is made between contact centres, they only respond to incoming inquiries, these are inbound contact centres, and contact centres, they start communication on their own, these are outbound contact centres. Bittner et al. summarized the classic inbound and outbound topics shown in Table 2-1.[13]

Inbound Topics	Outbound Topics
Directory services	Address verification
Order, booking and order acceptance	Cancellation prevention
Complaint and complaint management	Customer acquisition
Information service	Market and opinion research
Emergency service	Forward acquisition
Claims processing	Sale
Support service	

Table 2-1 Typical inbound and outbound contact centre topics [13]

2.1.2.1.1 Inbound contact centre

Figure 2-1 illustrates a model of an inbound call centre. An inbound contact centre has the same structure as call centres, but as already described in Chapter 2.1.1, additional communication channels are in use.
The inquiry always originates from the customers and the agents wait until they are assigned an inquiry[14].

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13 Bittner, S., Schietinger, M., Schroth, J., Weinkopf, C.; (2000); p. 22
14 Bittner, S., Schietinger, M., Schroth, J., Weinkopf, C.; (2000); pp. 21
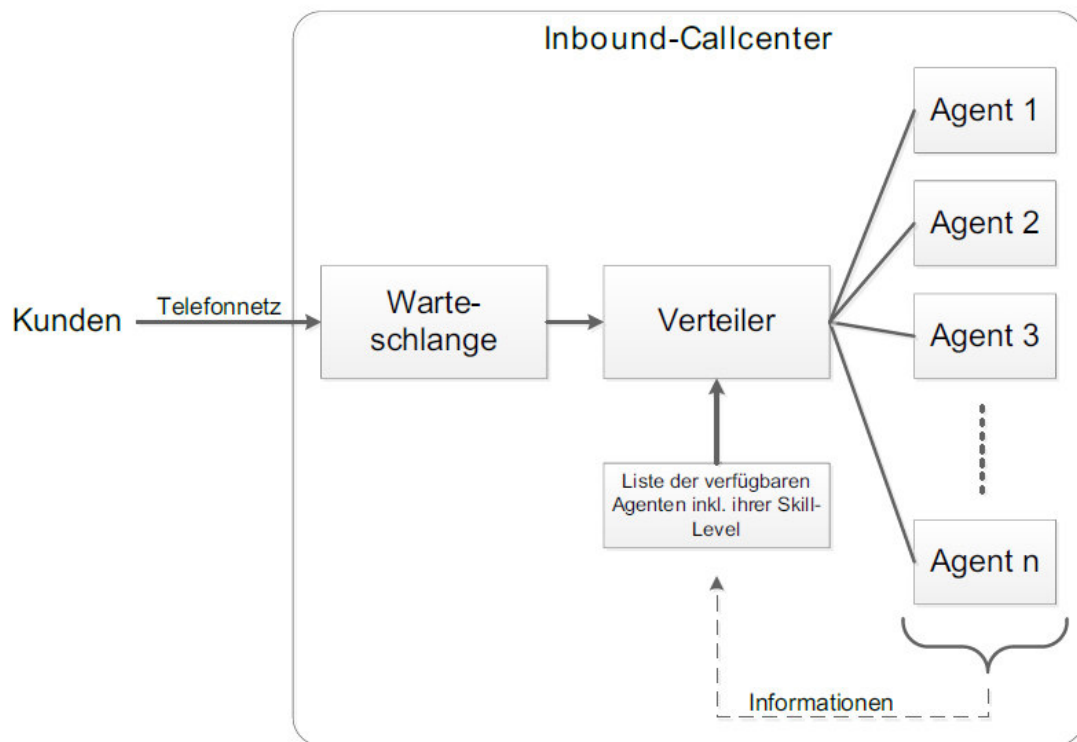
Figure 2-1 Model of an inbound call centre (in German)[15]

The customers with the inquiry are collected in a queue and are distributed according to their inquiry to a suitable and free agent. Every agent has skills. In Chapter 2.1.3.2 skills are described more briefly. The inquiries of the customers can be assigned to these skills. This ensures that the customer is connected to an agent who can also handle his inquiry. For example, if a customer has an injury about an invoice, he will be linked to an agent with the skill "invoice". Only those agents with the skill "invoice" are assigned, because only they can answer requests for invoices. Due to the skills, it is not possible for the customer to end up with an agent who answers technical questions but cannot provide information on invoices.

In order to use the optimal number of agents, it is necessary to weigh the empty time of the agents against the waiting times of the customers.[16] As shown in Chapter 2.1.1, a too long waiting period is usually unacceptable for customers. To reduce the waiting time the number of agents must be increased. Conversely, a high number of agents means that there is a high risk that they will not be fully utilized when the number of inquiries is low, which should also be prevented. Chapter 2.1.1. has already shown how to avoid or reduce low agent utilization.

For a more detailed analysis the queue theory and forecast models are used. The queuing theory deals with the waiting time as a function of the number of incoming inquiries, the number of processing jobs and the processing time. During the present Master thesis, the queuing theory[17] will not be discussed in detail. The literary index lists a few works that deal with the queuing theory in a call centre.

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15 Herzog, A.; (2017); p 6
16 Herzog, A.; (2017); pp. 6
17 Baum, D.; (2013); pp. 1

2.1.2.1.2 Outbound contact centre

In an outbound contact centre, communication originates from the agents. For example, by using the telephone, calls are made automatically. Contacts are called from a computer and assigned to an agent if the connection is established successfully.

Since many people are more difficult to reach during the day, the working hours of the agents are set in the evening hours. On the one hand the accessibility of the persons increases, on the other hand it is possible to prevent idle times for agents.[18], [19]

In order to alleviate the problem of accessibility, it is very important to maintain the contact data of known persons, usually customers, and to keep them as up to date as possible.

Figure 2-2 illustrates a model of an outbound call centre. The model of an outbound contact centre is regarding to the communication direction essentially the same like an outbound call centre, only additional communication channels are used by an outbound contact centre.
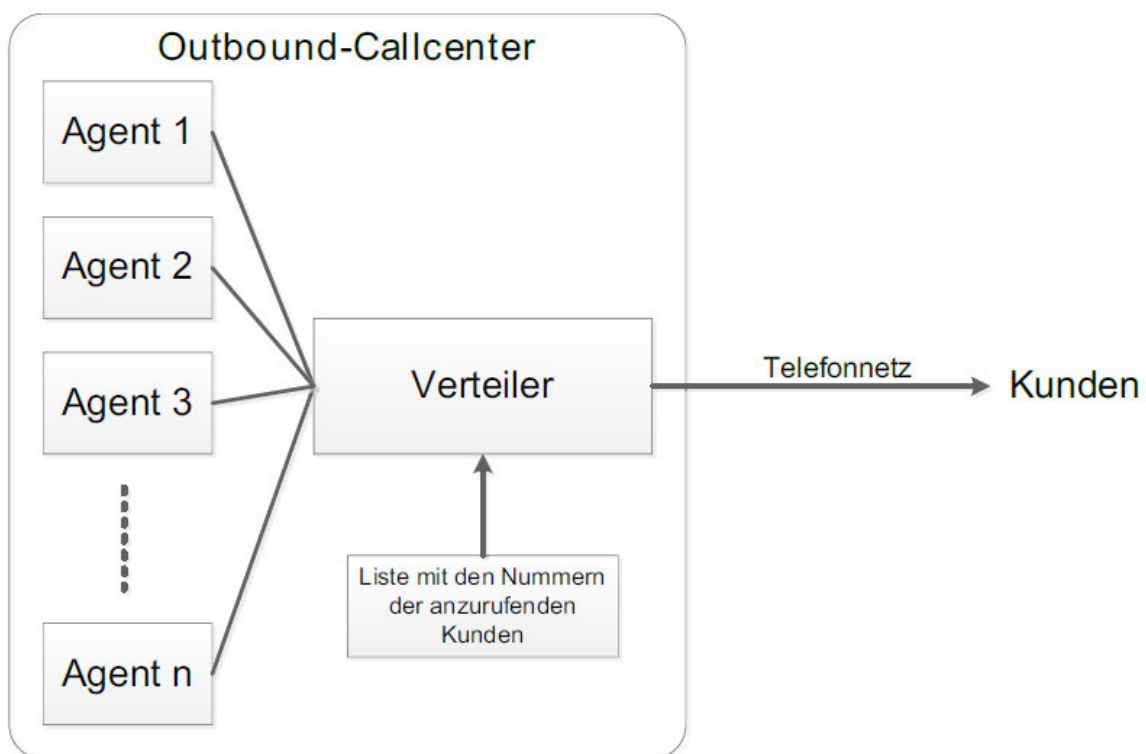
Figure 2-2 Model of an outbound call centre (in German)[20]

2.1.2.1.3 Inquiry controlled outbound contact centre

An inquiry controlled outbound contact centre is a special form of an inbound contact centre. It is attempted to intercept the disadvantages of contact centre, described in chapter 2.1.2.2.1., by reversing the communication direction.

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18 Herzog, A.; (2017), p. 8
19 Bittner, S.; Schietinger, M.; Schroth, J.; Weinkopf, C.; (2000); p. 22
20 Herzog, A.; (2017); p. 8

Figure 2-3 illustrates a model of a request driven outbound call centre. Like in figure 2-1 and 2-2 the inquiry controlled outbound contact centre is basically the same as an inquiry controlled outbound call centre.

In an inquiry controlled outbound contact centre, the property of the different sensation of waiting time is used. For example, a customer can use a contact form on the web page to request a call back and possibly select a desired time. A call back can also be offered on the automatic playback tape during a call. By specifying the reason for the inquiry, the customer is also called back directly by an agent with the required skill. The customer feels that it is a service to be called and that the time between making the inquiry and the call back is not a waiting time. This allows the agents to be better utilized and the waiting times for the customer are not perceived as such.[21]
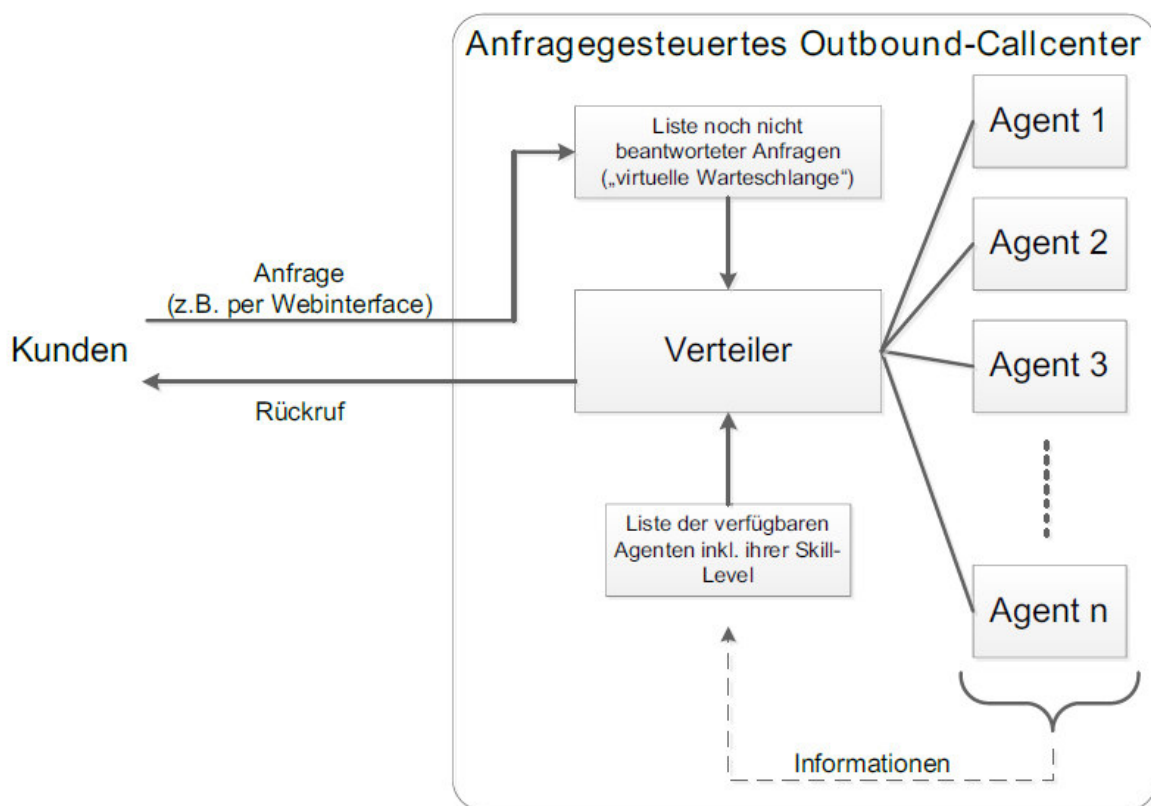
Figure 2-3 Model of an inquiry driven outbound contact centre (in German)[22]

2.1.3 Thematic subdivision of contact centres and technical details

A further subdivision of contact centres is the differentiation between subject areas. Table 2-1 shows which inquiries are processed in inbound and outbound contact centres. These

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21 Herzog, A.; (2017); pp. 9
22 Herzog, A.; (2017); pp. 9

requests are the main tasks of contact centres. A rough distinction can be made between commercial and technical concerns.[23]

2.1.3.1 Complexity of inquiries

In the case of technical inquiries, a distinction can be made between first and second level support. At the first level, agents process simple inquiries, which they can answer after only a short training period. Only if requests cannot be answered at the first level, the persons are forwarded to the second level, where better trained agents will process the inquiries.[24]

2.1.3.2 Agent skills

> *"Skill refers to a call centre employee's special ability to organise personnel deployment planning, if necessary. Skills may include knowledge of foreign languages as well as specialisation in specific subjects/products".[25]*

Table 2-1 lists inquiries that are typically answered in a contact centre. Since not every agent can answer every inquiry, skills are assigned to the agents. For example, an agent who is fluent in German and English and can answer technical inquiries gets the skills "German", "English" and "Technique". I.e. he is only assigned to people who have a technical inquiry and speak German or English. An agent who can answer commercial questions is then given the skill "Commercial".[26]

The reason for the skill allocation is the more efficient processing of inquiries. A person does not have to be redirected until it meets an agent who can answer the inquiry. In order to implement the system, an ACD and IVR system is required for the telephone system. The IVR system asks the caller for the reason for the call and the ACD system assigns the caller the best possible free agent.[27] The assignment to an agent is also referred to as routing.

In terms of multimedia communication channels, agents are only assigned to emails or contact form inquiries they are able to process.

Figure 2-4 on the next page illustrates the systematic routing through skills.

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23 Herzog, A.; (2017), pp. 9
24 Bittner, S.; Schietinger, M.; Schroth, J.; Weinkopf, C.; (2000); p. 22
25 Fojut, S.; (2008); p. 162
26 Herzog, A.; (2017); pp. 17
27 Fojut, S.; (2008); p. 162
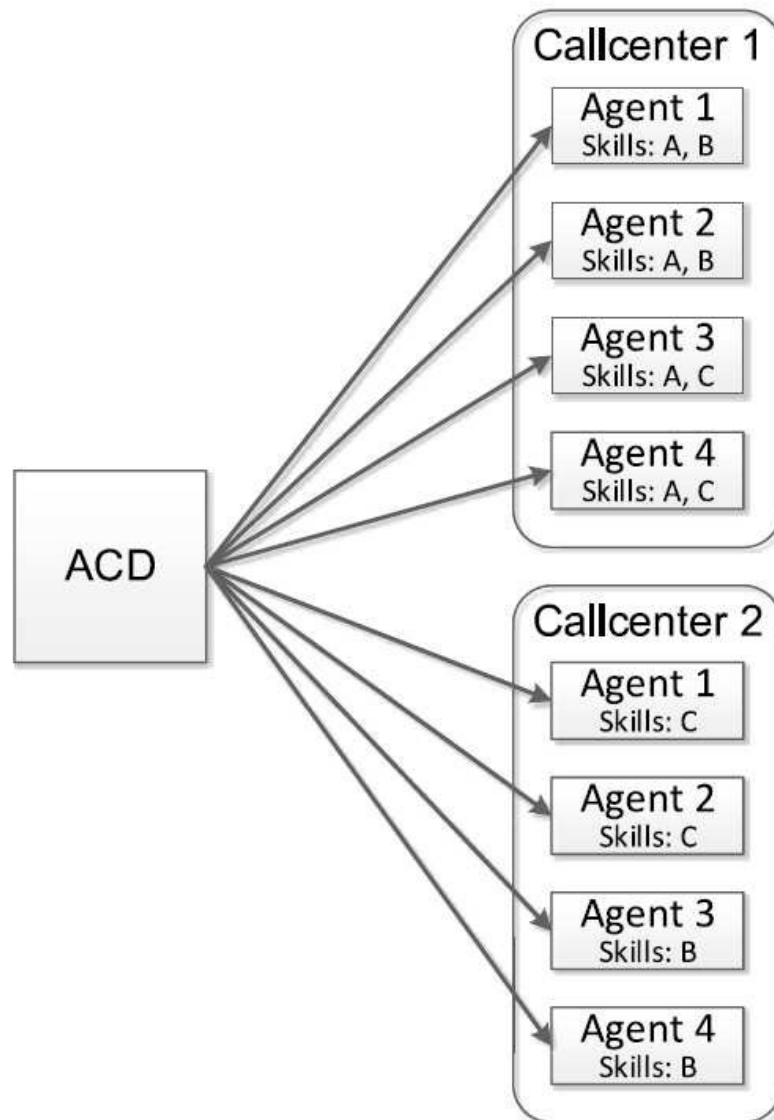
Figure 2-4 ACD call distribution to different agents with different skills (in German)[28]

For example, a customer with an inquiry about the topic "A" who is waiting in the queued is asked by the IVR about his inquiry topic and is routed by the ACD to an agent that can process the inquiry. Another example is, if a customer has an inquiry about topic "C" or "B", he can be routed to the first free agent at call centre one or two.

2.1.4 Customer arrival flow and customer types

Every optimization or simulation of a contact centre starts with a stream of customer arrivals. The customer arrival flow consists of the number of inquiries per time unit and a categorization.

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28 Herzog, A.; (2017); p. 30

The incoming inquiries can be of different types. All inquiries that match the criteria of a certain type will be assigned to the according category. Possible distinctions would be:[29]

- Reason for inquiry (technical, commercial, ...)
  In chapter 2.1.3.2. it was shown that the thematic routing to the agent is important to ensure an efficient process.
- Contractual relationship (business customer, private customer, ...)
  The contractual relationship can, for example, decide on a possible prioritization.

As an example, in a contact centre, persons can be divided into one or more categories. Customer types such as "private customers" and "business customers" can be defined, as "private consumer with technical questions", "private customers with commercial questions", "business consumers with technical questions" and "business customer with commercial questions". Basically every possible categorization is possible.

2.1.4.1 Inquiry processing time

In connection with the flow of customer arrivals, it is also of interest to know how long it takes an agent to process an inquiry. The processing time consists of two parts. The first part is the speaking time, in case of a multimedia channel e.g. the time in which you chat or read an email. The second part is the postprocessing time. This is the time the agent needs to perform documentation or start other processes.

It is easy to imagine that the processing times vary greatly with the person making the inquiry or with the reason for the inquiry. In this way, an inquiry on an invoice can be processed more quickly than a technical inquiry.

The processing time also depends on the skill level of the agent, i.e. the training level of the agent. Well-trained agents will be able to answer the inquiry more accurately and faster than those who are not well-trained.

In the case of a telephone inquiry, the waiting time required by a customer plays a role in the processing time. If the customer has to wait a long time to get his inquiry answered, he may firstly complain about the waiting time when the agent answers his call. This leads to a longer processing time, which in turn means that the agent can answer the next inquiry later, which in turn increases the waiting time for the next customer.[30], [31]

Figure 2-5 illustrates the process and time parts of a customer call from the point of view of a customer and an agent.

29 Herzog, A.; (2017); pp. 37
30 Herzog, A.; (2017); pp. 31
31 Fojut, S.; (2008); p. 27
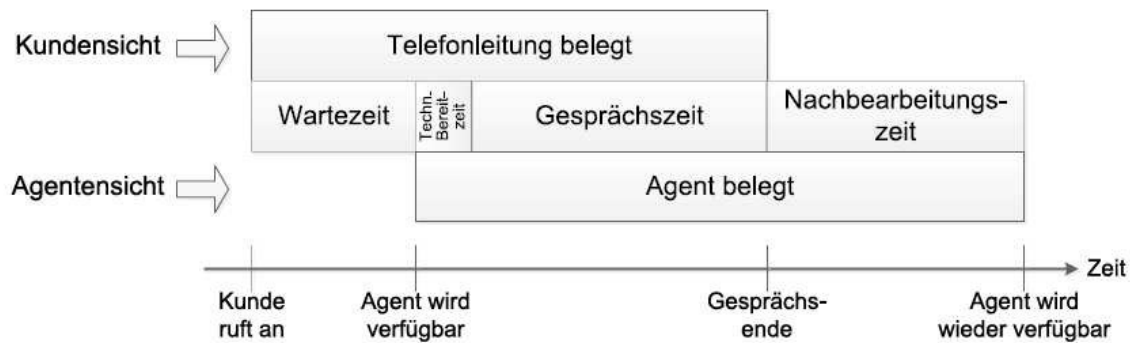
Figure 2-5 Process of a customer call (in German)[32]

The time the customer needs to get his inquiry answered consists out of the waiting time and speaking time. The time the agent needs consist out of the standby time, speaking time and post processing time.

2.1.4.2 Forwarding of telephone inquiries

In chapter 2.1.3.2. it was already shown how the routing of the inquiries to the agents works. If an error occurs and a caller is connected to an agent who cannot answer the inquiry, the agent must forward the caller to another agent who can answer the inquiry. It can also happen, that in the course of processing an inquiry, a new question arises which the processing agent cannot answer, then the caller must also be forwarded. Forwarding leads to longer waiting times and longer processing times and should therefore occur as rarely as possible.[33]

2.1.5 Definition and creation of a simulation process

The Duden[34] defines simulation in German as follows:

> *„(bildungssprachlich, Fachsprache) Sachverhalte, Vorgänge [mit technischen, naturwissenschaftlichen Mitteln] modellhaft zu Übungs-, Erkenntniszwecken nachbilden, wirklichkeitsgetreu nachahmen. […]"[35]*

It can be translated as followed:

Modelling of states, processes [with technical, scientific means] for exercise-, knowledge purposes and realistic imitation

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32 Herzog, A.; (2017); p. 32
33 Herzog, A.; (2017); pp. 32
34 Note: the Duden is a German book which is comparable with a dictionary.
35 Duden; https://www.duden.de/rechtschreibung/simulieren; Request from: 29.01.2019

The VDI guideline 3633-1 defines simulation in German as followed:

„Simulation ist das Nachbilden eines Systems mit seinen Prozessen in einem experimentierbaren Modell, um zu Erkenntnissen zu gelangen, die auf die Wirklichkeit übertragbar sind. […]"[36]

Translated:

Simulation is the replication of a system with its processes in an experimental model in order to gain knowledge that can be transferred to reality.

Summarising the above, it can be said that the aim of a simulation is to gain a better understanding of the basic real system and thus to be able to optimize the real system.

A simulation model for optimization essentially consists of three components:[37]

- Input variables:
  These are parameters that can at least be partly set (e.g. the number of agents or the customer request flow).

- System:
  The system can be a real contact centre or its representation in the form of formulas. The formulas work on the basis of the parameters.

- Output variables:
  Based on the work of the system, one or more output variables result. These can be, for example, accessibility or the service level.

Figure 2-6 shows the process of a simulation. On top of the figure the real system is shown. The real system has its input parameters and creates an output. The simulation model on the bottom of the figure is a simplified model from reality an has only the needed input parameters. The output of the simulation model is used to gain knowledge about real system.

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36 VDI Guideline 3633-1
37 Herzog A.; (2017); p. 151
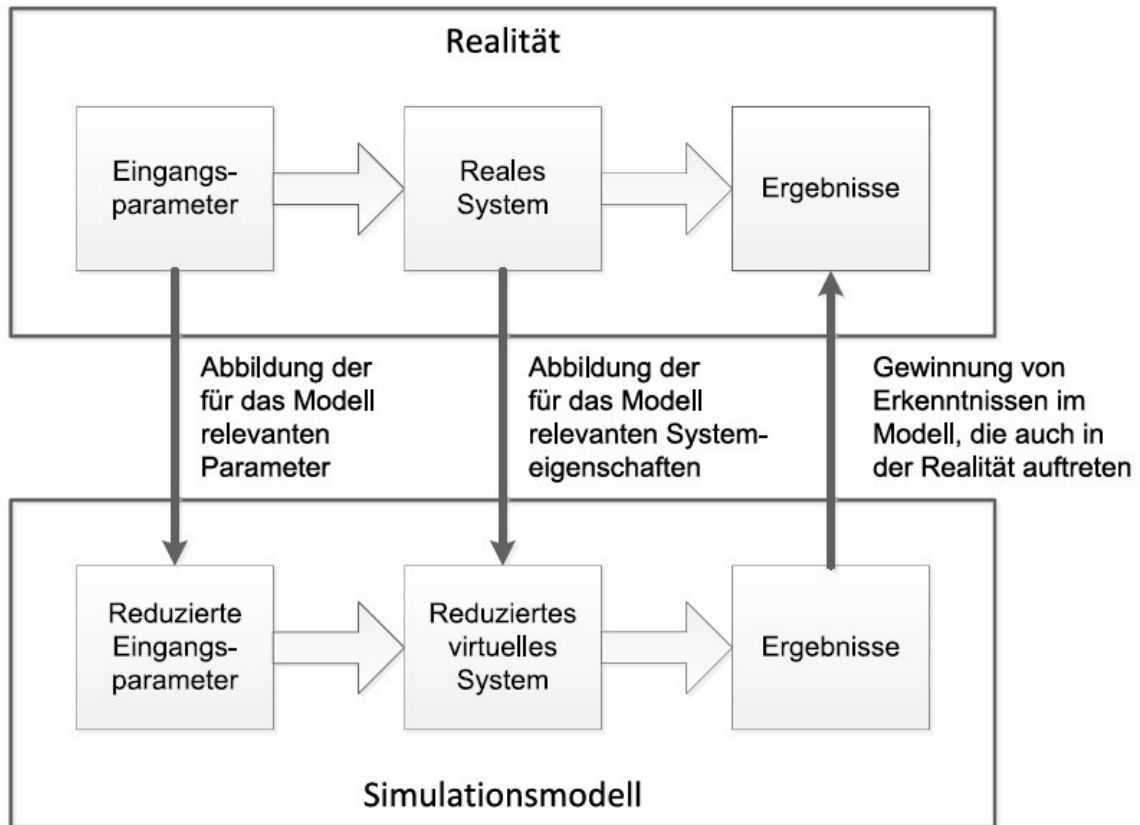
Figure 2-6 Modelling of a real system (in German)[38]

38 Herzog, A.; (2017); p. 151

2.2 Processes and process modelling

This chapter provides an overview of the basics of process management. It begins with an explanation of what constitutes a process and how it is to be understood in the context of a company. It will become apparent that a distinction must be made between core and support processes. Furthermore, the principles of process modelling will be discussed, and which notations exist to model processes.

2.2.1 Process definition

The literature provides a number of definitions of a process. For example, Becker and Schütte define a process in German as follows:

>*„Ein Prozess ist die inhaltlich abgeschlossene, zeitliche und sachlogische*
>*Folge von Aktivitäten, die zur Bearbeitung eines betriebswirtschaftlich*
>*relevanten Objektes notwendig sind. Ein solches Objekt wird aufgrund*
>*seiner zentralen Bedeutung für den Prozess als prozessprägendes Objekt*
>*bezeichnet. Weitere Objekte können in den Prozess einfließen."* [39]

Becker and Schütte can be translated as follows:
A process is the completed, temporal and logical sequence of activities that are necessary for performing a business-relevant object. Due to its central importance for the process, such an object is referred to as a process-defining object. Further objects can flow into the process.

Junginger, Kühn, Strobl and Karagiannis define a process in German:

>*„Unter einem Prozess wird eine Abfolge von Aktivitäten verstanden, die*
>*von Akteuren durchgeführt und zur Erstellung eines definierten*
>*Ergebnisses benötigt werden. Innerhalb der Aktivitäten werden Artefakte,*
>*wie z. B. Formulare oder Informationen, unter Zuhilfenahme von*
>*Ressourcen bearbeitet."* [40]

Junginger, Kühn, Strobl and Karagiannis can be translated as follows:
A process is a sequence of activities, carried out by actors and required to produce a defined result. Within the activities, artefacts such as forms or information are processed with the help of resources.

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39 Becker, J.; Schütte, R.; (2004); p. 107; Rosemann, M.; (1996); p. 9.
40 Junginger, S.; Kühn, H.; Strobl, R.; Karagiannis, D.; (2000); pp. 392.

All definitions in literature have the following points in common:[41]
- Logical sequence of operational activities
- Orientation for value creation
- Goal orientation: clearly defined scope of services with defined triggers
- Reproducibility
- Consistent responsibility of a process owner
- Time, cost and quality related

2.2.2 Distinction between process and business process

The terms process and business process are often used synonymously in technical literature.[42]

The process definition in Chapter 2.2.1. makes no statement about the receiver and the type of output. The term process already describes the sequence of a few activities to produce a result. Many processes are involved in the creation of services and products for customers outside the company. The fragmentation of the entire process requires coordination in order to meet the wishes and requirements of external customers. Based on a process, the concept of the business process was developed.[43]

Schmelzer and Sesselmann define a business process in German as follows:

„In einem Geschäftsprozess werden alle Aktivitäten organisatorisch zusammengefasst, die an der Bereitstellung von Leistung für externe Kunden beteiligt sind. Ziel der Geschäftsprozesse ist es, den Kundennutzen zu erhöhen und die Produktivität zu steigern."[44]

Translated it means:

In a business process, all activities that are involved in the provision of services for external customers are combined organizationally. The goal of business processes is to increase customer benefit and productivity.

Becker, Kugler and Rosemann summarise the characteristics of a business process in German as follows:

„Wesentliche Merkmale eines Geschäftsprozesses sind die Schnittstellen des Prozesses zu den Marktpartnern des Unternehmens (z. B. Kunden, Lieferanten)"[45]

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41 Schrotter, C.; (2002); p. 23
42 Vossen, G.; Becker, J.; (1996); p. 18
43 Schmelzer, H. J.; Sesselman, W.; (2013); pp. 29
44 Schmelzer, H. J.; Sesselman, W.; (2013); p. 31
45 Becker, J.; Kugeler, M.; Rosemann, M.; (2012); p. 7

The translated Becker, Kugler and Rosemann definition follows:

> Essential characteristics of a business process are the interfaces of the
> process to the company's market partners (e.g. customers, suppliers).

All definitions of business processes contain the following components in literature:[46]

- Customer request
- Inputs
- Production of services
- Result for customers (outputs)
- Business process manager
- Target and measurement variables for controlling the business process

2.2.3 Business process categories

In order to differentiate the business processes according to their function, they are divided into different categories. Not all of them primarily create customer benefits, but they are necessary to be able to carry out value-adding activities.

- **Management processes**[47]
  Management processes include the development and implementation of strategies and corporate goals. The output of management processes is primarily the provision of suitable framework conditions to achieve the goals.

- **Core processes**[48]
  Core processes are processes that are directly related to the manufactured product or service offered and thus contribute to the economic result of the company. I.e. they are value-adding processes.
  Core processes have the following characteristics:
    - Direct reference to the core competencies
    - Establishment of a sustainable competitive advantage
    - Strategic importance
    - Creation of a customer benefit
    - Non-imitability by competitors
    - Non-substitutability through other problem solutions
    - Focus on external service recipients

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46 Schmelzer, H. J.; Sesselman, W.; (2013); p. 31
47 Uitz I.; (2007); p. 18
48 Becker, J.; Kugeler, M.; Rosemann, M.; (2012); p. 7

- **Support processes**[49]
  Support processes have no direct relation to the manufactured products and services. From the customer's point of view, they have no value-adding character, but are necessary to execute core processes.

The boundary between core and support processes cannot be clearly defined and is fluid. In different companies, the same process can be both core- and support process. Without the support process the execution of the core processes would not be possible.[50]

The value chain model presented by Porter distinguishes between primary (value-creating) and supporting (value-defining) activities. The value-adding processes are the part of the company in which the added value occurs. They are oriented towards customer processes and are largely organised in teams with responsibility for results. The most important development projects for market, product, organizational and personnel development are summarized in value-defining processes. [51]

2.2.4 Process components[52]

Processes can be divided into several subprocesses. Figure 2-7 illustrates a process with subprocesses.
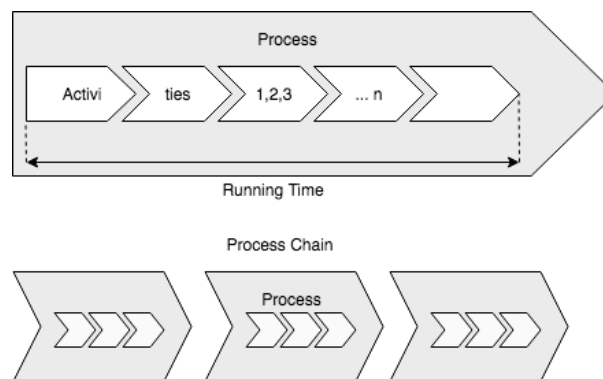
Figure 2-7 Process structure[53]

A process consists of several activities that have a logical and temporal sequence. As a result, it is set when an activity is executed. Figure 2-8 illustrates a process with several activities.

49 Becker, J.; Kugeler, M.; Rosemann M.; (2012); p. 7
50 Becker, J.; Kugeler, M.; Rosemann M., (2012); p. 7
51 Porter, M. E.; (1989); pp. 63
52 Grubelnik, W.; (2000); pp. 2
53 Grubelnik, W.; (2000); p. 5
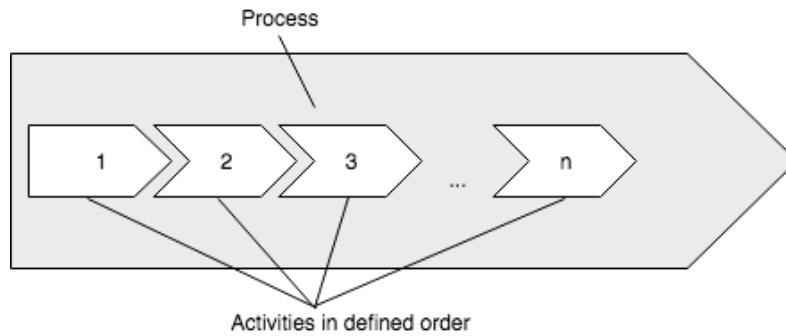
Figure 2-8 Process activities in defined order[54]

By executing the activities, a defined input is converted into a defined output. Both input and output, must be clearly defined and measurable. Illustrated in figure 2-9.
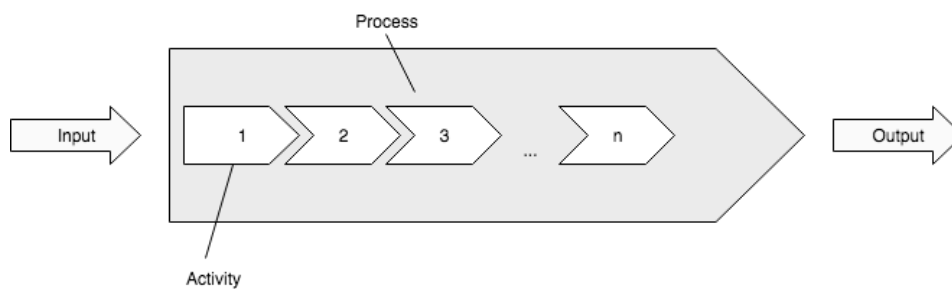
Figure 2-9 Input and Output of a process[55]

The overpass of the input into an output is called transformation. During the transformation, the value of the input increases for the customer. This means that only those activities that are oriented towards the process customer are of importance. The transformation is illustrated in figure 2-10.
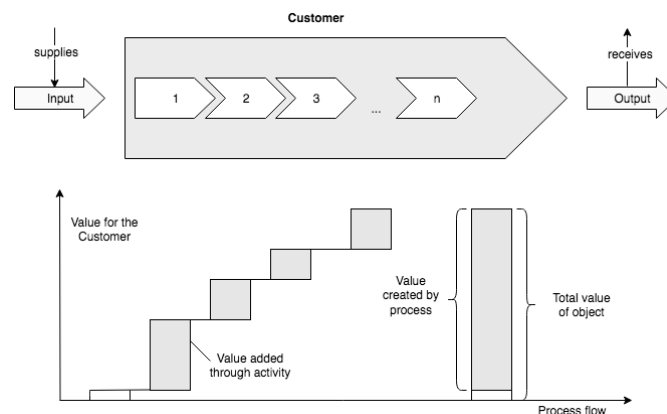
Figure 2-10 Value adding through transformation[56]

Each process is powered by a source and the sink represents the result of the process delivered to the process customer. The source and sink create an essential characteristic of

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54 Grubelnik, W.; (2000); p. 5
55 Grubelnik, W.; (2000); p. 6
56 Grubelnik, W.; (2000); p. 6

a process, namely the customer-supplier relationship. A customer can be a person or a process, which receives the outputs from the preceding process. The "source sink principle" is illustrated in figure 2-11.
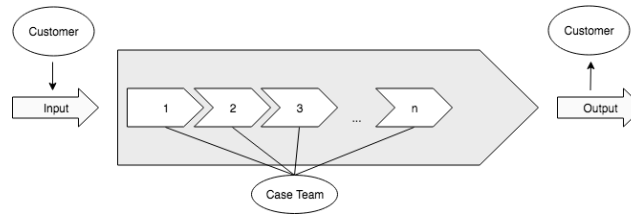
Figure 2-11 Source and sink of a process[57]

A functional organizational structure leads to fragmentation of process responsibility. Since successive activities are carried out by different organisational units, the interfaces need to be clearly defined to avoid misunderstandings.

In order to carry out transformations, certain resources are required. These are material and personnel resources as well as information and know-how. The resources can be divided into consumption-, use- and flow resources. Consumption resources are directly included in the output and are "consumed" in the process (e. g. energy, capital). Usage resources are not directly included in the output and can be reused (e. g. operating equipment). Flow resources are resources such as information and people needed for transformation.

An essential feature of a process is the definition and achievement of goals. Process goals are measured by the scope and timing of performance of the process results. Criteria for the evaluation of results are quality, time and costs. The three criteria are contradictory and therefore cannot be fully met. For example: in order to increase quality, time and capital is needed. To illustrate the stress field, arrange the criteria at the corners of a triangle. It is obvious, that it is not possible to reach the highest level for each criterion. The triangle was called "project management triangle" illustrated in figure 2-12.
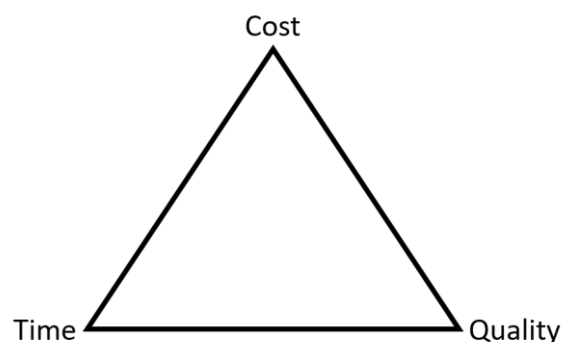
Figure 2-12 Cost, quality and time triangle[58]

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57 Grubelnik, W.; (2000); p. 7
58 Roger, A.; (1999); p. 337

2.2.5 Process management

The term process management refers to the planning, control and monitoring of (business) processes. Both core and support processes are part of the process management.[59]

However, process management does not only mean the design of processes, but also the relationship of the processes to the existing departments must be included here.[60]

Hirzel sees the benefits of process management for the company in the following points:[61]

- Lower costs per unit: The economic result is brought to the front. This leads to a targeted search for cost drivers.

- The throughput speed increases: The individual work steps are streamlined and coordinated with the various departments.

- Accuracy of the services grows: Through customer orientation, useless services are identified and eliminated.

- Customer satisfaction increases: The core processes are directly tailored to customer needs.

- Quality increases: There is a strong commitment to achieving objectives through disclosure of the performance promise.

- Reduction of reaction times: Simultaneous control of the entire value chain reduces response times.

To be able to implement a functional process management, an understanding of the managed processes is needed. For a better understanding, the processes in a company can be modelled.

2.2.6 Model and modelling in general

The Duden gives several definitions of the word model, since it is used in many areas of society. In the field of science, the definition of a model can be analogously translated as:

> Object or structure that represents or [schematically] illustrates [and simplifies, idealizes] the inner relationships and functions of something. [62]

In model theory there are three main characteristics of a model: [63]

- **Illustration characteristic:** Models are always copy of something, namely representations of natural or artificial originals, which themselves can again be also models.

- **Shortening characteristic:** Models generally do not capture all attributes of the original they represent, but only those that appear relevant to the respective model creators and/or model users.

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59 Kugeler, M.; (2001); pp. 368
60 Osterloh, M.; Frost, J.; (2006); p. 99
61 Hirzel, M.; (2005); pp. 20
62 Duden; https://www.duden.de/rechtschreibung/Modell#Bedeutung1c; Request from (26.01.2019)
63 Stachowiak, H.; (1973): pp. 131

- **Pragmatic feature:** Models are not per se clearly assigned to their originals. They perform their replacement function
  - for certain subjects, recognising and/or acting, using the model,
  - within certain time intervals,
  - limited to certain mental or actual operations.

Modelling refers to the process of creating a simplified copy. In principle, models serve to reduce complexity. Due to simplification process, information gets lost. As in chapter 2.1.5. with the simulation, it is the task of a model to simplify and gain knowledge. The results obtained must be transmissible to reality.

2.2.6.1 Applications of process modelling

Process modelling is the visualization of processes. Process modelling makes it possible to identify correlations between processes and organizational units.[64]

Rosemann, Schwegmann and Delfmann see the following applications of such process models in:[65]

- **Organization documentation:** Process models have the task to simplify the communication about the processes. Process models should be easy to understand for all members of an organization.
- **Continuous process management:** After a process has been introduced, it is important to compare the defined target goals with the actual results. Process models serve as specifications for the target goals.
- **Certification according to EN ISO 9000ff:** Efficient and consistently documented processes are the basis for certification of the company according to EN ISO 9000 ff.
- **Process simulation:** process simulations are used to investigate the system behaviour of processes on the basis of time factors. The simulation also serves to identify possible weak points within a process. Among other things, bottlenecks are discovered in this way.

2.2.6.2 Principles of orderly modelling

In the following, six principles of orderly modelling are described, which were established by Becker, Ehlers and Schütte. [66]

- **Principle of correctness**
  The principle of correctness is divided into two requirements: syntactical correctness and semantic correctness.

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64 Delfmann, P.; (1997); p. 88
65 Rosemann, M.; Schwegmann, A.; Delfman, P.; (2012); pp. 53
66 Becker, J.; Ehlers, L.; Schütte, R.; (1998); pp. 63

Syntactically correct are models that are complete and correct with respect to the underlying metamodel. The metamodel specifies the information objects and notation rules for the concrete model creation.

Semantically correct models require the structural and behavioural fidelity of the model system to the object system.

- **Principle of relevance**

  The principle of relevance includes, on the one hand, the delimitation of the area to be considered and, on the other hand, the concrete expression in the model. Therefore, the basic principle is the formulation of the modelling objectives in relation to all model components.

- **Principle of economic efficiency**

  This principle requires an appropriate balance between the effort required to create the model and the benefits. The economic efficiency can be increased by using structural blocks.

- **Principle of clarity**

  This principle refers to the comprehensibility of the models by third parties. The demand for a structured, intuitive and easy to read process model is related to and can influence the principle of correctness.

- **Principle of comparability**

  This principle should enable statements to be made about comparability with the object system on the basis of modelling. A distinction must be made between syntactic and semantic approaches. In order to ensure syntactical comparability of models, the models must be created with the same method and the observance of all method conventions and in the same degree of detail.

  The semantic consideration aims at the comparability of the model contents.

- **Principle of systematic construction**

  This principle requires, if describing in different layers, the metamodel must be designed in such a way that the relationships between the individual layers are clearly defined.

2.2.6.3 Detail levels in process modelling

In order to comply with the principle of economic efficiency, it is necessary to determine the right detail level for process modelling. The degree of detail must correspond to the task and can usually be derived from the goal of the modelling project. There are three detail levels:[67]

- **Detail level 1:** Responsibilities and/or inputs/outputs
  Detail level 1 is the roughest description level for tasks. A process is described with few tasks. The focus is on the rough process description in the sense of "What are the main steps that lead to the process goal?" Based on this, the responsibilities and inputs/outputs of the tasks/activities are described.

- **Detail level 2:** Change of processor/-media
  At detail level 2, a new task is modelled, if a change of processor occur. The same principle can also be applied to changing the working medium. Changing the processor or the medium can result in queries and loops in the process flow, tasks may be executed twice or delays may occur.

- **Detail level 3:** "Uninterruptability"
  With detail level three, a new task is modelled as long as it can still be divided by the processor. The new task must generate a result. If this is no longer possible, it does not make sense to divide the task further. The activity is now "uninterruptible". Typical application areas for process modelling at detail level 3 are, work instructions.

2.2.6.4 Introduction of different process modelling notations

To model processes, there are a number of different notations. The intended use determines the notation to be used within the framework of process modelling.

- **Value chain diagram**
  The value chain diagram is based on the value chain model introduced by Porter (Chapter 2.2.2.). Figure 2-13 illustrates a value chain diagram. The functions shown can be hierarchized. The purpose of value chain diagrams is to give the viewer an overview of the process. A precise consideration of individual processes and responsibilities is not planned. Nor can information about organizational units or application systems be given.[68]

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67 Bayer, F.; Kühn, H.; (2013); p. 24
68 Rosemann, M.; Schwegmann, A.; Delfman, P.; (2012); p. 65
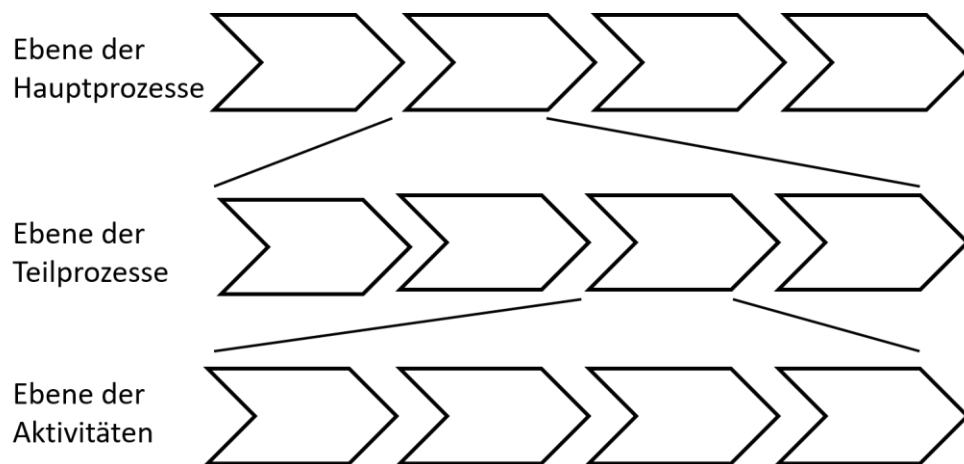
Figure 2-13 Hierarchical decomposition of process chains (in German)[69]

- **Flowcharts**

  Flowcharts consist of differently shaped elements connected by arrows. Each element describes a task to be performed and the direction of the arrows determines the sequence. The focus is on conveying the process flow to the people.[70]

  Through the simple visual modelling of processes, process sequences can be easily checked for illogical links and completeness. Figure 2-14 illustrates a typical flowchart with its components.
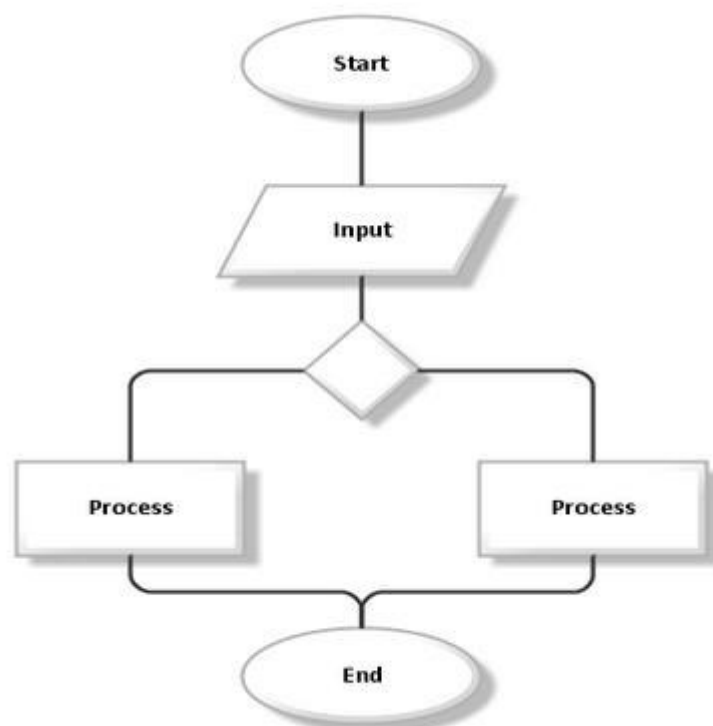
Figure 2-14 Example for a process flowchart[71]

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69 Delfmann, P.; (1997); p. 91
70 Schiedermaier, R.; (2000); p. 142
71 https://www.ariscommunity.com/flowchart; Request from 8.2.2018

- **Business Process Modelling Notation (BPMN)**

  The BPMN provides modelling elements for the mapping of mainly technical process flows. Similar forms as for alternative notations, e. g. flowcharts, are used. The most important appearance feature is the representation of "Swim lines". Swim lines are horizontal or vertical bars assigned to a specific organizational unit, person, machine or software. All activities that are executed within the same swim line, is performed by the identical unit. Processes are entered in rectangles. Start and end points are symbolized by a circle. A branch to follow a decision is represented by a rhombus. Arrows connect the symbols and thus indicate the process flow. The arrows can be further differentiated. For example, a dashed arrow represents a data/information flow.[72], [73], [74] Figure 2-15 illustrates a BPMN process.
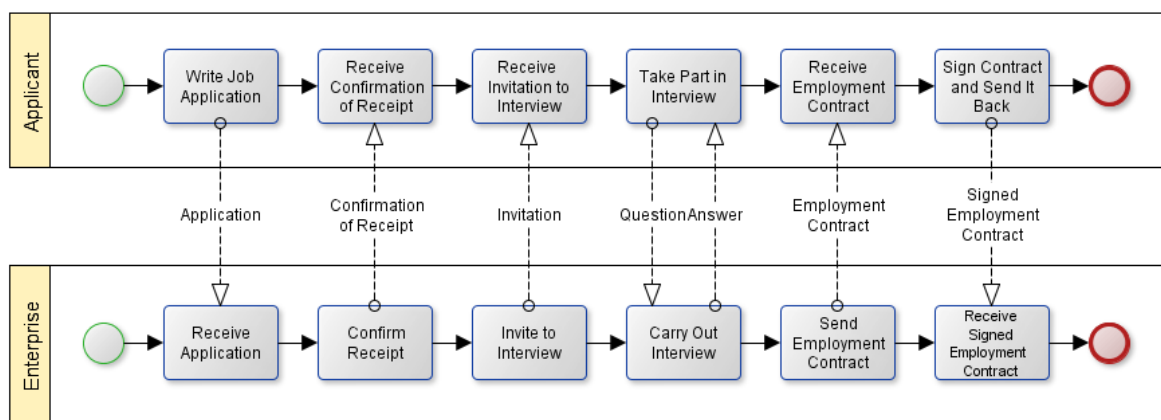
Figure 2-15 Illustration of a process using BPMN[75]

The strengths of BPMN are the [76]

- clear representation of processes across organizational units.
- the possibility of modelling process flows performed through software. This makes it possible to map highly automated processes.
- the mapping of information flows between the different swim lines.

Weaknesses are [77]

- the large number of different elements and the strong focus on technical processes.
- The difficulty in distinguishing between different object characteristics.

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72 Bayer, F.; Kühn, H.; (2013); pp. 95
73 http://www.bpmn.org/; Request from 26.1.2019
74 https://www.omg.org/spec/BPMN/2.0/; Request from 26.1.2019
75 https://www.yworks.com/products/yfiles-for-java-2.x/ybpmn; Request from 26.1.2019
76 Bayer, F.; Kühn, H.; (2013); pp. 100
77 Bayer, F.; Kühn, H.; (2013), pp. 100

2.3 Concluding remark

In the present chapter the basics of a call centre were presented. The possibilities of communication directions and communication channels were presented and what effects these have on the entire call centre. The development from a call centre to a contact centre was pointed out.

Subsequently, the basics of processes were discussed, from the definition of a process to process modelling. It was shown which notations exists for process modelling and what are the basic principles in modelling.

The literature presented in chapters 2.1 and 2.2 will be used in chapter 3 to answer the research questions formulated in chapter 1. First, the current situation at KWB call centre is analysed and which potentials exist is worked out. Afterwards, the current processes at KWB will be presented and the weak points identified. By combining the potentials in the call centre and the weak points in the processes, a new communication concept is created. Finally, the effects the new communication concept can have are simulated.

3 Development and simulation of a tailored communication concept for KWB

The present chapter deals with practical problem solving and answers the research questions formulated in chapter 1.2. The chapter is essentially divided into three parts, which build on each other. At the beginning, the current situation at the KWB call centre is analysed and discussed. The most important tool for customer communication, the telephone, is examined and analysed in more detail. Based on the information obtained, suggestions are made for further communication channels. Further the current processes within the call centre are recorded and the weak points identified. From the knowledge gained in the first section and from the weak points of the current processes, the communication concept with the target processes is then presented. Finally, a simulation of the designed concept is carried out, and the knowledge gained from it and its effects are examined more closely.

3.1 Call Centre at KWB

The KWB call centre is internally referred to as the service hotline. In the present chapter, both terms are used synonymously. In chapter 2.1 the call centre was defined and it was shown how it can be categorized. With the service hotline of the KWB a clear categorization is hardly possible, because it is a mixed form. The basic structure is an inbound contact centre. Inquiries can be made by telephone or Email. However, it also contains elements from the outbound-, and from the request driven outbound contact centre.

The service hotline can basically be divided into two areas. On the one hand, the disposition department, it processes requests for appointments and postponements. On the other hand, the technical support department, where inquiries about malfunctions, orders for spare parts and technical assistance are processed.

Table 3-1 lists the most frequent requests and assigns them to the responsible department. It is also indicated whether it is an inbound or outbound topic. The list was created by analysing employee interviews.

Inquiry Topic	Statement	Technical Support or Disposition	In-, or Outbound Topic
Malfunction	Inquiry because of a non-functional heating system. The person who initiates the contact is in most cases in front of the heating system and the technical support staff tries to instruct the person to correct the fault. For example, setting values in the control unit can be checked and reset if necessary. If the malfunction can be repaired via the telephone, no further steps are usually necessary. If it is not successful, a service technician must drive to the heating system and repair the malfunction.	Technical support	Inbound

(a possible following appointment would be a request controlled outbound topic, because the disposition would become active by notification from the technical support and the requesting person would be contacted) |
| Technical assistance | The transition from the malfunction is fluid, but in most cases the heating system still works. Work is being carried out, e.g. replacement of wearing parts. If the person doing the work is facing a problem that they cannot solve themselves, they can contact technical support and ask for technical assistance. This means that the employee in technical support helps the working person with his expert knowledge. | Technical support | Inbound |
| Spare parts order | Contact inquiry because of a spare part(s) order. Although there is a separate department within the KWB, these requests are also handled by the technical support. In the course of troubleshooting or technical support, it often turns out that spare parts have to be sent. | Technical support | Inbound |

Inquiry Topic	Statement	Technical Support or Disposition	In-, or Outbound Topic
Complaint	Inquiry about a complaint, mostly related to an invoice	Disposition	Inbound
Return parts processing	If components of a heating system have to be replaced within the warranty period, the dismantled components must be returned to KWB. If questions occur, they can be answered from employees of the disposition.	Disposition	Inbound
Information about products	These are requests for further information on heating systems and spare parts.	Technical support	Inbound
Information about services	These are requests for services offered. For example, commissioning checks or flue gas measurements.	Technical support	Inbound (As with mal-functions, request controlled outbound appointment may be made)
Information on maintenance contract	The KWB offers maintenance contracts. Once a year a maintenance of the heating system is carried out and the owner of the system gets a discount.	Disposition	Inbound
Information about offer	This can be, for example, information about a spare parts offer, or a new installation offer.	Disposition or technical support	Inbound
Invoice information	If work on the heating system is carried out by a service technician, an invoice will then be sent out.	Disposition	Inbound

Inquiry Topic	Statement	Technical Support or Disposition	In-, or Outbound Topic
Question to purchasing	The person making the request has a question for KWB Purchasing. Neither the technical support nor the disposition is responsible for this case and must forward the request.	Purchasing	Inbound
Appointment arrangement	An appointment can be made, for example, to carry out maintenance. Should it not be possible to solve the problem in the event of a malfunction, an appointment must also be made here afterwards.	Disposition	Inbound, outbound and request driven outbound system
Appointment information	Here an appointment has already been made, it is only a request if the caller has forgotten the appointment, for example.	Disposition	Inbound, outbound (for possible requests)
Other	Other reasons	Not specified	Not specified

Table 3-1 Typical request topics at KWB´s service hotline, responsibility and categorization (own presentation)

Table 3-2 lists the types of persons who, according to the employees, most frequently submit a contact request for inquires. In contrast to the query topics, the persons cannot be clearly assigned to any department. It is also not possible to assign a person group to the inbound or outbound contacts.

Person	Description of the person
End customer	At KWB, an end customer is defined as a person who is a private consumer (B2C).
Partner (sanitary heating air conditioning ("SHK" in German))	A partner (SHK) is a person who works for a KWB partner company. This means that partners are business customers (B2B).
Service technician	A service technician is a KWB employee who carries out work on a heating system on site.
Janitor	If a facility is located in a larger residential house, office building or industrial building, there may be a janitor on site. If a janitor makes a contact request, he usually speaks on behalf of a business customer.
Supplier	A supplier is an employee of a KWB supplier company.
Prospective customer	A prospective customer is any person who does not yet own a KWB heating system but is interested in a KWB product or a KWB service. It can be both, a private consumer (B2C) and a business customer (B2B).

Table 3-2 List of persons making inquiries at KWB (own presentation)

3.1.1 Analysis of actual situation of the KWB service hotline

Before it is possible to define certain communication channels, it must be understood how the current situation at the service hotline looks like. This means understanding what different types of persons inquiries have, what their exact inquiries are, and whether categories can be formed. Furthermore, it is of interest to know how long on average the speaking time lasts and whether it differs depending on the type of customer or the inquiry for the contact. A further important parameter is the postprocessing time which the employee needs after the end of the call, in order to be able to process the inquiry. Through the analysis of the captured parameters, potentials are to be pointed out for which it can make sense to offer alternative communication channels.

To carry out the simulation (chapter 3.4.), additional parameters have to be captured. This includes, for example, recording the time at which the inquire takes place. By entering the time, it is possible to create a customer arrival stream, which, together with the average processing time, forms the basis of the simulated employee utilisation. Chapter 3.4 deals with this in more detail.

Since KWB did not have any exact records on the service hotline in the summer of 2018 and there was no historical data, a method had to be developed with which it was possible to systematically record the required parameters. An MS Excel file was created for this purpose, with the help of which the employees could record the inquires. Chapter 3.1.1.1 deals with this in more detail.

3.1.1.1 Method for data capturing at KWB service hotline

The data capturing process took place in accordance with the General Data Protection Regulation from the European Union. The captured personal data has been anonymised and all data are only for the usage for the present master thesis.

In order to get an overview of the current situation at the service hotline, interviews were conducted with various employees. It turned out that there were very different data on the number, reasons and types of persons with inquires. However, since it is necessary to carry out an analysis as accurate as possible, the decision was taken to carry out a systematic recording.

For this purpose, an MS Excel form was created with the help of which the employees document every call they received. The exact operation of the MS Excel form is explained in Appendix 1. The documentation was done by the employees, directly after the call. In order to achieve systematization, employees could select from a predefined list for each category. The lists were created using the information obtained from the employee interviews. In addition, the subjective assessment of the employees about the difficulty of the problem was asked for certain reasons for the inquire in technical support. Only inbound calls were recorded.

The recorded parameters are listed in Table 3-3 and 3-4. As shown in Table 3-3, two different forms were created. One form for technical support and one for disposition. The different forms were identical for the general data but different for the specific data.

Technical support and disposition form						
Automatic recording	**General information**					
	Person	Reason for the call	Duration of the call	Duration of postprocessing	Forwarded to	Type of post-processing
Date	see table 3-2	see table 3-1	[minutes]	[minutes]	Disposition	Write email
Time					Partner (SHK)	Phone call
Staff (anonymised)					Technical support	Documen-tation
					Spare part shipping	Demand
					Telephone switching	Offer preparation
					Other	Spare part order
						Other

Table 3-3 Parameters recorded on the KWB service hotline (own presentation)

Specific information		
Specification technical support		Specification disposition
How hard was the problem to solve in the event of a malfunction	**How hard was the problem to solve in the case of technical assistance**	**What was the reason for making an appointment**
Simply by telephone	Simple	Technical assistance
Hard by telephone	Moderately	Maintenance
Simply on site	Hard	Repair
Hard on site		Other

Table 3-4 Parameters recorded on the KWB service hotline (own presentation)

Figure 3-1 illustrates the used form for data capturing. The recording was carried out in German, therefore the illustration is in German.

Drop-down lists were used for selecting certain parameters. Fields marked in red are automatically entered. Fields marked in blue provide a selection, and fields marked in green required an input by the employee. By pressing the "Eingabe Übernehmen" button the selected and entered parameters are saved in a database, and the form deletes the input fields for a new set of inputs.

Figure 3-1 Data entry form (in German) (own presentation)

3.1.1.2 Collected data at the KWB service hotline

The data capturing was carried out in technical support by three employees in the period from 27 August 2018 to 21 September 2018. Before the data capturing started, several test phases where performed.

During the observation period 551 calls were recorded.

- Employee A recorded from 27 August 2018 to 6 September 2018 and from 17 September 2018 to 21 September 2018 - 258 calls.
- Employee B recorded from 30 August 2018 to 14 September 2018 -185 calls.
- Employee C recorded from 30 August 2018 to 14 September 2018 - 108 calls.

In disposition, data collection was carried out by an employee in the period from 22 August 2018 to 3 September 2018 and 60 calls were recorded. The short period covered by the disposition is due to the fact, that it quickly became clear that the bottleneck in the disposition process was not the duration of the call (see chapter 3.2.2).

Appendix 2 lists the data captured, anonymised, unfiltered and uncategorised.

3.1.1.3 Analysis results: service hotline at technical support

Table 3-5 provides an overview of the key data collected. It shows that an average telephone call takes 5.65 minutes and the total processing time of an average phone call is 7.28 minutes. If we suppose 55 minutes of working time per hour per employee, the employee can process on average 7.55 calls per hour. To process more calls, more employees are needed, or the average processing time have to be decreased.

Average speaking time	5.65 minutes
Average post-processing time	1.63 minutes
Average processing time	7.28 minutes

Table 3-5 Average times in technical support (own presentation)

Figure 3-2 illustrates the relative share of calls by person type. It is easy to see that end customers make up the largest part, followed by partners and service technicians. The remaining customer types can be neglected in further consideration.
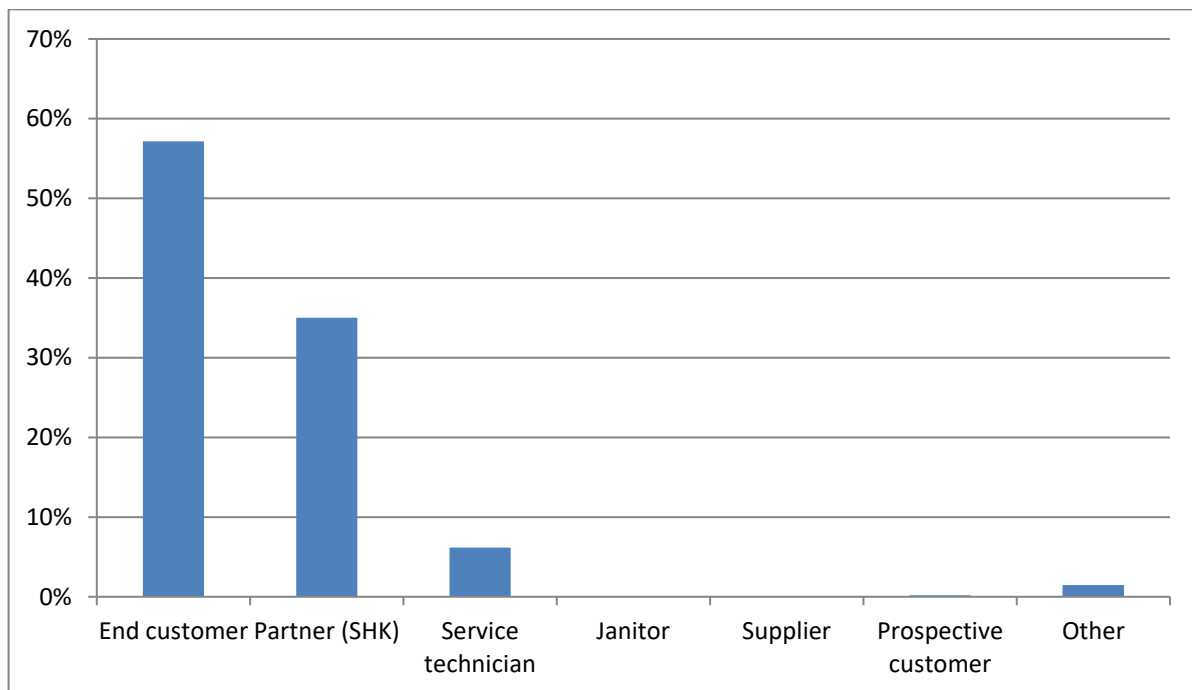
Figure 3-2 Percentage of different customer types (own presentation)

Figure 3-3 illustrates the share of reasons for the inquiry. It is easy to see that malfunctions account for the largest share with 28% and technical support with 37%.
It is also noticeable that appointment arrangements and appointment information also account for a significant proportion of calls. Since technical support is not responsible for these reasons, it is worth taking a closer look at the callers with this reason. Figure 3-3 deals with this in more detail.
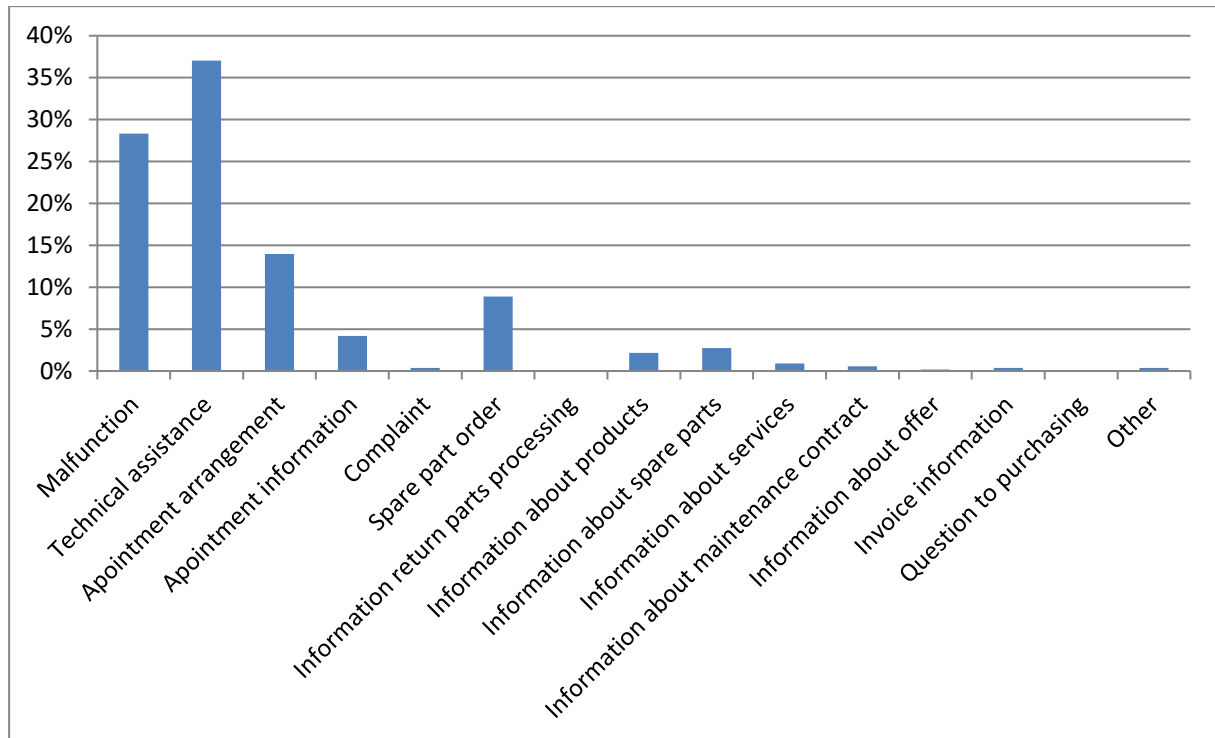
Figure 3-3 Percentage of reasons for the inquiries (own presentation)

Figure 3-4 illustrates the share of the different reasons for an inquiry with differentiation according to person type.
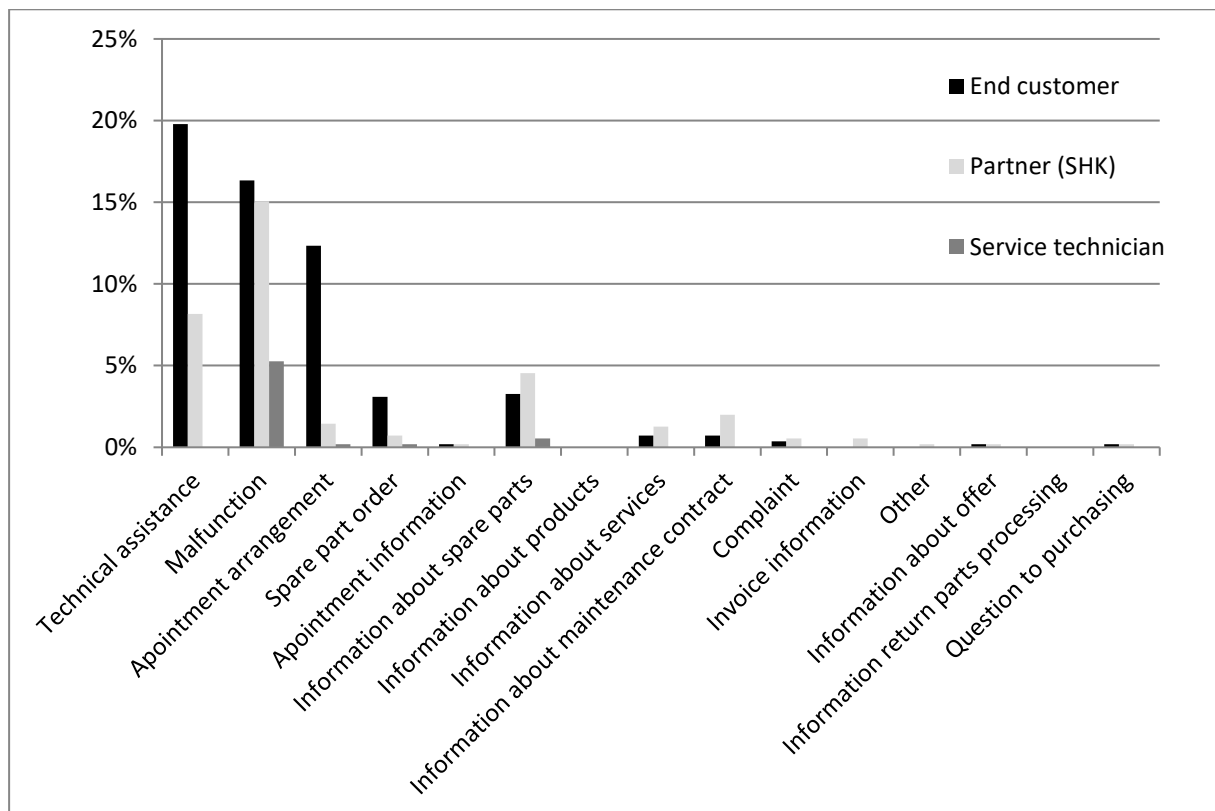
Figure 3-4 Customer type and reason for inquiry (own presentation)

While malfunctions, technical assistance and spare part orders are part of the scope of technical support, in figure 3-4 it can be seen very clearly that 12% of all calls from end customers are for appointments and 3% for appointment information. This means that 15% of all calls from end customers in technical support do not fall within the responsibility of technical support, but the disposition would be responsible for it. Since only 26% of the calls which do not fall under the responsibility of the technical support were forwarded during the observed period, there is a potential to free up capacities in the technical support. The potential can be realized by consequent forwarding or better routing. Figure 3-4 also illustrates that service technicians rarely call technical support, and the reason for the call is limited to technical assistance or to ordering spare parts. The low share of calls from service technicians is positive, because in figure 3-5 it is shown that calls from service technicians take longer processing times.

In figure 3-5, the share of callers is extended with the average processing time. It can be seen that the average processing time for end customers and partners is very similar and approximately eight minutes. For service technicians, the average processing time increases to eleven minutes.

At this point, it should be noted that the lowest average processing time from figure 3-5 is higher than the total average processing time from table 3-5. This is since in table 3-5 all calls were taken into account and some calls took only a few seconds and were therefore recorded with zero minutes, which reduces the average processing time. In figure 3-6, the alleged contradiction is resolved.
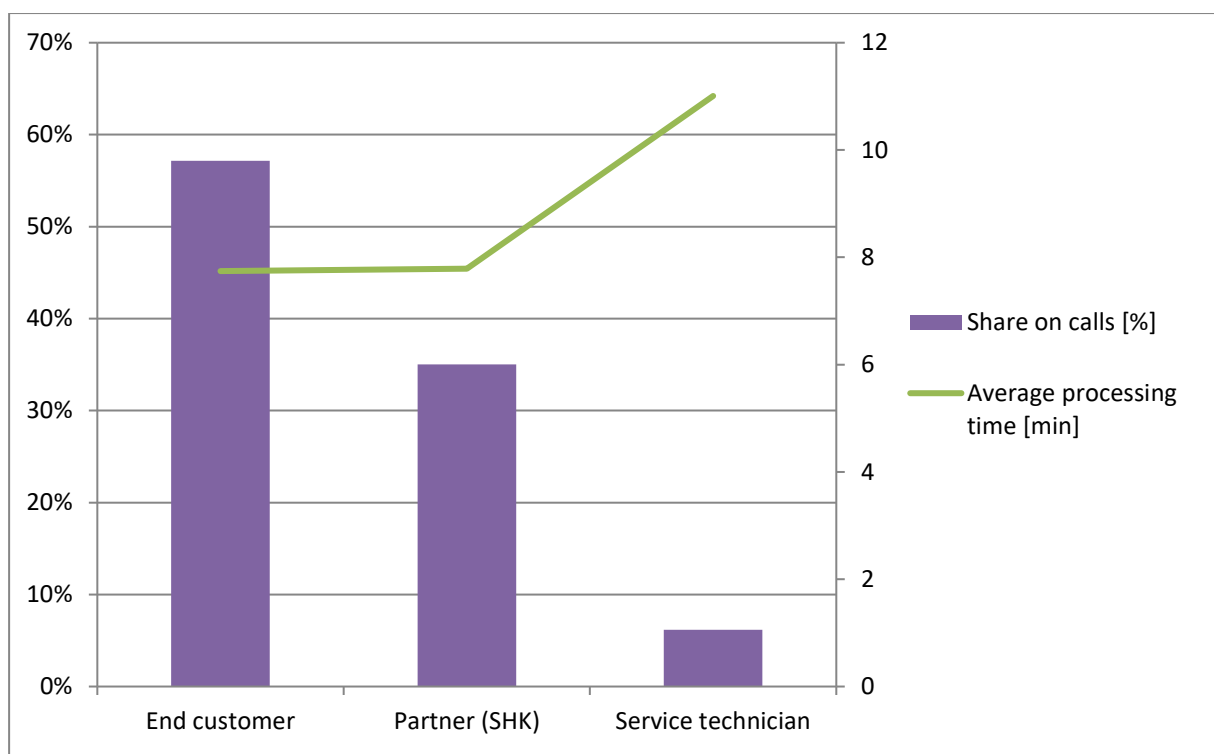
Figure 3-5 Customer type and required processing time (own presentation)

In figure 3-6, the reasons for the inquiry are extended with the respective average processing time. It is easy to see that a number of calls with the average processing time are well below the total average processing time, and the contradiction resulting from figure 3-5 is thus resolved.

It is easy to see that the average processing time for spare parts orders is significantly higher than the other times. The average processing time for spare parts information is also higher than the average processing time for calls with similar share. These two peculiarities are discussed in more detail in chapter 3.2.3.
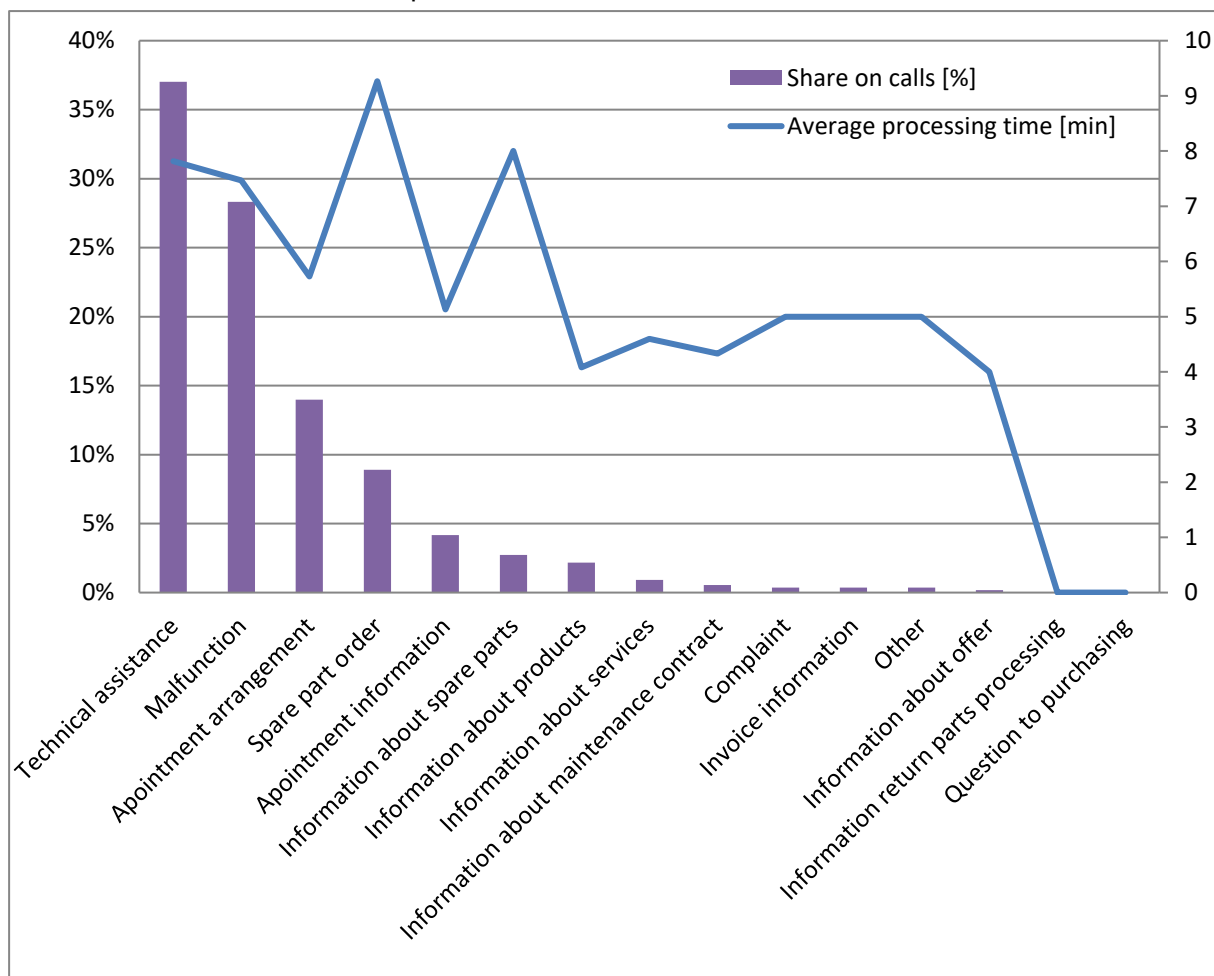
Figure 3-6 Reasons for call and required processing time (own presentation)

Figure 3-7 illustrates the average number of customer arrivals per employee recorded over the observation period in a time interval of one hour. For example, the calls captured by the employees during the entire observation period between 7:00 a.m. and 8:00 a.m. were averaged in the diagram at 7:00 a.m. The blue line represents the average number of inquiries per hour per employee.

Another noticeable feature is that the average number of conversations in the afternoon is lower than in the forenoon. This circumstance will play an important role in the simulation of the communication concept. Chapter 3.4. deals with it in more detail.

The green line shows the maximum value reached during the observation period.

The red line shows a single day. On 3 September 2018 the number of calls was significantly higher than on the remaining days. It should be mentioned that it was a Monday and it was cold in Austria the previous weekend. This means that it can be assumed that many heating systems went into operation for the first time after the summer and that there was an increased number of malfunctions.

Another conspicuous feature in figure 3-7 is that apart from one outlier, no more than seven calls per hour were conducted. If you take the average processing time of 7.28 minutes from Table 3-5, you get a maximum possible number of approximately eight calls per hour. Considered a break of five minutes, 7.55 conversations per hour can be conducted. This number corresponds to the observed maximum number of calls.

Figure 3-7 forms the basis for the simulation of the communication concept. Chapter 3.4 deals with it in more detail.
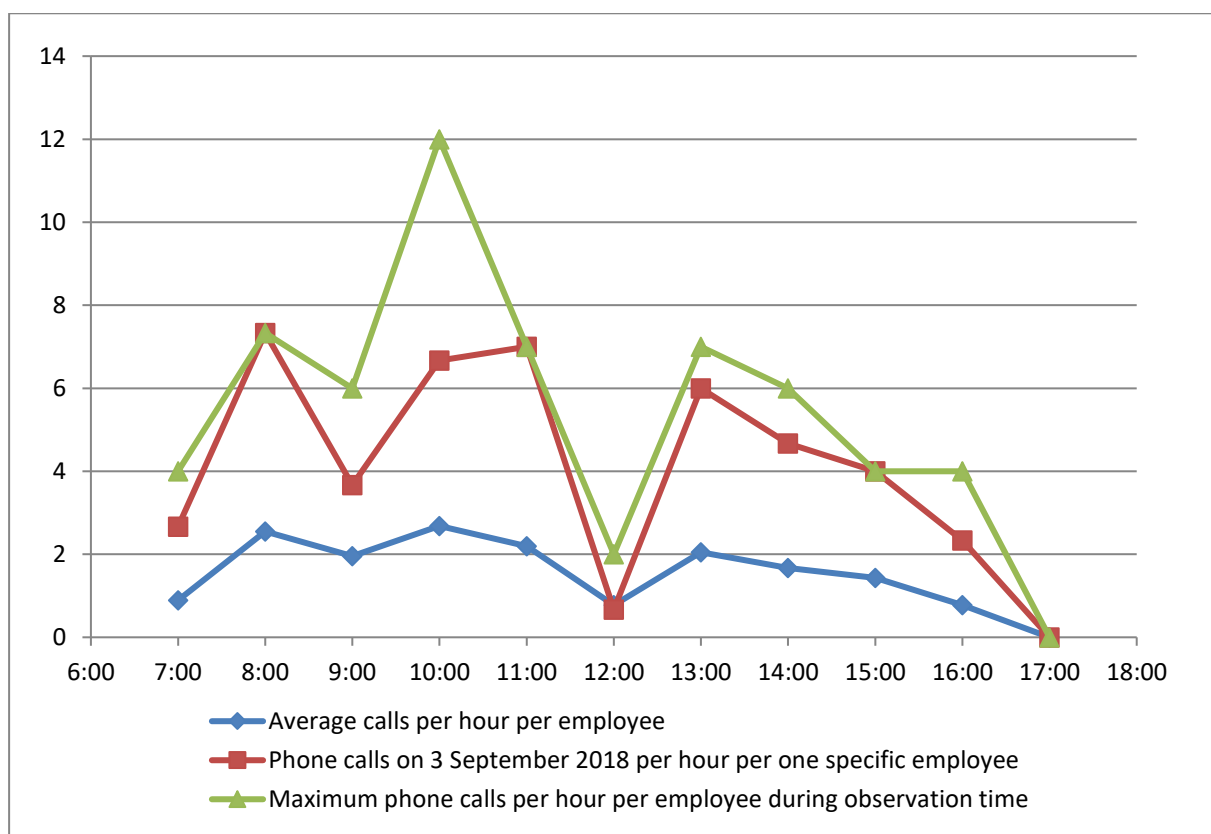
Figure 3-7 Flow of customer arrivals in the period under observation (own presentation)

As the last point for the analysis of the service hotline at technical support, the most conspicuous result for the specific query should be mentioned. In the event of a malfunction and technical assistance, the employee could indicate whether and which alternative solution was conceivable. In other words, whether the problem could be solved by any means other than calling the service hotline. If the call was due to a malfunction, 15.7% of it would have become unnecessary if the KWB Service Wiki had been used, as the exact description of how to solve the problem is explained in the Service Wiki. The service Wiki is a copy of the

well-known Wikipedia. It contains information about the heating systems and all known problems and spare parts and describes problem solutions and the correct procedure for installing spare parts. Of the 15.7% of calls mentioned, 84% were partners who usually have access to at least parts of the Service Wiki. If the partners use the Service Wiki more, the number of inquiries could decrease. Chapter 3.2.3 deals with this in more detail.

3.1.1.4 Analysis results: service hotline at disposition

Table 3-6 provides an overview of the key data collected. It can be seen that an average telephone call takes 1.87 minutes and the total processing time is 3.07 minutes.

Average talk time	1.87 minutes
Average postprocessing time	1.20 minutes
Average processing time	3.07 minutes

Table 3-6 Average times in disposition (own presentation)

Figure 3-8 illustrates the relative share of inquiry by customer type. It is easy to see that it is mainly end customers who call in the disposition department.
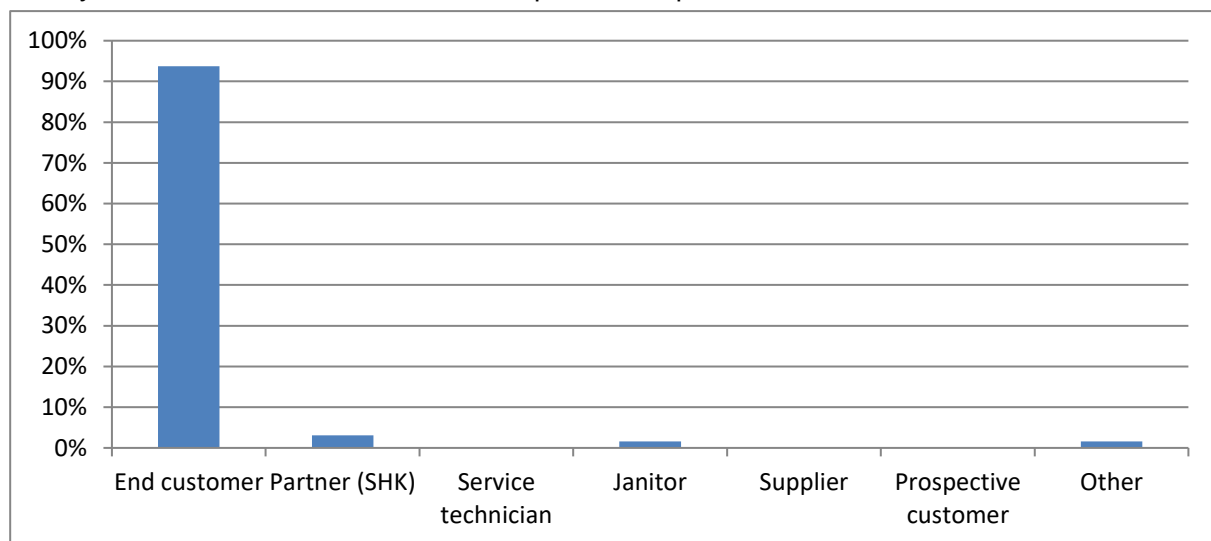
Figure 3-8 Distribution of customer types (own presentation)

Figure 3-9 illustrates the share of inquiries according to the reason for the inquiry. In the first place with 40% of the calls lies the reason of the appointment agreement. The second and third most frequent calls are due to malfunctions and technical assistance. Since disposition is not responsible for this type of reason, they must be forwarded.
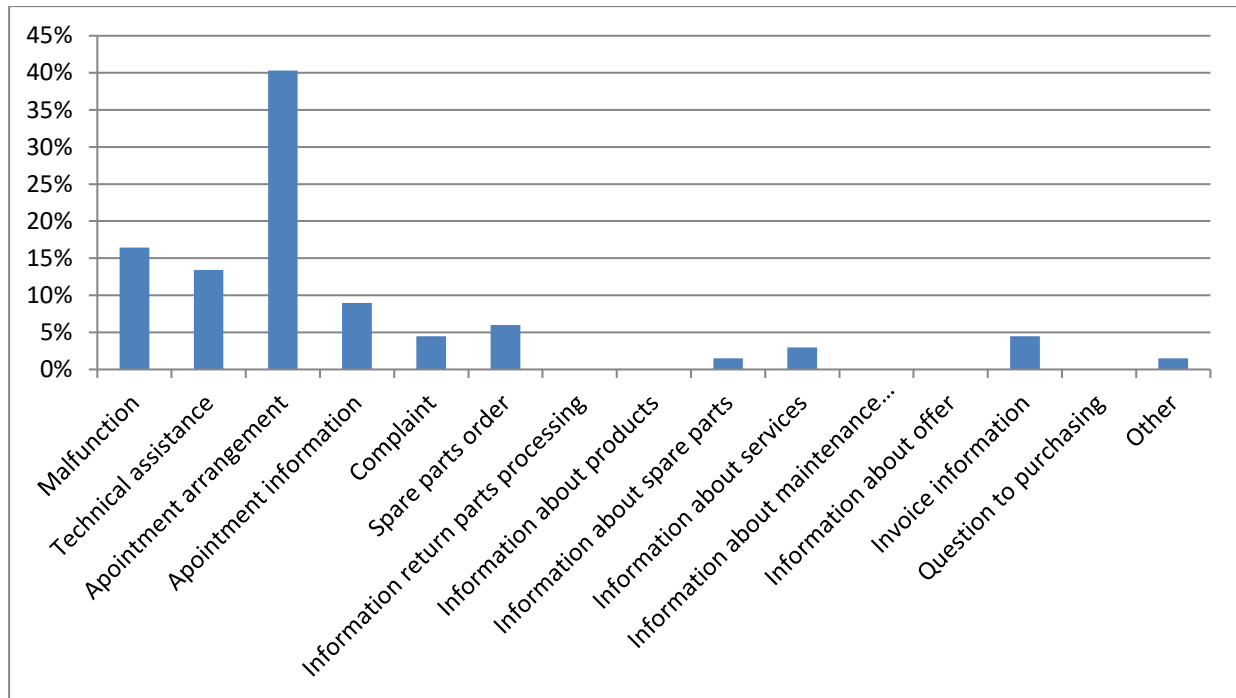
Figure 3-9 Distribution of the reasons for the call (own presentation)

In the disposition it is not further necessary to carry out more exact considerations, since by the short processing time and the small number of calls, the telephone calls do not form the bottleneck in the disposition process. If one omits the reasons for malfunction and technical support, which can be achieved by better routing, the only relevant remaining reason is the scheduling. In chapter 3.2.3. it is discussed how to reduce the number of calls that take place for the reason of the appointment.

3.2 KWB Business process overview

Figure 3-10 gives an overview of KWB´s business processes. Since the illustration was taken from KWB's internal documents, the illustration is in German.

Chapter 1.1.1.1. explains the tasks of customer service. The business process that represents the tasks is shown in figure 3-10 under "Service Auftragsabwicklung". Following chapter 2.2.3., it is a core process.

In the processes according to which the service hotline is operated, one level of detail needs to be considered more deeply. To be more precise, the process used in disposition department can be assigned to the core process of "Service Auftragsabwicklung". However, it does not create any further added value. Chapter 3.2.2 deals in more detail with the process and the tasks in the disposition department.

The process used in technical support can be classified as a support process. It is necessary to be able to carry out the core process but cannot be directly assigned to the on-site troubleshooting service.
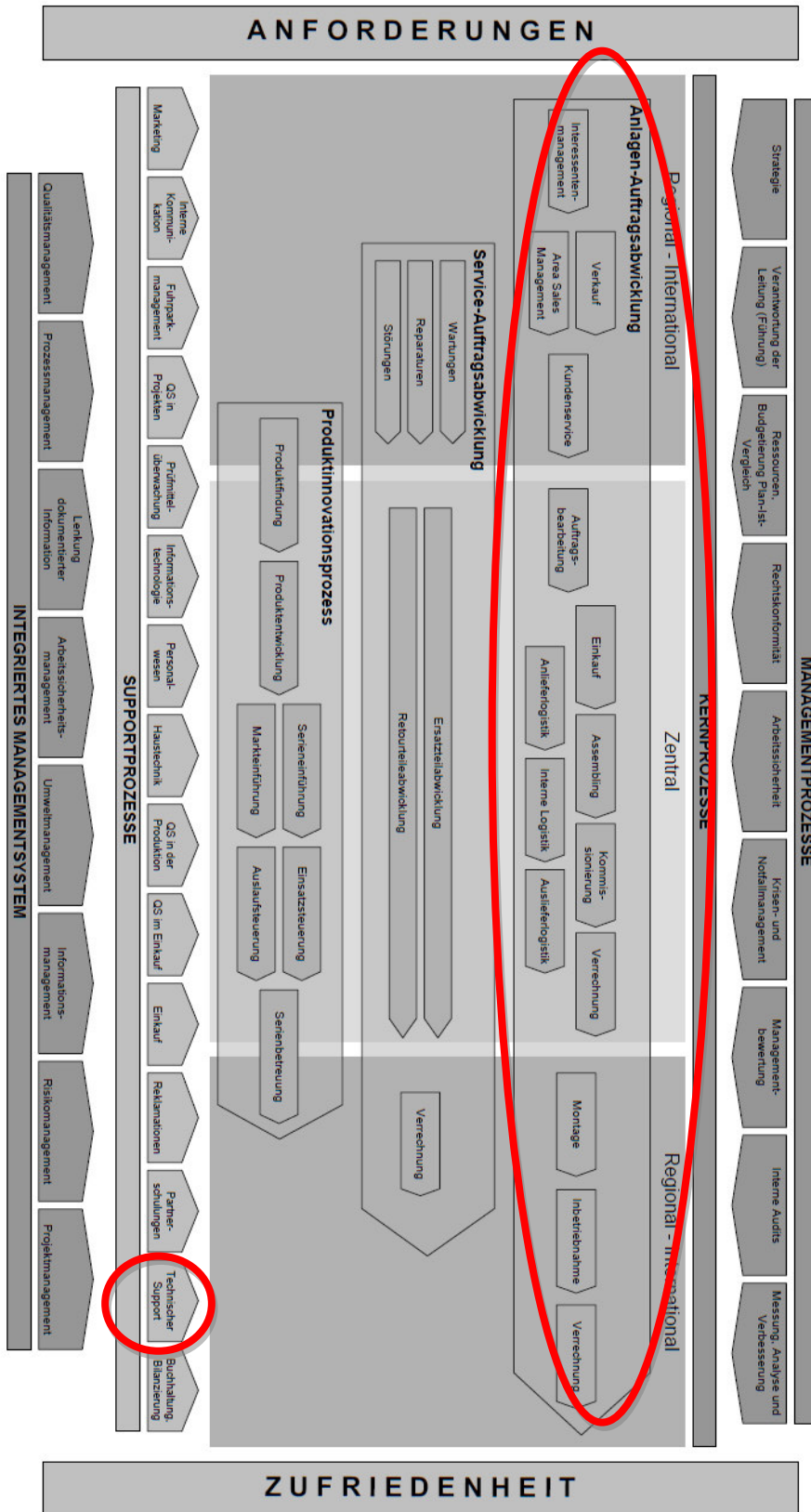
Figure 3-10 KWB Business Process Overview (in German)[78]

3.2.1 Actual process performed at technical support department

Figure 3-11 illustrates in detail the current process used in technical support. The process was created with the help of an outdated process from 2010 and conducted employee interviews.
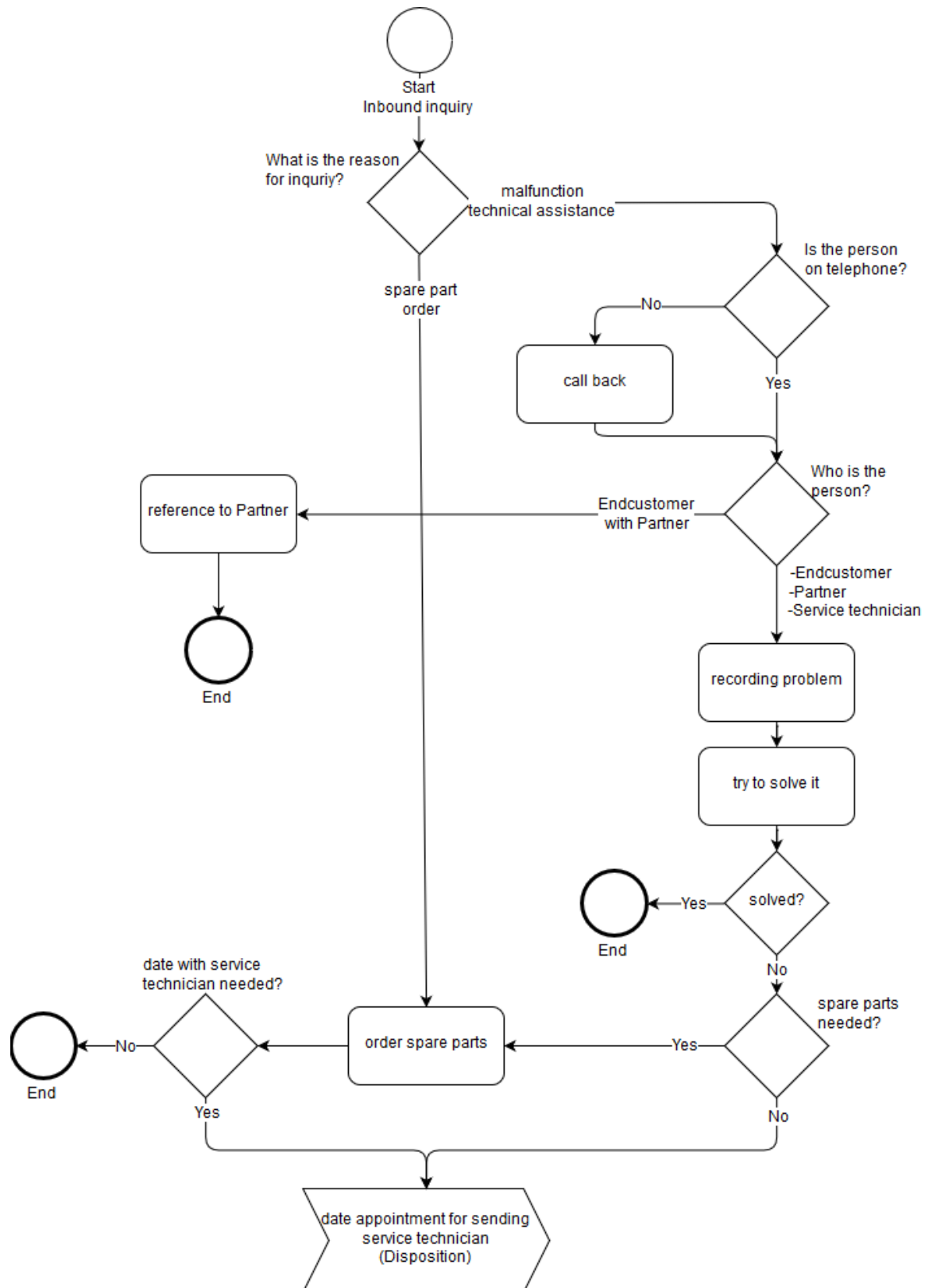
Figure 3-11 Actual process used at technical support at KWB (own presentation)

At the beginning of the process there is always a person who has a inquiry. In most cases (see chapter 3.1.1.3.) it is an end customer, a partner or a service technician. The inquiry can be made via the Service Hotline or via email. In the case of an email, in most cases the requesting person is called back, unless the email can be answered clearly. This decision is at the assessment of the employee. If the person making the inquiry is on the telephone, the reason for the inquiry is recorded. In most cases, the problems are an inquiry for technical support, an inquiry due to a plant malfunction or an order for spare parts (see chapter 3.1.1.3). In the course of the inquiry recording the caller will be checked. If it is an end customer who has a partner, he has to be referred to the partner who is responsible for the problem. However, if it is a partner or end customer without a partner, an attempt is made to solve the problem. If it can be solved it comes to an end of the process. If it cannot be resolved, an appointment is made with scheduling. At this appointment a service technician drives to the heating system and solves the problem. If spare parts are required to solve the problem, a spare part order will be carried out.

If the inquiry is a spare parts order, it is carried out by the employee.

The bottleneck in the process is the telephone call. To be precise, the task to solve the problem is the bottleneck. How long the processing time is for a telephone call is shown in chapter 3.1.1.3.

To be able to process the total number of requests, the number of employees must be correspondingly high in terms of processing time and number of requests. Since requests over the telephone are time-critical requests, employees must become active immediately if possible. One way to mitigate the bottleneck problem would be to redirect some of the time-critical requests to non-time-critical communication channels. This would allow the employees to process the inquiries when the workload on the telephone is not so high.

3.2.2 Actual process performed at disposition department

As already mentioned in chapter 1.1.1.2., the scheduling employees are responsible for scheduling the service technicians and the corresponding appointments.

The process behind it, is essentially always the same, only the urgency of the mission varies. Malfunctions missions are generally more urgent than maintenance mission.

The disposition process was created with the help of an outdated process from 2010 and conducted employee interviews.

The scheduling process can start in different ways. Firstly, the scheduling department receives a notification from technical support with all relevant information. This is the case if the technical support could not solve a malfunction via the telephone before and it is necessary to send a service technician to the heating system.

Secondly, a person can contact the scheduling department directly. Therefore, the person can use the service hotline or write an email the service hotline or by email.

The third option is for the scheduling employees is, to arrange maintenance appointments themselves. In contrast to the first two options, the initiative comes from the employees and

not from external persons, i.e. it leads to an outbound contact. However, the process remains essentially the same.

On the next page, figure 3-12 illustrates the scheduling process. The process was created with the help of an outdated process from 2010 and conducted employee interviews.

At KWB, the scheduling process is assigned to the core process of "Service Auftragsabwicklung". The process of scheduling an appointment directly precedes the process of troubleshooting or maintenance performed through a service technician at the heating system. The latter are the value-creating processes. Disposition Department has another task at the end of the core process of "Service Auftragsabwicklung", namely billing. However, this Master thesis does not deal with this in more detail.

If the process has been started by one of the three options mentioned, the employee must first find out the postcode of the plant location. Each employee has several service technicians under his responsibility, who are available to him to be able to process the requested appointments. Each service technician has a defined area of responsibility. If the heating system falls within his area of responsibility, a free time must be found between his already planned appointments. If several service technicians are responsible for this area, at all service technicians are searched for a free time. The difficulty with this task is that the travel time of the service technicians from one appointment to another in Austria should not exceed ten minutes. This means that you have to find a free appointment where the technician is either before or after the appointment. Maintenance and other non-urgent appointments are planned up to three weeks in advance. Since the basic workload of the service technicians is carried out with maintenance, time slots (buffers) are released depending on the season. These buffers are required for malfunctions. As a rule, the malfunctions must be planned at very short notice and are usually of great urgency. If no free date for a malfunction can be found, it is the task of the scheduling department to postpone the dates accordingly and create a free date and inform all affected persons accordingly.

If an appointment is found, it must be agreed with the inquiring person. If it is possible to carry out the operation on the proposed date, the date is fixed. The service technician is informed about the appointment with the exact location data, and all information is stored in the ERP system. If the proposed date is not suitable, a new one must be found.

The bottleneck in the presented scheduling process is searching for free dates in the service technician calendars. This bottleneck could, for example, be mitigated by the use of software. The software would take over the scheduling and always suggest a suitable date to the employee. In a further step, the software could even process appointment inquiries directly and communicate with the inquiring person.
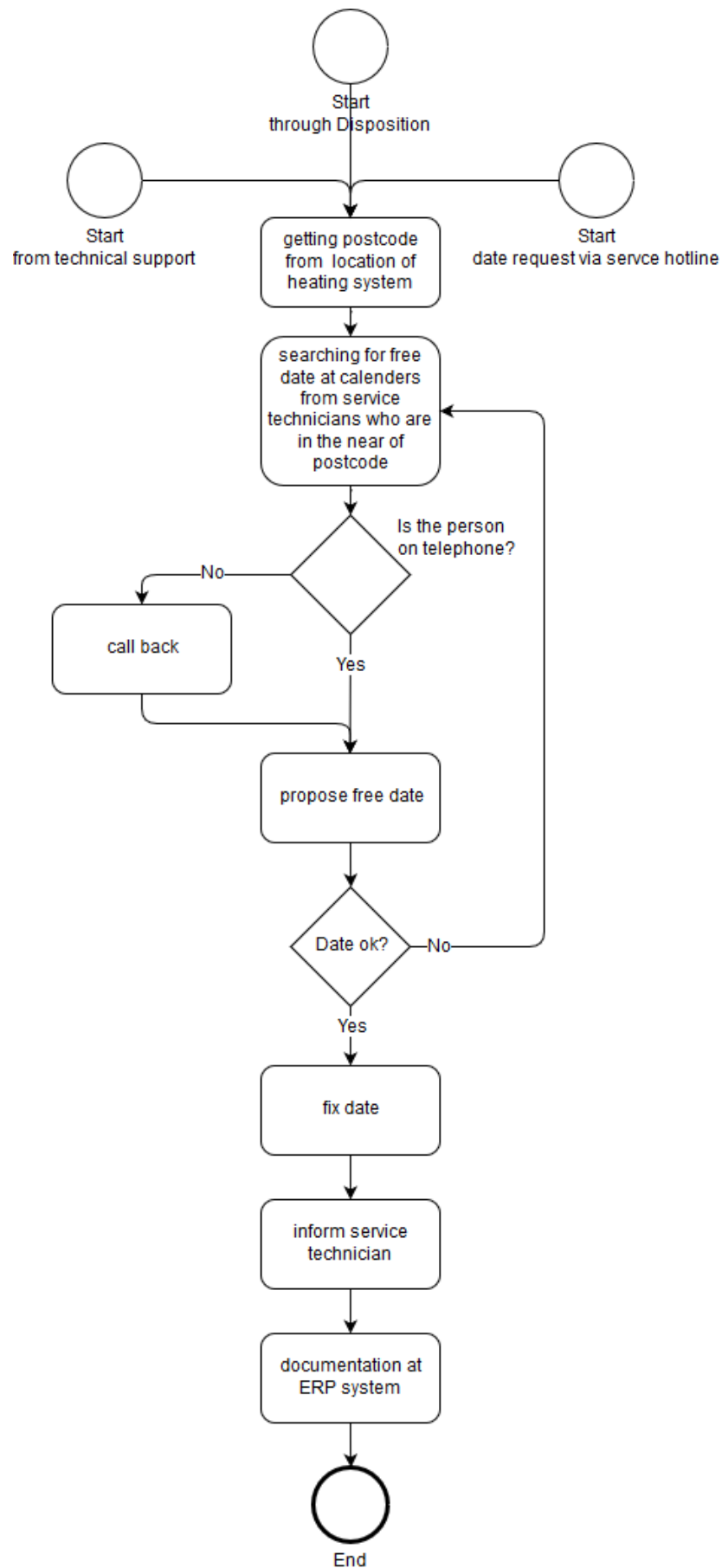
Figure 3-12 Actual Process of Disposition at KWB (own presentation)

3.2.3 Summary of the analysis of the service hotline at KWB

The analysis of the service hotline has revealed some interesting points in the area of technical support and scheduling department.

In summary, you can note the following points at the technical support department:

- 18% of all inquiries to technical support are for appointments or appointment information. By a more consistent forwarding into the disposition the processing time would decrease considerably and free capacities would be created. However, a better solution would be to improve routing (see chapter 2.1.3.2). In the described case, the call is not answered in technical support, but immediately routed to disposition and therefore no processing or forwarding by technical support would be necessary.

- The average processing time for spare parts orders is 9.27 minutes, significantly longer than the average processing time for calls with other reasons. Since spare part orders account for about 9% of all inquiries and about half of these are made by partners, it would be possible to forward these calls directly to the spare part ordering department (better routing). During the interviews with the employees, it turned out, that many of the spare parts orders are at first sight to be equated with offer preperations. So the inquiries can not be forwarded. It could be interesting to introduce a webshop for spare parts. The partners don´t have to make an inquiry and can order the required spare parts themselves. A webshop could lead to a win-win situation as it would save time for both, partners and technical support employees. The partners would not have to wait for their inquiry to be answered, and free capacity would be created in technical support due to the lower number of calls.

- Another conspicuous point of the analysis is that 15.7% of calls due to a malfunction could be prevented by using the KWB Service Wiki. Since 84% of the callers are partners who have access to the Service Wiki, this is a potential to free up capacities. In the described case, it would be interesting why the partners apparently did not use the Service Wiki. However, this was not part of the present master thesis.

- Figure 3-7 shows, that on average more calls are received in the morning than in the afternoon. This circumstance means, that with a constant number of employees in technical support, there may be free capacities in the afternoon or bottlenecks in the morning. This depends on whether you specify the number of employees for the customer arrival stream in the forenoon or in the afternoon. KWB determines the number of employees on the basis of the largest customer arrival stream occurring. As a result, there are free capacities in the afternoon. If you redirect some of the calls to non time-critical communication channels, you could also reduce the workload in the morning and postpone it to the afternoon. As an example the use of an email is mentioned. An Email does not have to be answered immediately as with a call but can be answered at a later time when nobody is calling. In chapter 3.4. it is shown by means of the circumstance described here, that a higher utilisation and a lower

number of employees can be achieved by redirecting to non-time crucial communication channels.

In scheduling, the most conspicuous point is that in addition to the high number of malfunctions and technical assistance, mainly calls for an appointment are received. The malfunctions and technical assistances could be reduced by a better routing. For the scheduling process it is possible to introduce a software solution. The software would find the ideal appointment within seconds.

3.2.4 Selection of adequate communication channels for KWB

The findings described in chapter 3.2.3 already give an initial idea of possible communication channels. As required by the objective, the reduction of calls to technical support is necessary. At this point, a distinction must again be made between time-critical and non-time-critical requests. If it is possible to redirect inquiries from time-critical communication channels into non-time-critical channels, it is possible to gain flexibility. Because the usage of non time-critical channels leads to a better workload, without the need for less inquiries in total.

- The inaccurate allocation of inquiries to the relevant departments also leads to a waste of capacity. If an IVR and ADC system is introduced, the capacities of the employees would increase without one inquiry less in total.

- Based on chapter 3.2.2. and chapter 3.2.3, it is recommended to introduce a software tool that plans and arranges the appointments for the service technicians independently. Contact with end customers and partners could take place via a contact form, email or SMS. In the medium term, an ACD system or a chatbot would also be conceivable, which would communicate independently with the customer. The exact process behind this is described in chapter 3.3.

- In order to meet the requirement to take account of digitalization, a possibility could be created or, in the case of KWB, further expanded to enable remote maintenance to be carried out in the event of malfunctions. It is referred under the name "Comfort Online communication channel". The "Comfort Online" is the KWB heating system control unit with which it is already possible to carry out remote maintenance to a limited extent. It could proceed as follows. The heating system automatically reports that a malfunction has occurred and informs the end customer or partner that KWB customer service has already been informed. An employee in technical support tries to solve the problem via remote maintenance, and only if remote maintenance is not possible, an appointment automatically has to be made via the scheduling tool. Chapter 3.3. describes a possible process with this communication channel in more detail. Another advantage of expanding "Comfort Online" is, if a partner or end customer calls for technical assistance, information via "Comfort Online" could be

exchanged, resulting in shorter talking times. The caller would not have to talk, about the condition of the system, and the technical support employee could faster start with the problem solving.

- In the area of technical assistance, the "Service Wiki" could also be further expanded and made better known to the partners. In contrast to the other communication channels, the more intensive use of the Service Wiki would lead to a real reduction of inquiries and not only to a redirection to channels that are non time-critical.

- An order for spare parts requires the longest processing time. It would make sense to introduce a webshop. Subsequently it will be known as the "Webshop communication channel". These calls would also lead to a reduction, as no technical support employee would have to deal with them anymore.

- As the last communication channel KWB can place an inquiry web form on the homepage. This means that persons briefly describe their problem and narrow it down by making a predefined choice. The form is sent to the responsible department, where it can be processed by an employee as soon as he has free capacities. This communication channel is essentially comparable to an Email, only the beginning of the process is different, because the answer to the inquiry would carried out by writing an Email.

3.3 Overview of the communication concept and the target-process design

In the previous chapters, it was shown that there are essentially two main tasks in technical support. At the end of the activities there can be a spare parts order as well as a scheduling process performed by the scheduling department. The main task of scheduling department is to make the appointments. It was also shown what the current situation at the service hotline looks like and what are the potentials for improvements.

Chapter 3.2.4. showed and explained which communication channels should be included in the concept.

The communication channels contained in the concept are clearly listed in table 3-7.

Communication channels that already exist in parts	New communication channels to be added
Service hotline (with better routing)	Scheduling software tool
Email	Webshop for spare part orders
Remote maintenance channel (Comfort Online, currently still very rudimentary system)	Contact form on the webpage
KWB Service Wiki (apparently hardly used)	Chat (in further development stage incl. Chatbot)

Table 3-7 List of communication channels (own presentation)

Based on the current processes as shown in chapters 3.2.1. and 3.2.2. and the current communication channels, a process model is created which is extended by the new communication channels. The BPMN for process modelling, presented in chapter 2.2.6.4, is used.

In the course of process design, great importance was attached to ensuring that the proposed solutions could also be implemented and that the existing processes were integrated wherever possible. Interviews were conducted at regular intervals with the heads of technical support and disposition department. During the interviews, the proposed solutions were discussed and, if necessary, edited.
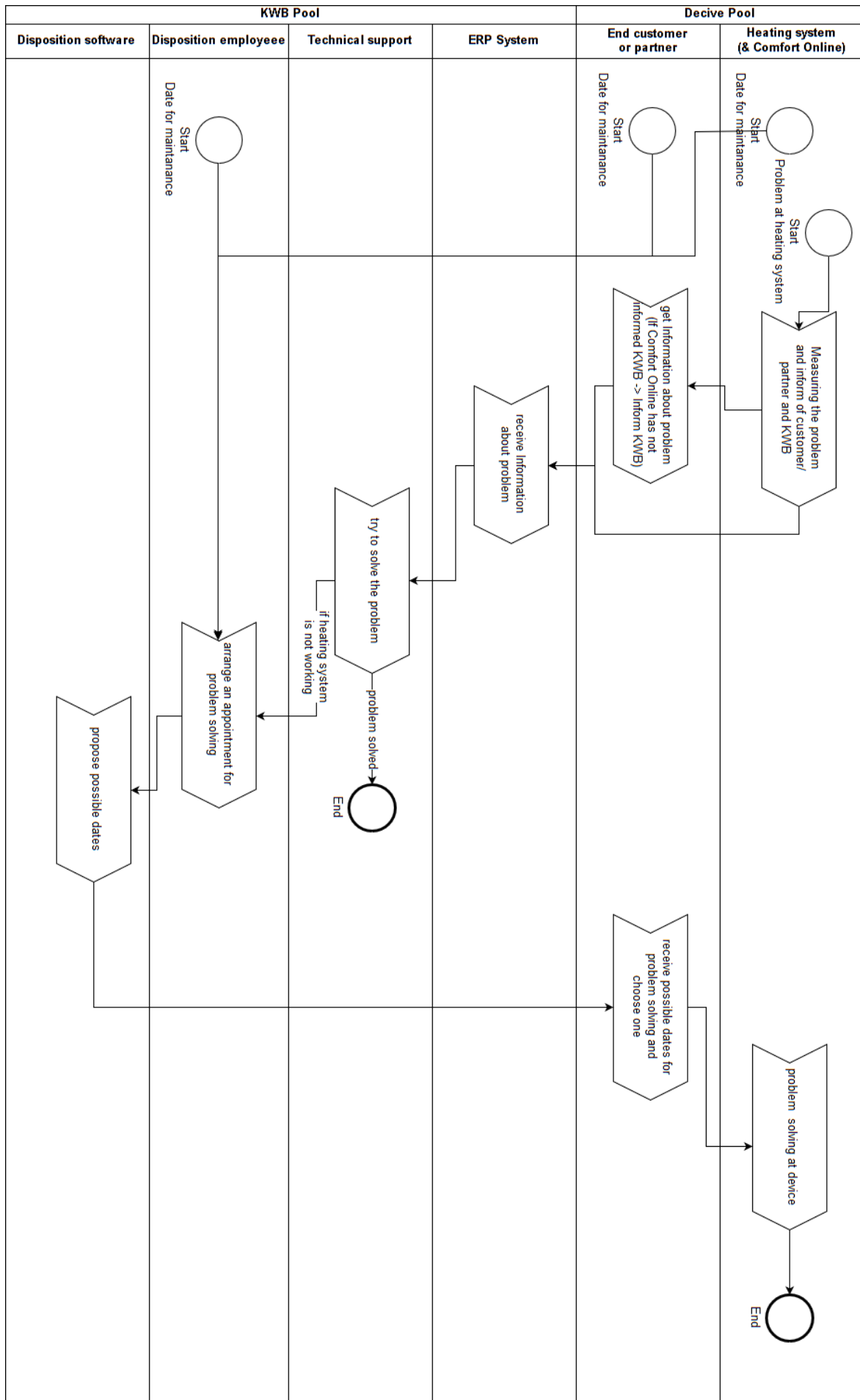
Figure 3-13 Overview of general process at detail level 1 (own presentation)

Figure 3-13 illustrates the overall target process model. It gives a rough overview of technical support process and scheduling process. In chapter 2.2.6.3. detail levels were defined. The overall target process model in figure 3-13 describes the detail level 1.

It is no longer possible to distinguish clearly between support and core processes. The technical support process shown in chapter 3.2.1. is combined with the scheduling process.

You can see the different pools with the corresponding swimming lines. In the case of pools, a distinction must be made between heating system side and KWB side. The heating system pool contains the swimming lines, "Comfort Online" and "End customer or Partner". The swimming lines lists the general process steps that are carried out by the respective unit. On the KWB side there are the swimming lines for the "ERP System", the "Technical Support", the "Scheduling Software" and the "Disposition". With the mentioned swimming lines it has to be distinguished, that "End customer or Partner", "Technical Support" and "Disposition" are persons. The other swimming lines are software tools.

3.3.1 Technical support target process

Figure 3-14 shows the technical support target process in detail level 2. Starting with the heating system, all the important people and departments needed to solve the problem are included. Both the occurrence and rectification of malfunctions and the technical assistance for persons at the heating system are taken into account. The overview does not take the possibility of ordering spare parts into account. Appendix 3 shows the technical support target process for a technical problem in detail level 3. Detail level 3 provides, among other things, the possibility of ordering spare parts, as well as loops and iterations to ensure that it cannot stop at a certain point in the process. For example, the overview does not include what happens if the customer does not select a date for reparation. An escalation is considered in detail level 3 technical support process. In specific, the disposition employee contacts the person by telephone at a certain time before the planned appointment and informs him of the appointment.
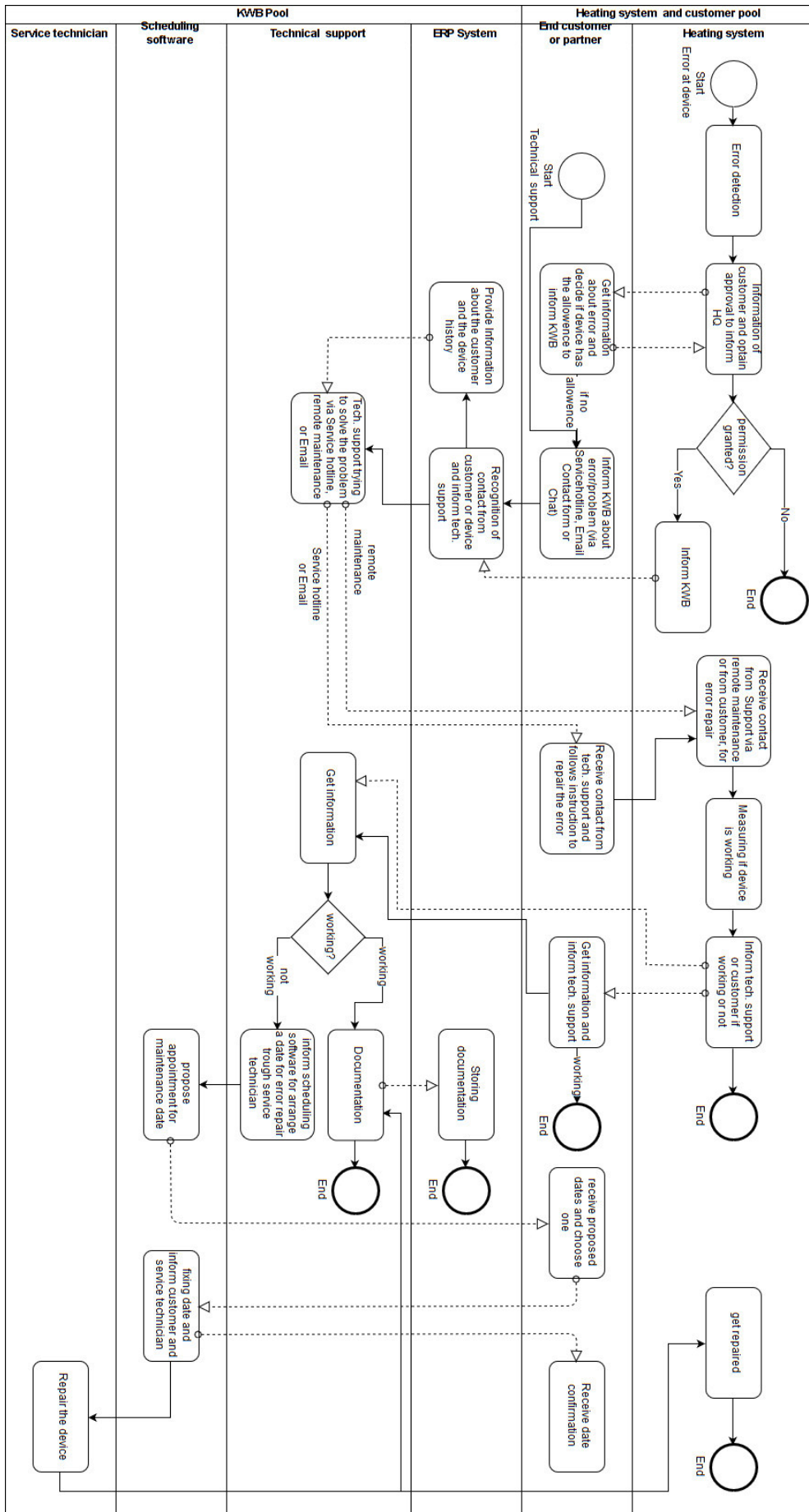
Figure 3-14 Overview of the overall target process at detail level 2 (own presentation)

In the figure 3-14 you can see the two pools:
- Pool 1: "Heating system and customer", consisting of the swim lines
  - Heating system
  - End customer or partner
- Pool 2: "KWB", consisting of the swim lines
  - ERP system
  - Technical support
  - Scheduling software
  - Service technician

The swimming lines, heating system, ERP system and scheduling software are software solutions. This means that all process steps within these lines are automatically executed without human intervention.

Each time the process flow crosses the boundary between the two pools, a communication channel is required. Not all communication channels are needed at the same time. Comfort Online is required for informing the KWB about a fault and for remote maintenance. The service hotline is needed to inform the KWB and to guide a person with the heating system. Email and the contact form are required at the beginning of the process. The disposition planning tool is only required at the end of the process.

The only exception is the last activity in the process when the service technician repairs the equipment. The service technician is on-site at the heating system and does not require a communication channel.

Figure 3-15 shows the technical support target process including the communication channels.
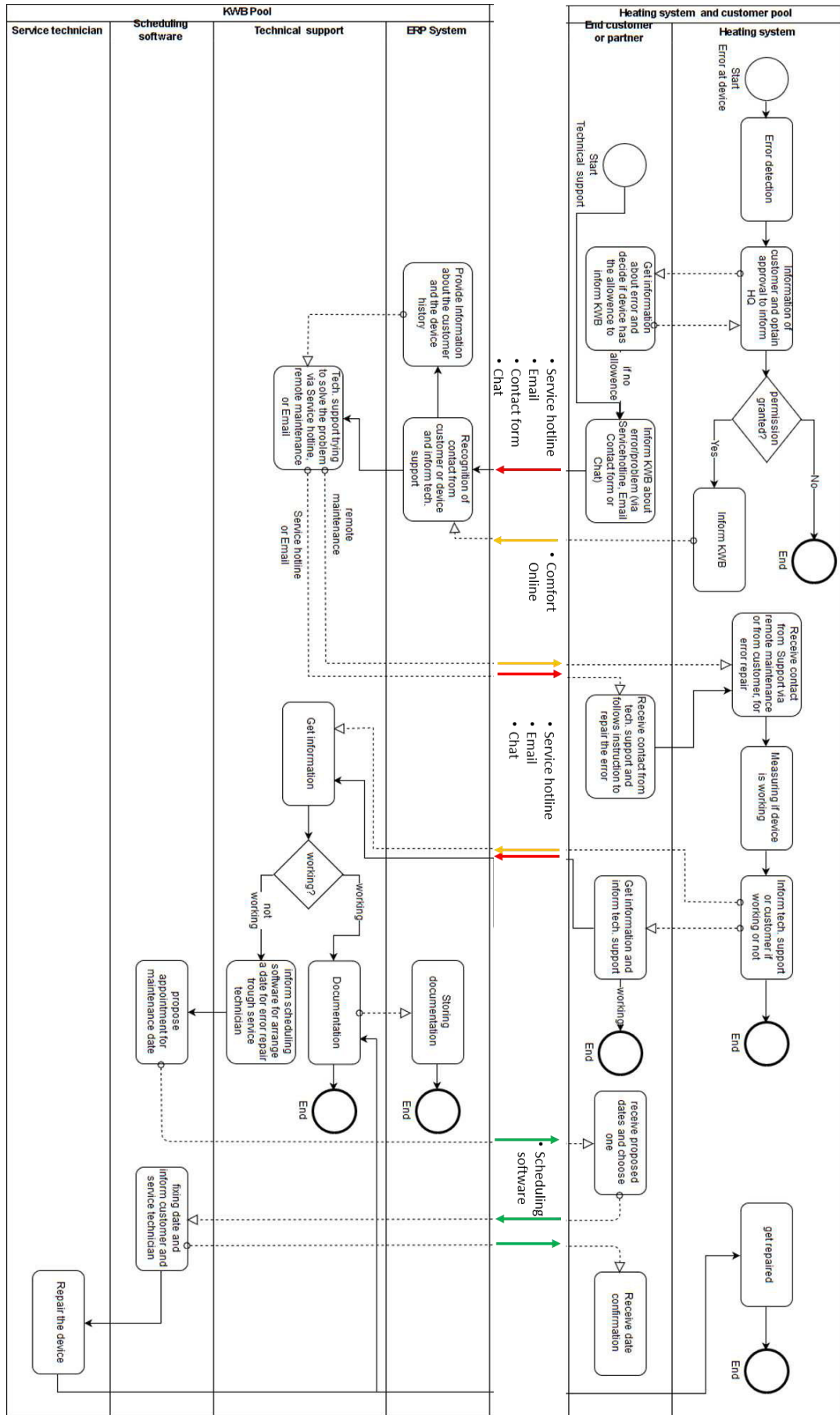
Figure 3-15 Technical support process at detail level 2, incl. communication channels (own presentation)

3.3.1.1 Target process at the heating system and customer pool

Figure 3-16 shows the two lines "Heating System" and "Customer" from pool 1.
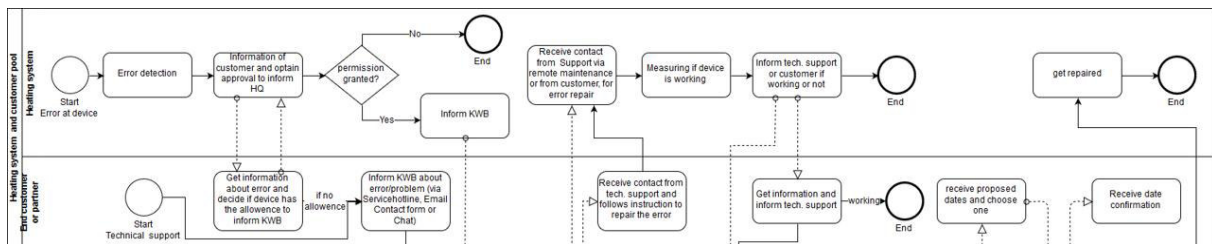
Figure 3-16 Technical support target process at the heating system pool at detail level 2 (own presentation)

There are two ways to start the process. Either Comfort Online measures a malfunction in the heating system or the customer/partner requires technical assistance. Should a malfunction occur, Comfort Online will inform the customer about the malfunction and ask for permission to inform KWB. If the customer grants approval, Comfort Online will inform the KWB; if the customer does not grant approval, the customer must inform the KWB independently. In order to inform the KWB about the malfunction, the communication channels service hotline, Email, contact form on the webpage and chat are available. The same communication channels are available to customers in the event of technical assistance. As soon as the KWB is informed, the process continues in the KWB and the customer or the heating system receives contact from a technical support employee at a later point in time.

The heating system is contacted by an employee via Comfort Online and attempts to start up again. If the contact does not take place via Comfort Online, the customer will be contacted and given instructions on how to solve the problem.

If the heating system is set in motion, the process comes to an end. If the heating system does not start working, an appointment must be made for a service technician to drive to the heating system and repair it. The customer receives several date proposals from the scheduling software tool, and he must select one date.

In the detailed level 3 technical support target process in Appendix 3, the procedure if the customer does not select a date, is shown. Figure 3-17 shows an excerpt from detail level 3 technical support target process.

The scheduling tool waits until one day before the planned date took place. If the customer did not confirm the date, an employee from disposition department is notified. The employee must then contact the customer via the service hotline and inform him about the date.

The curved lines in Figure 3-17 are intended to illustrate that other process steps take place before and after this section.
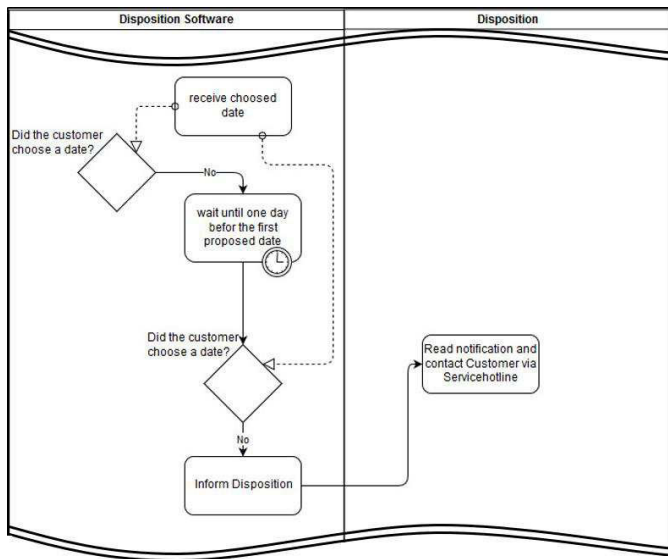
Figure 3-17 Escalation if customer do not confirm the date at detail level 3 (own presentation)

The detailed level 3 technical support target process from appendix 3 describes further processes in the customer and heating system line, e.g. the loop of the approval in case of a malfunction or the exact procedure in case of a spare parts order or a technical assistance. In detail level 2 figure 3-14, the possibility of ordering spare parts is not shown. An order for spare parts can either be a starting point in its own right or occur in the course of troubleshooting or technical assistance. Chapter 3.2.3. shows that the communication concept should include a spare parts web shop. The web shop communication channel is described in more detail in level 3 technical support target process. However, since the process of ordering spare parts extends over several process steps at different points, no further illustration is given here.

3.3.1.2 Target process at the KWB Pool

Figure 3-18 illustrates an overview of the target process on the KWB pool.
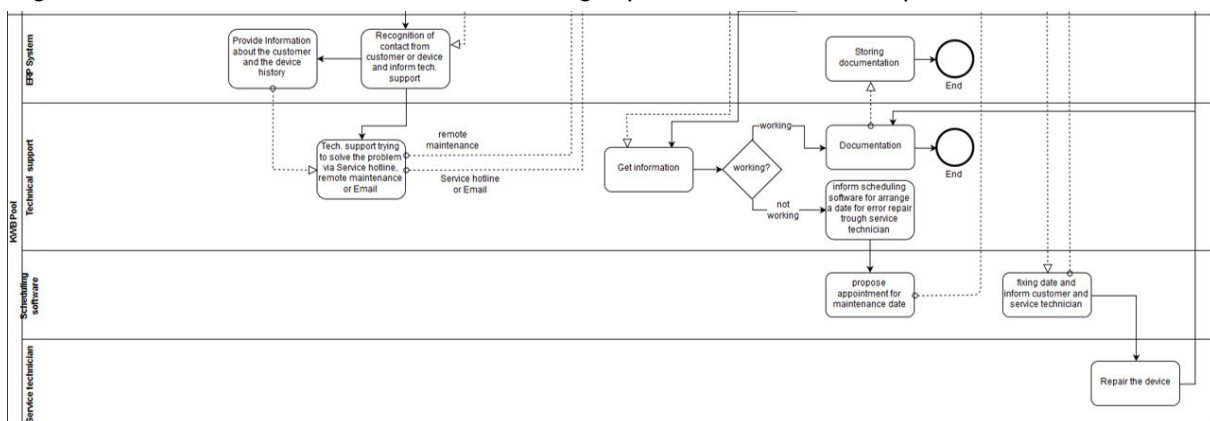
Figure 3-18 Technical Support target process KWB pool at detail level 2 (own presentation)

At the KWB pool, the process begins with the recording of an inquiry by the ERP system. Afterwards the technical support is informed about the inquiry. Technical support will check whether it is possible to solve the problem via Comfort Online or not. If the problem can be solved, the process will be documented and comes to an end. If the problem is not solvable via Comfort Online the customer must be contacted directly via Email or the service hotline. At this point of the process, the heating system and the customer are involved again. The employee from technical support try to assist the customer at the heating system. If the problem is not solved, an appointment to repair the heating system has to be made from the scheduling software, where a service technician drives to the heating system and repairs it.

3.3.2 Scheduling target process at the disposition department

If a date is needed where a service technician drives to the heating system without a previous technical problem, the scheduling target process looks as follows. The process is started either directly by the customer, directly by the scheduling department or by the ERP system. Figure 3-19 illustrates the scheduling target process in detail level 2. The detailed level 3 process is shown in Appendix 3.

The three starting points meet at the disposition planning tool. From this point on, there is no difference in who started the process, and the process is the same as described in chapter 3.3.1.
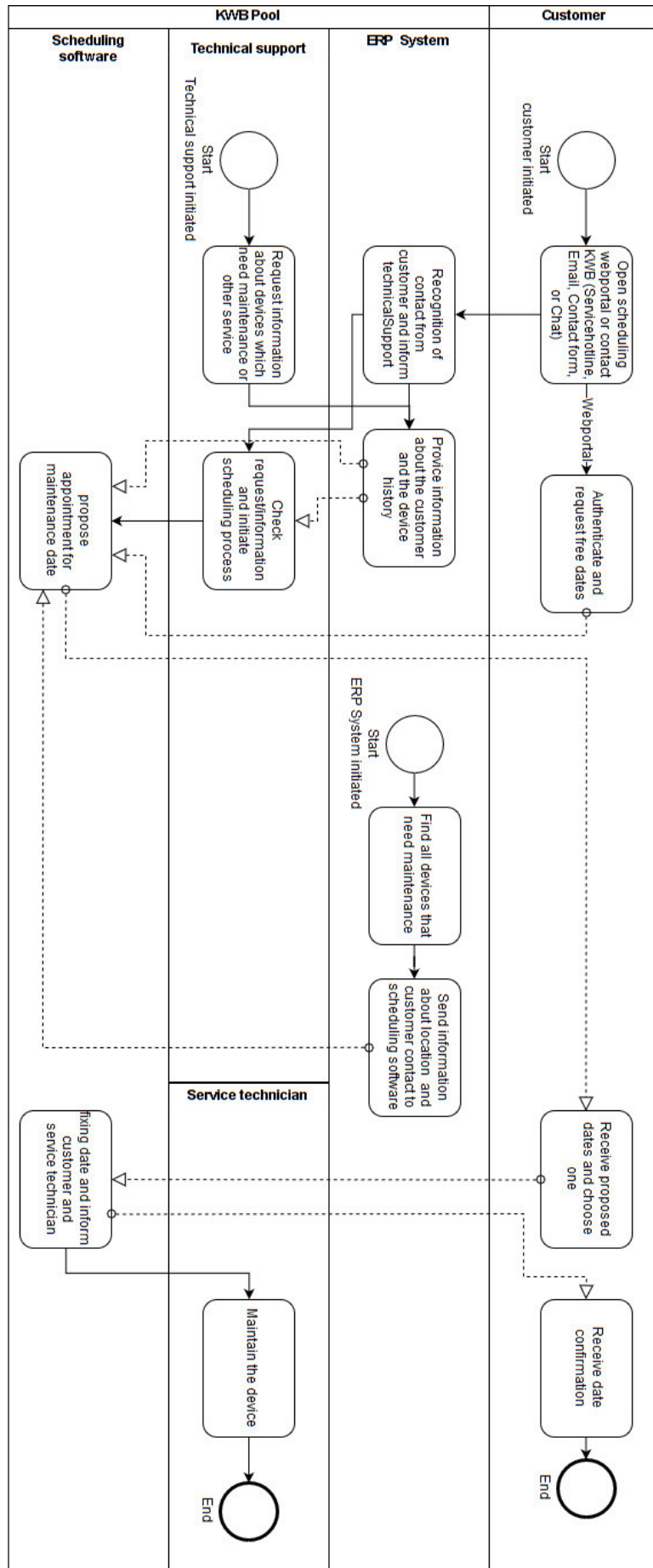
Figure 3-19 Target process if a date is needed at detail level 2 (own presentation)

There is potential for further improvement in the scheduling target process in the future. Maintenance of a heating system is currently be carried out once a year, or after a certain number of operating hours has been exceeded without maintenance. In the future, it may be possible to link the maintenance to the current state of the heating system. The buzzword in literature is "Predictive Maintenance". The heating system itself reports when maintenance is required in order to anticipate an imminent malfunction in the near future. This would reduce the occurrence of malfunctions, because a maintenance would be carried out before the malfunction occur.

The effects of this technology would be obvious. The presented technical support target process would be reduced by all process steps that have to be performed because of a malfunction. The scheduling software do not have to be so flexible anymore, which makes it possible to plan more efficiently. Currently the scheduling must be very flexible, because malfunctions have to be scheduled very quickly. If malfunctions would rarely occur, because KWB were informed weeks in advance about the possibility of a malfunction, KWB would no longer have to react within a few days.

As a short example, during the practical work at KWB, investigations were also carried out in the area of scheduling and route efficiency. For example, if you knew about all dates one week in advance, you would save about 10% of travel time and distance. The study took place in the summer, when very few short-term appointments had to be scheduled. However, the present master thesis does not deal with this in more detail.

3.3.3 Summary of the target process modelling

The target processes presented in chapter 3.3 show how the communication concept with the new communication channels could be implemented in daily work. The effects of the new approach are examined in chapter 3.4.

If one compares the processes from figures 3-11, 3-12 and figures 3-14 and 3-19 (or Appendix 3), it is obvious that the work for employees can be reduced by using software solutions. To be clear, this does not mean that the processes themselves become simpler or shorter. It is easy to see at first glance that the processes become more complex through the use of software solutions.

Another consequence is that a clear distinction can no longer be made between support and core processes or value-adding and non value-adding processes. One could argue, for example, that the use of scheduling software is a support process even though it is integrated into the core process. One could also argue that troubleshooting by technical support adds value because the customer saves the costs of the service technician, and KWB can earn money by sending the service technician to another maintenance date. However, it can be said that the classification boundaries between processes shown in Chapter 2.2 are blurred.

3.4 Case simulation of the designed communication concept

The previous chapters described how a communication concept for KWB can look like, the contained communication channels are described, and why it makes sense to integrate the communication channels into the concept. Now the question arises as to the impact of implementing the concept. Since it was not possible to realize the concept in the course of the master thesis, another way had to be sought to provide an assessment of the effects.

Since it is already known what the situation at the service hotline is and for which requests a separate communication channel is intended, it is possible to estimate the effects if one assumes how many people would use the new channels for their inquiries and no longer use the service hotline.

In order to be able to quantify the effects, a simulation of the concept was created with MS Excel. In the following chapter, the method of calculation will be discussed and the potential effects and their impact will be shown by means of two simulation examples.

3.4.1 Calculation method

The results of the analysis of the service hotline were combined with the communication channels and some general information and the effects on the utilization of the employees were presented.

In detail the simulations have three starting points, which were combined in later calculations. Further on the calculation start points and the calculation steps are explained:

- The first starting point is the flow of customer arrivals (Figure 3-6). The service hotline analysis showed how likely it is that a certain type of person will inquiry for a certain reason. Combining the two information's, it is possible to say at any time how likely it is that any person with any reason makes an inquiry. For example, one can say that a caller between 10:00 and 11:00 hours is 19.78% of an end customer with a malfunction.

- As a second starting point, the communication channels are now included in the calculation. For this purpose, it must be assumed for each communication channel how many people with a particular inquiry use the communication channel provided for specific inquiries. For example, it can be assumed that 50% of the people who make a inquiry to order spare parts would use the spare parts webshop. It is also assumed that end customers and partners use the offered communication channel equally.

- The third starting point is general information like break time as well as freely selectable information on the number of inquiries in a freely selectable time period for scheduling department and technical support department.

- The first step of calculation is to calculate how many calls at the telephone in total is reduced by the assumed use of the communication channels. Since a communication channel is not provided for all types of inquiries, the composition of the reasons that remain on the telephone changes. This also means that the average processing time at the service hotline changes. For example, spare parts orders with long processing times no longer need to be processed by employees due to the webshop.

- The second step of calculation is the assumption of perfect routing. This means that each department only gets the inquiries for which it is responsible. Inquiries that take place in scheduling department, but the technical support department would be responsibility of it are calculated to technical support department. The same applies vice versa.

- The next step is to calculate the number of inquiries per day from the starting number of inquiries and the given period in which they take place. The number of inquiries per hour is calculated on the basis of the number of customer arrivals and the calculated number of inquiries per day.

- With the average processing time, the number of employees required to process all calls at the telephone is now calculated. Since the KWB has hired all employees full-time, it is assumed that the largest number of employees required in a period of one hour results in the number of employees for the whole day. For example, if between 8:00 and 9:00 five employees are required to process all telephone calls, the five employees will also be present all day.

- Since the analysis of the service hotline showed that on average fewer inquiries take place in the afternoon than in the morning, a further assumption was made when calculating the required employees in the new concept. It is assumed that the division of working time can be made more flexible, which creates the possibility of employing fewer employees in the afternoon.

- With the calculated required number of employees, their workload can now be calculated.

- Now the redirected inquiries in the new communication channels are considered. At this point, it is necessary to differentiate whether the request still needs to be processed by an employee in scheduling- or in technical support department or not. For example, when ordering via the spare parts webshop, no further technical support work will be necessary or if a contact form is selected instead of the telephone, processing will still be necessary. This knowledge is used to calculate the new load on the service hotline and the remaining number of inquiries in the various communication channels that still need to be processed.

- The remaining inquiries are from a certain type. The needed processing time for the certain inquiries can be calculated.

- Finally, the inquiries made through the new communication channels are added to the basic utilization of the employees. The basic utilization results from the utilization caused by the telephone. It should be noted, if the basic load factor has already reached 100%, no further inquiries can be processed. The remaining requests will then be postponed and processed as soon as the basic load is no longer 100%.

- The utilization resulting from the simulation, is the assumed utilization in case the communication concept would be realized.

3.4.2 Results of simulation cases of the "new" communication channels

In the following, three case simulations and their results will be presented.
The case simulations assume the same number of inquiries, but the usage of the additional communication channels is different.

3.4.2.1 Case one: "non-frequent use"

Case simulation one presents a non-frequent use of the additional communication channels. In table 3-9 the usage of the communication channels for each inquiry is shown. Table 3-8 lists the number of inquiries and the period to be simulated
 as well as the break times of the employees. There are 600 inquiries per week at technical support and 300 per week at disposition. The break time per employee is assumed with five minutes per hour and the lunch break takes 30 minutes.

Technical support		Disposition	
Number of inquiries	600	Number of inquiries	300
Period (weeks)	1	Period (weeks)	1
Number of working days	5	Number of working days	5
Breaktime/hour/employee [min]	5	Breaktime/hour/employee [min]	5
Lunch breaktime [min]	30	Lunch breaktime [min]	30
Base (minutes per hour)	60	Base (minutes per hour)	60

Table 3-8 Starting parameters for case simulation one, two and three (own presentation)

Table 3-9 shows the assumed usage of the communication channels. For example, it is assumed, that 50% of all spare part orders are processed via the web shop. The difference to case simulation 2 and 3 is, that the assumed usage of the communication channels is lower. The most channels in case simulation are between 0% and 20% of the inquiries.
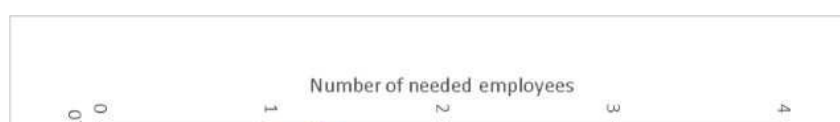
Number of needed employees

Communication channels	Service Wiki	Email	Contact form	Scheduling software	Comfort Online	Web shop	Chat (without Chatbot)
Malfunction	5%	0%	5%	0%	20%	0%	5%
Technical assistance	5%	0%	0%	0%	0%	0%	15%
Appointment	0%	10%	5%	50%	0%	0%	0%
Appointment information	0%	10%	5%	0%	0%	0%	5%
Complaint	0%	10%	0%	0%	0%	0%	0%
Spare part order	0%	0%	0%	0%	0%	50%	0%
Return parts processing	0%	0%	0%	0%	0%	20%	0%
Information about products	0%	0%	5%	0%	0%	0%	5%
Information about spare parts	0%	0%	5%	0%	0%	20%	5%
Information about services	0%	0%	5%	0%	0%	0%	5%
Information on maintenance contract	0%	0%	5%	0%	0%	0%	5%
Information about offer	0%	0%	0%	0%	0%	0%	5%
Invoice information	0%	0%	0%	0%	0%	0%	5%
Question to purchasing	0%	0%	0%	0%	0%	0%	0%
Other	0%	0%	0%	0%	0%	0%	0%

Table 3-9 Assumption of usage of communication channels, case simulation one (own presentation)

Technical Support	Time	Average processing time old [min]	Time
Average processing time old [min]	7,28	Average processing time old [min]	3,11
Average processing time new [min]	6,69	Average processing time new [min]	2,44
Time saving [%].	8%	Time saving [%].	22%

Table 3-10 Resulting average processing time on the telephone, case simulation one (own presentation)

Table 3-10 shows the effects on the processing times at the telephone. Since 50% of time-consuming cases, such as ordering spare parts, are processed via the web shop, the average processing time for a telephone call at technical support and disposition is reduced by 8%. Due to the better routing, 22% of the processing time is saved in disposition department.

Figure 3-20 Employees needed and utilization of employees for case simulation one (own presentation)

The results of the case simulation one are presented in figure 3-20. In the following figure 3-20 is explained:

- The time is plotted in hourly increments on the X-axis.

- The number of employees is plotted on the primary Y-axis (left)

- The utilization of employees is plotted on the secondary Y-axis (right).

- The yellow bar shows the number of employees required in the old concept. In case simulation one, three employees are required to process all inquiries.

- The blue line shows the utilisation of the employees. In the old concept only the telephone is considered in the simulation, the blue line also shows the progress of the contact inquiries over the day. It is easy to see that the utilisation in the afternoon is much lower than in the forenoon.

- The blue bars indicate the number of employees required in the new concept. By accepting a more flexible time management of the employees and the use of non time-critical communication channels, it is possible to process all contact inquiries with two employees in the afternoon instead of three.

- The orange line shows the theoretical workload of the employees, if they would only process the contact inquiries from the telephone. The difference in the morning between the yellow and orange lines shows the redirection to the new communication channels.

- The grey line shows the utilization of the employees during processing of all inquiries, independent of the communication channel used. Two further assumptions were made regarding capacity utilisation. On the one hand, it was assumed that the processing of inquiries via non time-critical communication channels would be delayed by one day. This means for example, that Monday's requests will be processed on Tuesday. On the other hand, the processing of inquiries via non time-critical channels only takes place after the first peak of contact requests at the service hotline. This means that processing does not begin until 9:00 am. After this time range it is easy to see, that the utilization of the employees, is considerably higher than only via the telephone. The fact that the grey line is the same as the orange line from 11:00 a.m. onwards means that all contact inquiries using non time-critical communication channels were processed.

- With the assumed number of inquiries and assumed usage of communication channels, it is possible to save one part-time worker and all inquiries could still be processed.

3.4.2.2 Case two: "frequent use"

Case simulation two presents a frequent use of the additional communication channels. In table 3-11 the usage of the communication channels for each inquiry is shown and it is higher than in case simulation one. Table 3-8 lists the number of inquiries and the period to be simulated as well as the break times of the employees. There are 600 inquiries per week at technical support and 300 per week at disposition. The break time per employee is assumed with five minutes per hour and the lunch break takes 30 minutes. These are the same parameters like in case simulation one.

Table 3-11 shows the assumed usage of the communication channels.

Communication channels	Service wiki	Email	Contact form	Scheduling software	Comfort Online	Web shop	Chat (without Chatbot)
Malfunction	0%	0%	5%	0%	60%	0%	5%
Technical assistance	0%	0%	0%	0%	0%	0%	20%
Appointment	0%	5%	5%	70%	0%	0%	5%
Appointment information	0%	5%	20%	0%	0%	0%	5%
Complaint	0%	5%	5%	0%	0%	0%	0%
Spare part order	0%	0%	0%	0%	0%	70%	0%
Return parts processing	0%	0%	0%	0%	0%	30%	0%
Information about products	0%	0%	10%	0%	0%	0%	5%
Information on spare parts	0%	0%	10%	0%	0%	50%	5%
Information about Services	0%	0%	10%	0%	0%	30%	10%
Information on maintenance contract	0%	0%	10%	0%	0%	30%	10%
Information about offer	0%	0%	5%	0%	0%	0%	10%
Invoice information	0%	0%	5%	0%	0%	0%	10%
Question to purchasing	0%	0%	5%	0%	0%	0%	0%
Other	0%	0%	5%	0%	0%	0%	0%

Table 3-11 Assumption of communication channel usage, case simulation two (own presentation)

Table 3-12 shows the average processing times by using the telephone. In contrast to case simulation, the time saving in technical support department by using the telephone is only 4%. In disposition, it is 31%.

Technical Support	Time	Disposition	Time
Average processing time old [min]	7,28	Average processing time old [min]	3,11
Average processing time new [min]	6,96	Average processing time new [min]	2,15
Time saving in [%].	4%	Time saving in [%].	31%

Table 3-12 Resulted average processing time by using the telephone, case simulation two (own presentation)
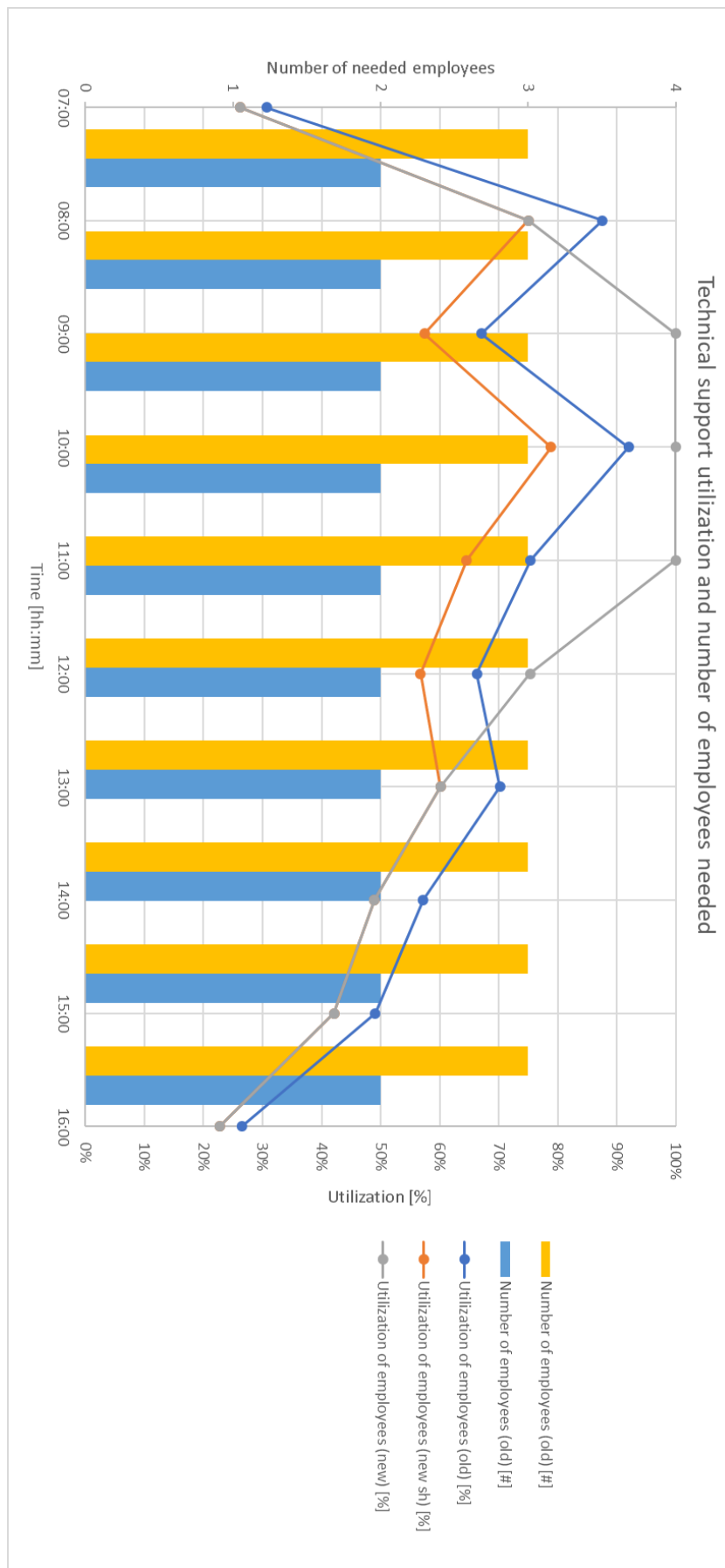
Figure 3-21 Employees needed and utilization of employees in case simulation two (own presentation)

Figure 3-21 shows the results of the case simulation two. In the following figure 3-21 is explained:

- It is noticeable at first glance that an increase in the usage of non time-critical channels means that fewer employees are required to handle the same number of inquiries. Due to the lower number of employees required and the delayed processing of contact inquiries, better utilisation can also be achieved.

- You can see how the area between the grey and orange curve increases. This is due to the use of the new communication channels and the lower number of employees.

- With the assumed number of callers and assumed usage of the communication channels it is possible to save a full-time employee, and all inquiries could still be processed.

3.4.2.3 Case three: "intense use"

As a concluding brief example, it is shown how great the impact of digitalization can be. The same parameters as in case simulation two were used, only the usage of the communication channel "Comfort Online" was increased to 90%. This means that 90% of the malfunctions are reported by the heating system itself and the end customer no longer must inform the KWB about the malfunction. Figure 3-23 shows the result from case simulation three. Without going into the details, it is recognizable that only half of the employees are needed to process the same number of inquiries. The grey line also shows that despite halving the required number of employees, there is still further potential to reach full employee utilisation.
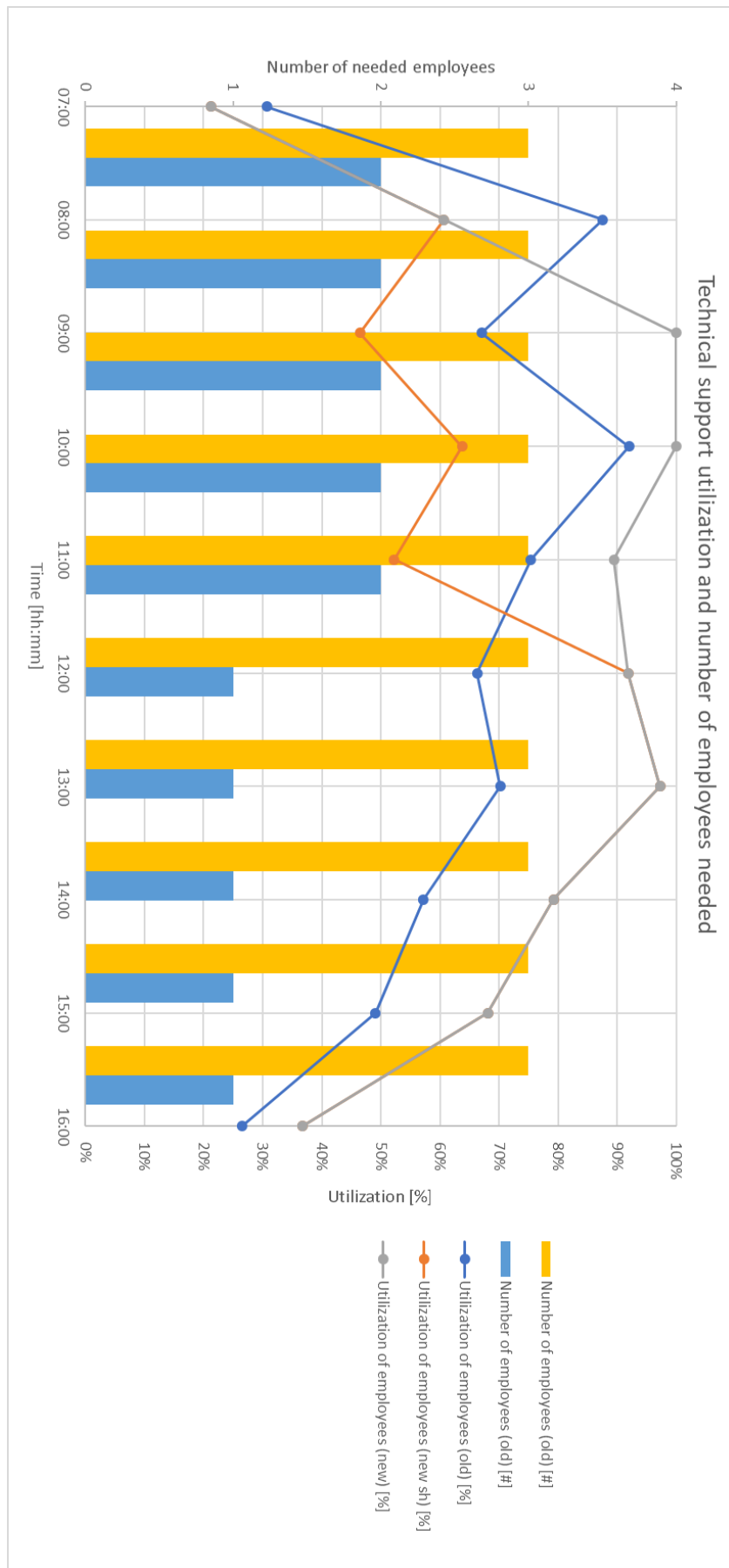
Figure 3-22 Employees needed and utilization of employees in case simulation three (own presentation)

4 Conclusion

In this concluding chapter, the most important results are summarized. The limitations that arose during data capturing, process modelling, and case simulation are discussed. Additionally, an outlook is given on the questions that arise.

4.1 Summary

This Master thesis presents a communication concept that takes into account the ongoing digitalisation of present time and anticipates further developments. In order to be prepared for the very near future of customer communication. This is necessary for KWB to prepare itself now and exploit existing potentials. The existing potentials are shown and how they can be made usable.

The increased use of software solutions that carry out work steps independently and make decisions, will increase the requirements on process design. The number of interfaces between different processes will increases, as do the requirements for interface definitions. In this context, the results show that it will become increasingly difficult in the future to make a clear distinction between core and support processes.

Using the example of the communication channel "Chat", it was shown that digitisation will lead to even more digitisation. Only through the introduction of a chat portal, the resulting learnings about the inquiries that are made, it becomes possible to use chatbots effectively. This means that flexibility is gained in the first step and automation can be implemented in the second step.

Using the Comfort Online communication channel, it was shown that the "Internet of Things" will play an increasingly important role in the future. In the first step, the customer is offered more convenience, as he has no longer to worry about the communication between the heating system and KWB. In the second step both the costs for the customer, and for the KWB will sink. The customer will benefit from the fact that predictive maintenance will reduce downtime. The KWB will profit from better planning security and possibly from new service products.

It is worth to note, that the path of digitalization must now be taken, as it will take a long development to fully exploit the resulting potentials. However, the first advantages will already become apparent after a short time.

4.2 Limitations

The following limitations resulted during data capturing:

- Due to the large number of different thematic inquiries at the service hotline, only the most frequent ones were recorded and documented. It is important to keep in mind that special cases can often be very time-consuming. During an employee interview, for example, it was discovered that very long processing times can sometimes occur when ordering spare parts. For example, if an offer for a complete overhaul of the heating system has to be made. In such a case, it is not uncommon for the processing time to exceed more than one hour.

- Only inbound calls were documented during data capturing.

- The topic of outbound calls is particularly important in scheduling. Since the employees also arrange appointments on their own, outbound calls often occur. During the employee interviews, it turned out that the accessibility of customers is a problem. The scheduling software can defuse the situation in these cases.

- In technical support department, there were days during data collection when the flow of customer arrivals was very high and employees were working at full utilisation. This could have led to a situation where not all calls were captured.

- Since only the calls that were processed were recorded, no statement can be made about the actual number of calls. It could be possible that people who didn't reach anyone hung up and didn't call anymore.

- The observed period is not representative for the whole year. In the winter season the inquiries thematics are different than in the summer season.

The following limitations arose during process modelling:

- As with the service hotline, only the most frequent inquiries and the associated work steps were recorded. Since there are a large number of thematic inquiries that have to be processed differently, the process model that covers all possible cases would be very confusing. As can be seen from the analysis of the service hotline, the process model covers the most frequent cases (malfunction, technical assistance, ordering of spare parts and scheduling).

- In BPM notation, there is a high number of different modelling elements, but only a small number were used. Since KWB did not know the BPMN notation until the present master thesis, a compromise was reached. The familiar elements from flowcharts were used, and the swim lines and pools were added. This ensured that the process model was easy to understand, and the goal was also achieved by using the BPM notation. Namely the visualization of the work steps performed by software products.

- When creating the actual processes, outdated models from 2010 had to be used. In combination with the knowledge gained from the employee interviews, the processes were modelled in this way. The procedure described may mean that work steps have not been recorded. However, this model is sufficient to give an impression of how the inquiries are handled by the employees.

- When creating the target processes, only the current situation could be taken into account. If further communication channels are offered in the future, there is the possibility that new inquiries will emerge, or it turns out in the course of the inquiry processing that other processing methods would be more meaningful and more efficient.

The limitations of the case simulation:

- Only inbound calls were taken into account. Outbound calls would reduce the available processing time, and thus have a direct impact on employee utilization. There is a possibility that if an employee makes an outbound call, the calculated load would rise over 100%.

- The usage of the communication channels was assumed.

- Only the known requests from the data analysis were considered and no special cases.

- It was assumed that the flow of customer arrivals would be constant during the simulated period.

- It was assumed that the share of the person types and the share of the inquiry reasons is constant in the simulated period.

- The simulation was carried out mainly on the basis of the service hotline (telephone) analysis. The analysis was carried out in the summer season, but it is not representative for the whole year.

- The requests made via the communication channels, were delayed by one day in the simulation. This means that a request on Monday using a non-time-critical communication channel can only be processed as of Tuesday morning.

- In addition to the one day delay, requests from non time-critical communication channels were only processed after the first peak of calls.

4.3 Outlook

The presented communication concept is already partly implemented by KWB.

- A new service hotline was already introduced during working on the master thesis. This made it possible to use the potential shown in the area of more efficient routing. A new data capturing after the start of the new service hotline showed that the routing potentials are used.

- During the execution of the master thesis, a contact form was already implemented on the homepage. However, the contact form was not really accepted by the customers as hoped.

- KWB is currently introducing a planning tool. One goal of the introduction is to communicate with customers to make appointments and thus increase efficiency. Another is the elimination of the bottleneck in the scheduling process.

In the course of the present master thesis, some of the questions that arose were not further considered. The following lists the questions that can be examined more closely.

- No account is taken of customer waiting time in the communication channels. Keyword queue theory.

- What is/could be the motivation of customers to use/not use certain communication channels?
    - How could this motivation be influenced?
    - What is the motivation of the partners not to use the Service Wiki?

- How could the resulting advantages be transferred into service products by non-time-critical communication channels and partially automated communication?

- How to confirm the finding that software tools increase the complexity of processes?

- How to confirm the finding that digitalization leads to more digitalization?

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List of abbreviations

a.m.	Ante meridiem
ACD	Automated Call Distributer
BPMN	Business Process Modelling Notation
e. g.	Exempli gratia (example given)
ERP System	Enterprise Resource Planning System
FAX	Shortform of Telefax
I. e.	Id est
IVR	Interactive Voice Respond
KWB	Kraft und Wärme aus Biomasse GmbH
Min	Minutes
SHK	Sanitär Heizung Klima (KWB internal abbreviation)

Appendix

Appendix 1: Collected Data of service hotline analysis (in German)

Datum	Uhrzeit	Telefonist	Wer ruft an?*	Grund des Anrufs	Anlage	Dauer Telefonat	weitergeleitet an	Dauer Nachbearbeitung	Art der Nachbearbeitung	Wie schwierig war sie zu beheben	Alternative	Alternative	Wie kompliziert war das Problem?	Alternative
21.09.2018	09:45:41	A	Partner (SHK)	Auskunft zu Produkte		1		0						
21.09.2018	09:35:43	A	Endkunde	Ersatzteil Bestellung		3	Ersatzteil Versand	2	Ersatzteilbestellung					
21.09.2018	08:49:51	A	Partner (SHK)	Technische Unterstützung	SHV	5	Ersatzteil Versand	4	Ersatzteilbestellung					
21.09.2018	08:21:48	A	Partner (SHK)	Ersatzteil Bestellung		2	Ersatzteil Versand	2	Ersatzteilbestellung					
21.09.2018	08:16:02	A	Partner (SHK)	Störung	EF	4		0		Einfach vor Ort	keine Alternative	Mittel	keine Alternative	
20.09.2018	15:45:10	A	Partner (SHK)	Technische Unterstützung		2		0						
20.09.2018	15:29:36	A	Partner (SHK)	Technische Unterstützung		5		0						
20.09.2018	14:52:38	A	Partner (SHK)	Technische Unterstützung		2		1					Einfach	per ServiceWiki
20.09.2018	14:40:49	A	Partner (SHK)	Technische Unterstützung		5		5					Mittel	keine Alternative
20.09.2018	13:42:18	A	Partner (SHK)	Auskunft zu Ersatzteile		12	Partner (SHK)	20	Angebotserstellung				Einfach	keine Alternative
20.09.2018	13:20:20	A	Partner (SHK)	Terminauskunft		3	Andere	1	Email schreiben				Einfach	per ServiceWiki
20.09.2018	13:01:52	A	Partner (SHK)	Störung	EF	7		0		Einfach vor Ort	keine Alternative			
20.09.2018	12:42:25	A	Partner (SHK)	Technische Unterstützung		8		2						
20.09.2018	11:51:46	A	Partner (SHK)	Technische Unterstützung	EF	2		0						
20.09.2018	11:50:58	A	Partner	Technische	PFP	6	Partner	2	Email schreiben				Schwer	keine

Date	Time		Anrufer	Grund	Produkt		Zusatz		Aktion						
			(SHK)	Unterstützung			(SHK)								Alternative
20.09.2018	10:51:33	A	Partner (SHK)	Technische Unterstützung	USV	4		0						Einfach	keine Alternative
20.09.2018	10:22:15	A	Partner (SHK)	Technische Unterstützung	CF 2	2		0						Mittel	keine Alternative
20.09.2018	10:18:11	A	Endkunde	Terminvereinbarung		1		0						Mittel	keine Alternative
20.09.2018	10:13:05	A	Partner (SHK)	Störung	EF	5		0		Einfach vor Ort	per ServiceWiki			Einfach	per ServiceWiki
20.09.2018	09:39:06	A	Partner (SHK)	Störung	EF	2		0		Einfach vor Ort	per ServiceWiki				
20.09.2018	09:28:52	A	Partner (SHK)	Technische Unterstützung		4		0							
20.09.2018	08:49:51	A	Partner (SHK)	Technische Unterstützung		2		0							
20.09.2018	08:37:28	A	Partner (SHK)	Störung		3	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative	Mittel	keine Alternative		
20.09.2018	08:32:10	A	Partner (SHK)	Störung		4		8		Einfach vor Ort	keine Alternative	Mittel	keine Alternative		
20.09.2018	08:11:17	A	Endkunde	Erstatzteil Bestellung	USV	1		2							
20.09.2018	07:53:05	A	Partner (SHK)	Terminvereinbarung		3		2							
20.09.2018	07:52:51	A	Partner (SHK)	Störung	USV	3		2		Einfach vor Ort	keine Alternative				
19.09.2018	16:03:00	A	Partner (SHK)	Störung		3		2		Einfach vor Ort	per ServiceWiki				
19.09.2018	14:40:42	A	Partner (SHK)	Technische Unterstützung		12		0							
19.09.2018	14:16:43	A	Service Techniker	Technische Unterstützung		2		0							
19.09.2018	14:07:54	A	Partner (SHK)	Erstatzteil Bestellung		4	Ersatzteil Versand	2	Ersatzteilbestellung					Einfach	per ServiceWiki
19.09.2018	13:37:13	A	Partner (SHK)	Auskunft zu Produkte	MF2	8		0						Einfach	keine Alternative
19.09.2018	13:06:23	A	Partner (SHK)	Auskunft zu Ersatzteile		4		2							
19.09.2018	12:56:50	A	Endkunde	Auskunft zu Produkte		3		0							
19.09.2018	11:39:29	A	Endkunde	Technische Unterstützung		18		0							

19.09.2018	11:19:15	A	Service Techniker	Technische Unterstützung		3		0					
19.09.2018	11:07:17	A	Partner (SHK)	Technische Unterstützung	CF 2	3		0				Einfach	keine Alternative
19.09.2018	10:42:57	A	Interessent	Auskunft zu Produkte		2		0				Einfach	per ServiceWiki
19.09.2018	10:38:49	A	Endkunde	Terminvereinbarung		1	Disposition	2	Email schreiben			Einfach	per ServiceWiki
19.09.2018	10:35:18	A	Endkunde	Technische Unterstützung		5		0					
19.09.2018	09:59:22	A	Endkunde	Störung		8	Ersatzteil Versand	4	Ersatzteilbestellung	Einfach vor Ort	keine Alternative		
19.09.2018	09:54:11	A	Endkunde	Terminvereinbarung		3	Disposition	2	Email schreiben			Mittel	keine Alternative
19.09.2018	08:54:09	A	Endkunde	Störung	USV	4	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative		
19.09.2018	08:11:42	A	Partner (SHK)	Technische Unterstützung	USV	3		0					
19.09.2018	08:07:14	A	Endkunde	Störung		6	Disposition	2	Email schreiben	Schwer vor Ort	keine Alternative		
19.09.2018	07:49:34	A	Endkunde	Störung	EF	8	Disposition	3	Email schreiben	Einfach vor Ort	keine Alternative	Einfach	keine Alternative
18.09.2018	16:10:45	A	Partner (SHK)	Störung	TDS	5	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative		
18.09.2018	15:47:15	A	Partner (SHK)	Technische Unterstützung		8		0					
18.09.2018	15:26:39	A	Andere	Technische Unterstützung		4	Andere	2	Dokumentation				
18.09.2018	14:45:08	A	Partner (SHK)	Auskunft zu Ersatzteile		5	Ersatzteil Versand	3	Ersatzteilbestellung			Einfach	per ServiceWiki
18.09.2018	14:35:37	A	Partner (SHK)	Störung		5	Ersatzteil Versand	2	Ersatzteilbestellung	Einfach vor Ort	keine Alternative	Einfach	per ServiceWiki
18.09.2018	14:19:10	A	Partner (SHK)	Technische Unterstützung		4		2					
18.09.2018	13:46:50	A	Partner (SHK)	Technische Unterstützung		2		0					
18.09.2018	13:32:31	A	Endkunde	Technische Unterstützung		5	Disposition	2	Email schreiben			Einfach	per ServiceWiki
18.09.2018	12:55:02	A	Partner (SHK)	Technische Unterstützung		2	Partner (SHK)	5	Email schreiben			Einfach	keine Alternative
18.09.2018	11:47:11	A	Partner	Auskunft zu		3	Andere	1	Email schreiben			Einfach	keine

Date	Time		Caller	Topic	Product	Num	Party	Num	Action	Location	Alternative	Level	Alternative
18.09.2018	11:32:35	A	Partner (SHK)	Angebot Technische Unterstützung		12	Partner (SHK)	2	Dokumentation			Schwer	Alternative keine Alternative
18.09.2018	11:08:56	A	Endkunde	Sonstiges		5	Andere	2	Email schreiben				
18.09.2018	10:36:56	A	Partner (SHK)	Sonstiges		2	Partner (SHK)	1	Email schreiben			Mittel	per ServiceWiki
18.09.2018	10:26:06	A	Partner (SHK)	Störung		2		0		Einfach vor Ort	keine Alternative		
18.09.2018	10:25:49	A	Partner (SHK)	Technische Unterstützung		10		0					
18.09.2018	09:39:16	A	Endkunde	Störung	USV	5	Disposition	3	Email schreiben	Einfach vor Ort	keine Alternative		
18.09.2018	09:30:59	A	Partner (SHK)	Terminvereinbarung		4	Disposition	1	Email schreiben			Einfach	per ServiceWiki
18.09.2018	09:01:50	A	Partner (SHK)	Störung	EF	4		0		Einfach Telefonisch	per ServiceWiki		
18.09.2018	08:56:13	A	Endkunde	Störung		7		2		Schwer vor Ort	keine Alternative		
18.09.2018	08:47:09	A	Partner (SHK)	Störung		3	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative		
18.09.2018	08:43:13	A	Endkunde	Terminvereinbarung		1		0					
18.09.2018	08:35:23	A	Partner (SHK)	Erstatzteil Bestellung		3	Ersatzteil Versand	4	Ersatzteilbestellung				
18.09.2018	08:32:12	A	Endkunde	Störung	EF	11	Ersatzteil Versand	4	Ersatzteilbestellung	Einfach Telefonisch	per ServiceWiki		
17.09.2018	16:34:14	A	Partner (SHK)	Technische Unterstützung		6		0					
17.09.2018	15:58:34	A	Partner (SHK)	Erstatzteil Bestellung		3	Ersatzteil Versand	5	Ersatzteilbestellung				
17.09.2018	14:06:38	A	Partner (SHK)	Störung		3	Partner (SHK)	5	Email schreiben	Einfach vor Ort	keine Alternative	Einfach	per ServiceWiki
17.09.2018	13:51:56	A	Endkunde	Auskunft zu Produkte		8	Vermittlung	2	Email schreiben				
17.09.2018	13:38:18	A	Partner (SHK)	Erstatzteil Bestellung		4	Ersatzteil Versand	5	Ersatzteilbestellung				
17.09.2018	13:31:54	A	Partner (SHK)	Technische Unterstützung		4		0					
17.09.2018	12:39:39	A	Partner (SHK)	Störung	USV	6		0		Einfach vor Ort	keine Alternative		
17.09.2018	11:50:04	A	Endkunde	Störung	TDS	4	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative	Einfach	per ServiceWiki

Datum	Uhrzeit	Gruppe	Kundentyp	Anliegen	Produkt								
17.09.2018	11:41:00	A	Endkunde	Störung		4		0		Einfach Telefonisch	keine Alternative		
17.09.2018	11:38:25	A	Endkunde	Störung	USV	6		0		Einfach Telefonisch	per ServiceWiki		
17.09.2018	10:52:26	A	Partner (SHK)	Störung	CF 2	2		0		Einfach Telefonisch	per ServiceWiki		
17.09.2018	10:40:05	A	Partner (SHK)	Technische Unterstützung		4		0					
17.09.2018	10:08:40	A	Partner (SHK)	Technische Unterstützung		5		2					
17.09.2018	07:56:56	A	Endkunde	Technische Unterstützung		10		0				Einfach	per ServiceWiki
14.09.2018	08:06:07	B	Endkunde	Terminvereinbarung		8		2	Dokumentation			Einfach	per ServiceWiki
14.09.2018	10:19:00	C	Endkunde	Technische Unterstützung	MF2	5		1				Einfach	per ServiceWiki
14.09.2018	08:21:25	C	Endkunde	Terminvereinbarung	EF	4		1					
14.09.2018	08:21:12	C	Service Techniker	Technische Unterstützung	EF	7		1					
13.09.2018	15:58:46	B	Endkunde	Technische Unterstützung		10		2				Einfach	per ServiceWiki
13.09.2018	15:29:29	B	Service Techniker	Technische Unterstützung	TDS	15		1					
13.09.2018	14:37:54	B	Endkunde	Störung		10		1		Schwer Telefonisch			
13.09.2018	14:02:22	B	Endkunde	Terminvereinbarung		8		2				Mittel	per ServiceWiki
13.09.2018	11:42:31	B	Endkunde	Störung	EF	10		1		Schwer Telefonisch		Einfach	per ServiceWiki
13.09.2018	11:19:56	B	Endkunde	Terminvereinbarung		4	Disposition	2				Mittel	keine Alternative
13.09.2018	10:56:23	B	Endkunde	Technische Unterstützung		8		3	Ersatzteilbestellung			Schwer	keine Alternative
13.09.2018	10:29:13	B	Endkunde	Erstatzteil Bestellung		8		3	Ersatzteilbestellung			Einfach	per ServiceWiki
13.09.2018	10:01:22	B	Endkunde	Störung		6		1		Einfach Telefonisch			
13.09.2018	09:30:00	B	Endkunde	Störung		5		2		Einfach Telefonisch		Einfach	per ServiceWiki
13.09.2018	08:41:33	B	Endkunde	Terminvereinbarung		5		2					
13.09.2018	08:15:57	B	Endkunde	Technische	UPS	8	Disposition	2	Email schreiben	Einfach vor		Einfach	per

Date	Time		Kunde	Grund	Produkt		Disposition		Tätigkeit			ServiceWiki
				Unterstützung						Ort		ServiceWiki
13.09.2018	08:05:37	B	Partner (SHK)	Störung		12	Disposition	3	Email schreiben	Schwer vor Ort		
13.09.2018	07:52:08	B	Endkunde	Terminvereinbarung		8		3	Dokumentation			
13.09.2018	09:38:05	C	Endkunde	Technische Unterstützung	USV	6		1			Einfach	per ServiceWiki
13.09.2018	08:52:18	C	Partner (SHK)	Technische Unterstützung	EF	6		1			Einfach	per ServiceWiki
13.09.2018	08:28:56	C	Endkunde	Technische Unterstützung	UPS	8		1				
13.09.2018	08:28:34	C	Endkunde	Störung	USV	15		1		Schwer vor Ort	Einfach	per ServiceWiki
12.09.2018	16:05:43	B	Partner (SHK)	Technische Unterstützung	USV	6		2				
12.09.2018	15:20:11	B	Endkunde	Terminvereinbarung		5	Disposition	2				per ServiceWiki
12.09.2018	14:04:33	B	Endkunde	Störung		7		2		Schwer Telefonisch	Mittel	per ServiceWiki
12.09.2018	13:07:53	B	Endkunde	Terminvereinbarung		4		1	Dokumentation			
12.09.2018	13:03:07	B	Partner (SHK)	Technische Unterstützung		10		5	Ersatzteilbestellung		Einfach	per ServiceWiki
12.09.2018	11:05:25	B	Endkunde	Störung		8		2		Einfach Telefonisch	Mittel	keine Alternative
12.09.2018	10:30:23	B	Endkunde	Terminvereinbarung		5		2	Dokumentation		Einfach	
12.09.2018	09:34:40	B	Endkunde	Technische Unterstützung		10		1				
12.09.2018	08:43:14	B	Service Techniker	Erstatzteil Bestellung		10		30	Angebotserstellung			
12.09.2018	08:02:51	B	Endkunde	Terminvereinbarung		6		2	Dokumentation			
12.09.2018	07:41:55	B	Endkunde	Terminvereinbarung		6		3	Dokumentation		Mittel	per ServiceWiki
12.09.2018	14:15:56	C	Endkunde	Störung	USV	6		1		Einfach vor Ort		
12.09.2018	14:15:30	C	Endkunde	Terminauskunft	UPS	3		1				
12.09.2018	10:07:53	C	Endkunde	Terminvereinbarung	UPS	4		1				
12.09.2018	09:47:56	C	Endkunde	Terminauskunft	UPS	4		1				
12.09.2018	09:36:54	C	Endkunde	Auskunft zu Ersatzteile	UPS	8		1				
12.09.2018	08:25:39	C	Endkunde	Störung	USV	5		1		Schwer Telefonisch		
12.09.2018	08:15:01	C	Service	Technische	USV	11		1				

Date	Time		Caller	Request	Product							
12.09.2018	08:14:41	C	Techniker Endkunde	Unterstützung Technische Unterstützung	UPS	6		1			Mittel	keine Alternative
11.09.2018	16:13:46	B	Endkunde	Erstatzteil Bestellung		10		2				
11.09.2018	15:45:40	B	Endkunde	Technische Unterstützung		15		2				
11.09.2018	13:58:31	B	Partner (SHK)	Terminauskunft		4		1				
11.09.2018	13:09:32	B	Endkunde	Störung		10		2		Einfach Telefonisch		
11.09.2018	12:45:24	B	Endkunde	Störung		10		2		Schwer Telefonisch	Einfach	per ServiceWiki
11.09.2018	10:58:14	B	Endkunde	Störung		7		2		Einfach vor Ort	Einfach	keine Alternative
11.09.2018	10:40:18	B	Endkunde	Technische Unterstützung		10		2				
11.09.2018	10:02:25	B	Endkunde	Erstatzteil Bestellung		5		5				
11.09.2018	09:27:17	B	Endkunde	Störung		5		2		Einfach Telefonisch	Einfach	keine Alternative
11.09.2018	08:51:05	B	Andere	Erstatzteil Bestellung		2	Disposition	60	Angebotserstellung			
11.09.2018	16:25:59	C	Endkunde	Auskunft zu Ersatzteile	USV	4		1			Einfach	keine Alternative
11.09.2018	16:03:11	C	Endkunde	Störung	USV	14		1		Schwer vor Ort		
11.09.2018	16:02:09	C	Endkunde	Terminvereinbarung	USV	4		1			Einfach	keine Alternative
11.09.2018	14:51:20	C	Endkunde	Terminvereinbarung	EF	8		1				
11.09.2018	12:55:33	C	Endkunde	Terminvereinbarung	TDS	4		1				
11.09.2018	10:28:43	C	Endkunde	Technische Unterstützung	USV	8		1			Einfach	per ServiceWiki
11.09.2018	10:28:22	C	Endkunde	Terminvereinbarung	UPS	4		1				
11.09.2018	09:26:14	C	Endkunde	Terminvereinbarung	UPS	14		1			Einfach	keine Alternative
11.09.2018	08:52:22	C	Endkunde	Terminvereinbarung	USV	4		1			Einfach	per ServiceWiki
11.09.2018	08:51:50	C	Service Techniker	Technische Unterstützung	MF2	14		2				
10.09.2018	16:07:51	B	Endkunde	Technische		8		2	Dokumentation			

Datum	Zeit		Anrufer	Anliegen	Produkt				Notiz			
				Unterstützung								
10.09.2018	15:57:58	B	Endkunde	Terminvereinbarung		4		2	Dokumentation			
10.09.2018	14:46:20	B	Endkunde	Terminauskunft		4		1				
10.09.2018	14:16:46	B	Endkunde	Technische Unterstützung	TDS	8	Andere	2				
10.09.2018	13:47:36	B	Partner (SHK)	Erstatzteil Bestellung	USV	6		4	Ersatzteilbestellung			
10.09.2018	12:53:25	B	Service Techniker	Technische Unterstützung	TDS	8		2			Einfach	keine Alternative
10.09.2018	12:30:00	B	Service Techniker	Technische Unterstützung		7		2				
10.09.2018	11:35:24	B	Endkunde	Störung		7		2		Einfach vor Ort	Einfach	per ServiceWiki
10.09.2018	10:14:37	B	Endkunde	Technische Unterstützung		10		1				
10.09.2018	09:44:40	B	Endkunde	Technische Unterstützung		5		1				
10.09.2018	08:58:23	B	Service Techniker	Technische Unterstützung		5		2				
10.09.2018	08:48:23	B	Endkunde	Störung	EF	10		1		Schwer Telefonisch		
10.09.2018	08:37:14	B	Endkunde	Technische Unterstützung	TDS	6		1			Mittel	keine Alternative
10.09.2018	08:25:59	B	Endkunde	Störung	USV	5		1		Einfach Telefonisch		
10.09.2018	08:11:37	B	Endkunde	Terminvereinbarung		4		1				
10.09.2018	08:07:16	B	Endkunde	Störung	USV	7	Disposition	2		Einfach vor Ort	Einfach	per ServiceWiki
10.09.2018	13:46:41	C	Partner (SHK)	Auskunft zu Ersatzteile	UPS	6		1				
10.09.2018	13:26:32	C	Endkunde	Terminvereinbarung	UPS	4		1				
10.09.2018	13:26:05	C	Service Techniker	Erstatzteil Bestellung	USV	6		1				
10.09.2018	13:25:46	C	Service Techniker	Technische Unterstützung	SHV	5		1				
10.09.2018	13:25:23	C	Endkunde	Terminvereinbarung	USV	4		1				
10.09.2018	08:59:57	C	Endkunde	Terminvereinbarung	UPS	4		1				
10.09.2018	08:30:17	C	Endkunde	Terminvereinbarung	USV	4		1				
10.09.2018	08:30:02	C	Endkunde	Störung	TDS	8		1		Einfach Telefonisch		
10.09.2018	08:14:38	C	Endkunde	Terminvereinbarung	UPS	4		1				

07.09.2018	11:59:15	B	Endkunde	Störung	USV	6		2	Ersatzteilbestellung	Einfach Telefonisch		Einfach	per ServiceWiki
07.09.2018	11:25:10	B	Partner (SHK)	Erstatzteil Bestellung		5		6					
07.09.2018	10:37:40	B	Endkunde	Technische Unterstützung		4		1					
07.09.2018	10:12:16	B	Service Techniker	Technische Unterstützung		5		1					
07.09.2018	09:46:36	B	Endkunde	Terminvereinbarung		4		1	Dokumentation				
07.09.2018	09:31:16	B	Endkunde	Technische Unterstützung		10		2	Ersatzteilbestellung				
07.09.2018	08:55:32	B	Endkunde	Terminvereinbarung		3		1					
07.09.2018	08:52:09	B	Endkunde	Technische Unterstützung		10		1					
07.09.2018	07:57:10	B	Endkunde	Störung	USV	6		1		Einfach Telefonisch			
07.09.2018	07:54:01	B	Endkunde	Störung	TDS	7		1		Schwer Telefonisch			
06.09.2018	15:59:25	A	Partner (SHK)	Terminvereinbarung		5	Disposition	1	Email schreiben				
06.09.2018	15:31:08	A	Partner (SHK)	Terminauskunft		2		1					
06.09.2018	14:33:13	A	Partner (SHK)	Technische Unterstützung	CF 2	1		0					
06.09.2018	13:22:59	A	Partner (SHK)	Erstatzteil Bestellung	EF	3	Ersatzteil Versand	2	Ersatzteilbestellung			Mittel	keine Alternative
06.09.2018	13:18:20	A	Endkunde	Erstatzteil Bestellung	USV	2	Ersatzteil Versand	2	Ersatzteilbestellung				
06.09.2018	13:08:38	A	Partner (SHK)	Technische Unterstützung	USV	4		0					
06.09.2018	11:53:32	A	Endkunde	Technische Unterstützung	TDS	10		0					
06.09.2018	11:38:05	A	Partner (SHK)	Technische Unterstützung	EF	4	Partner (SHK)	15	Dokumentation				
06.09.2018	11:20:51	A	Endkunde	Technische Unterstützung	USP	5		0					
06.09.2018	10:48:00	A	Partner (SHK)	Technische Unterstützung	USV	3		0					
06.09.2018	10:45:58	A	Partner (SHK)	Störung		5		0		Einfach Telefonisch	per ServiceWiki		
06.09.2018	10:33:14	A	Partner	Technische		2		0					

Datum	Zeit		Kunde	Grund	Produkt		Weiterleitung		Aktion			
			(SHK)	Unterstützung								
06.09.2018	10:27:24	A	Partner (SHK)	Erstatzteil Bestellung	USV	2	Ersatzteil Versand	2	Ersatzteilbestellung			
06.09.2018	10:06:51	A	Partner (SHK)	Technische Unterstützung		1		0				
06.09.2018	09:29:05	A	Partner (SHK)	Reklamation		1		0				
06.09.2018	08:59:04	A	Partner (SHK)	Störung	EF	3		0		Einfach vor Ort		per ServiceWiki
06.09.2018	08:48:40	A	Partner (SHK)	Technische Unterstützung	EF	3	Ersatzteil Versand	3	Ersatzteilbestellung		Einfach	per E-Mail
06.09.2018	08:45:42	A	Partner (SHK)	Technische Unterstützung		2		0			Einfach	per ServiceWiki
06.09.2018	08:07:35	A	Partner (SHK)	Erstatzteil Bestellung		4	Ersatzteil Versand	2	Ersatzteilbestellung		Einfach	per ServiceWiki
06.09.2018	07:41:58	A	Partner (SHK)	Technische Unterstützung	EF	3		0			Einfach	per ServiceWiki
06.09.2018	16:07:55	B	Endkunde	Terminvereinbarung		5		1				
06.09.2018	15:29:10	B	Endkunde	Technische Unterstützung		10		1				
06.09.2018	14:46:50	B	Endkunde	Technische Unterstützung	UPS	10		1				
06.09.2018	14:28:51	B	Endkunde	Störung		8		1		Schwer Telefonisch		
06.09.2018	13:23:08	B	Endkunde	Störung		7		1		Schwer Telefonisch	Einfach	per ServiceWiki
06.09.2018	13:08:25	B	Service Techniker	Technische Unterstützung		12		1				
06.09.2018	10:55:09	B	Endkunde	Störung	USV	8		2		Einfach vor Ort		
06.09.2018	10:10:49	B	Endkunde	Technische Unterstützung		4		1				
06.09.2018	10:05:54	B	Endkunde	Terminvereinbarung		5		2				
06.09.2018	09:38:53	B	Endkunde	Störung		5		1		Einfach Telefonisch		
06.09.2018	09:33:36	B	Endkunde	Störung		5	Disposition	2		Einfach vor Ort		
06.09.2018	08:52:19	B	Partner (SHK)	Technische Unterstützung		10		10	Email schreiben			
06.09.2018	08:21:43	B	Endkunde	Technische Unterstützung	UPS	10		1			Einfach	keine Alternative

Datum	Zeit	Kl.	Kunde	Anliegen	Produkt	n1	Weiterleitung	n2	Aktion						
06.09.2018	07:39:43	B	Endkunde	Störung		7	Disposition	3		Einfach vor Ort					
06.09.2018	16:31:13	C	Service Techniker	Technische Unterstützung	CF 2	18		1						Mittel	per ServiceWiki
06.09.2018	10:59:25	C	Endkunde	Terminauskunft	USV	4		1						Schwer	keine Alternative
06.09.2018	10:59:06	C	Endkunde	Auskunft zu Ersatzteile	UPS	12		1						Einfach	per ServiceWiki
06.09.2018	09:55:33	C	Partner (SHK)	Terminvereinbarung	EF	7		1						Einfach	per ServiceWiki
06.09.2018	09:55:10	C	Endkunde	Terminvereinbarung	MF2	6		1							
06.09.2018	08:29:38	C	Endkunde	Terminvereinbarung	UPS	4		1							
06.09.2018	08:24:51	C	Endkunde	Technische Unterstützung	USV	8		1							
06.09.2018	08:20:48	C	Service Techniker	Terminauskunft	USV	4		1						Mittel	keine Alternative
06.09.2018	07:50:46	C	Endkunde	Störung	USV	8		1		Einfach vor Ort				Einfach	per ServiceWiki
05.09.2018	16:07:10	A	Endkunde	Terminvereinbarung		2	Disposition	2	Email schreiben						
05.09.2018	15:57:59	A	Partner (SHK)	Technische Unterstützung		3		0							
05.09.2018	15:39:49	A	Endkunde	Technische Unterstützung	USV	8		0						Einfach	per ServiceWiki
05.09.2018	15:30:35	A	Endkunde	Störung	USV	5		0		Einfach Telefonisch	keine Alternative	Schwer	keine Alternative		
05.09.2018	15:22:07	A	Partner (SHK)	Technische Unterstützung		4		0						Einfach	per E-Mail
05.09.2018	14:43:11	A	Partner (SHK)	Technische Unterstützung		6		0							
05.09.2018	14:07:12	A	Partner (SHK)	Technische Unterstützung		2		0						Einfach	per ServiceWiki
05.09.2018	13:41:39	A	Partner (SHK)	Auskunft zu Services		3		0							
05.09.2018	13:15:37	A	Partner (SHK)	Störung	PFP	5		0		Einfach Telefonisch	per ServiceWiki			Mittel	keine Alternative
05.09.2018	11:11:26	A	Partner (SHK)	Störung	USV	3	Partner (SHK)	2	Email schreiben	Einfach vor Ort	per E-Mail			Einfach	keine Alternative
05.09.2018	10:08:36	A	Partner (SHK)	Technische Unterstützung		7		0							
05.09.2018	09:41:22	A	Partner (SHK)	Auskunft zu Produkte		2		0						Mittel	keine Alternative

Datum	Zeit	Gruppe	Kunde	Grund		Anzahl	Weiterleitung	Anzahl	Aktion	Lösung	Alternative	Bewertung	Alternative
05.09.2018	09:39:53	A	Partner (SHK)	Auskunft zu Wartungsvertrag		2		0					
05.09.2018	09:38:09	A	Partner (SHK)	Auskunft zu Services		2		0				Einfach	keine Alternative
05.09.2018	08:56:56	A	Partner (SHK)	Störung	EF	6		0		Einfach Telefonisch	per ServiceWiki		
05.09.2018	08:39:17	A	Partner (SHK)	Erstatzteil Bestellung		2	Ersatzteil Versand	5	Ersatzteilbestellung			Einfach	per ServiceWiki
05.09.2018	08:25:23	A	Endkunde	Auskunft zu Services	EF	7	Technische Support	2	Email schreiben				
05.09.2018	07:46:59	A	Endkunde	Störung	USV	4	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative		
05.09.2018	16:25:39	B	Endkunde	Störung		5		1		Einfach Telefonisch		Mittel	keine Alternative
05.09.2018	15:47:28	B	Endkunde	Technische Unterstützung		6		1				Einfach	per ServiceWiki
05.09.2018	15:39:09	B	Partner (SHK)	Technische Unterstützung		6		1					
05.09.2018	15:34:47	B	Endkunde	Terminvereinbarung		5		0					
05.09.2018	14:38:20	B	Endkunde	Terminvereinbarung		5		1	Email schreiben			Mittel	keine Alternative
05.09.2018	14:10:00	B	Endkunde	Terminvereinbarung		5		2					
05.09.2018	14:03:10	B	Service Techniker	Technische Unterstützung		15		2				Einfach	keine Alternative
05.09.2018	12:54:52	B	Service Techniker	Technische Unterstützung		5		0					
05.09.2018	11:24:08	B	Endkunde	Störung		6	Disposition	2		Einfach vor Ort			
05.09.2018	11:18:22	B	Endkunde	Auskunft zu Produkte		4		0					
05.09.2018	11:10:40	B	Andere	Störung		10		1		Schwer Telefonisch			
05.09.2018	10:52:10	B	Service Techniker	Technische Unterstützung		10		1		Schwer Telefonisch		Einfach	keine Alternative
05.09.2018	10:18:21	B	Endkunde	Störung		5		0		Einfach Telefonisch		Einfach	keine Alternative
05.09.2018	10:00:37	B	Partner (SHK)	Terminauskunft		4		1				Einfach	keine Alternative
05.09.2018	09:55:34	B	Endkunde	Störung		7		1		Einfach Telefonisch		Einfach	per ServiceWiki
05.09.2018	08:52:47	B	Endkunde	Störung		8	Andere	2		Einfach vor			

Datum	Zeit	Gr.	Kunde	Grund	Code	Dauer	Weiterleitung	Anzahl	Aktion	Aufwand 1	Alternative 1	Aufwand 2	Alternative 2
05.09.2018	08:38:55	B	Endkunde	Störung		7		1		Ort Schwer Telefonisch		Einfach	per ServiceWiki
05.09.2018	08:26:54	B	Endkunde	Technische Unterstützung		5		2					
05.09.2018	08:15:41	B	Endkunde	Auskunft zu Rechnung		5	Disposition	1				Einfach	keine Alternative
05.09.2018	07:44:09	B	Endkunde	Technische Unterstützung	UPS	6		1					
05.09.2018	16:21:38	C	Endkunde	Terminvereinbarung	USV	4		1				Einfach	keine Alternative
05.09.2018	13:53:49	C	Endkunde	Störung	USV	15		1		Schwer Telefonisch		Mittel	keine Alternative
05.09.2018	13:26:40	C	Partner (SHK)	Technische Unterstützung	MF2	18		1					
05.09.2018	12:59:54	C	Partner (SHK)	Technische Unterstützung	USV	12		1				Einfach	per E-Mail
05.09.2018	12:59:08	C	Service Techniker	Technische Unterstützung	USV	12		1				Einfach	per ServiceWiki
05.09.2018	12:41:47	C	Service Techniker	Technische Unterstützung	EF	6		1					
05.09.2018	12:40:48	C	Andere	Terminauskunft	MF2	6		1					
04.09.2018	15:57:41	A	Partner (SHK)	Technische Unterstützung	CF 2	5		0					
04.09.2018	15:41:29	A	Partner (SHK)	Störung		4	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative	Einfach	per ServiceWiki
04.09.2018	15:23:10	A	Partner (SHK)	Störung		5		0		Einfach Telefonisch	per ServiceWiki		
04.09.2018	14:47:26	A	Endkunde	Störung	TDS	3		0		Einfach vor Ort	keine Alternative		
04.09.2018	14:14:09	A	Partner (SHK)	Erstatzteil Bestellung		4	Ersatzteil Versand	5	Ersatzteilbestellung				
04.09.2018	14:04:23	A	Partner (SHK)	Technische Unterstützung	EF	1		0				Einfach	per ServiceWiki
04.09.2018	13:38:38	A	Partner (SHK)	Technische Unterstützung	SHV	5		0					
04.09.2018	13:29:02	A	Endkunde	Erstatzteil Bestellung	USV	3	Ersatzteil Versand	2	Ersatzteilbestellung			Einfach	keine Alternative
04.09.2018	13:22:17	A	Partner (SHK)	Störung	EF	4		0		Einfach Telefonisch	per ServiceWiki	Einfach	per ServiceWiki
04.09.2018	12:48:48	A	Partner	Technische	EF	5		0				Einfach	per

Datum	Zeit		Kunde	Anliegen	Code	Anzahl	Aktion	Anzahl							
04.09.2018	11:36:14	A	Partner (SHK)	Unterstützung Auskunft zu Wartungsvertrag		4	Vermittlung	5	Email schreiben					Einfach	per ServiceWiki
04.09.2018	11:26:40	A	Partner (SHK)	Technische Unterstützung	USP	2		0							
04.09.2018	10:56:15	A	Partner (SHK)	Störung		3		0		Einfach vor Ort	per ServiceWiki			Einfach	keine Alternative
04.09.2018	10:45:26	A	Endkunde	Technische Unterstützung		1	Disposition	1	Email schreiben						
04.09.2018	10:27:20	A	Partner (SHK)	Störung		2		0		Einfach vor Ort	keine Alternative	Mittel	per ServiceWiki		
04.09.2018	09:59:15	A	Partner (SHK)	Störung		2		0		Einfach Telefonisch	per ServiceWiki			Einfach	per ServiceWiki
04.09.2018	09:34:35	A	Partner (SHK)	Technische Unterstützung		8		0							
04.09.2018	08:57:42	A	Endkunde	Störung	EF	3		0		Einfach Telefonisch	per ServiceWiki				
04.09.2018	08:55:12	A	Partner (SHK)	Technische Unterstützung	PFP	9		0						Einfach	per ServiceWiki
04.09.2018	08:04:13	A	Partner (SHK)	Technische Unterstützung	CF 2	9		0							
04.09.2018	16:30:24	B	Endkunde	Störung		4		1		Einfach Telefonisch					
04.09.2018	15:55:21	B	Endkunde	Terminvereinbarung		8	Disposition	1							
04.09.2018	15:33:19	B	Endkunde	Technische Unterstützung	EF	12		1							
04.09.2018	14:45:37	B	Endkunde	Technische Unterstützung	EF	7		2						Einfach	
04.09.2018	14:02:34	B	Endkunde	Technische Unterstützung		12		2							
04.09.2018	13:28:25	B	Endkunde	Terminvereinbarung		4		2						Mittel	per ServiceWiki
04.09.2018	11:41:05	B	Service Techniker	Technische Unterstützung		10		0							
04.09.2018	11:15:33	B	Endkunde	Terminvereinbarung		4		1						Mittel	per ServiceWiki
04.09.2018	10:55:08	B	Endkunde	Erstatzteil Bestellung		6		1						Einfach	per ServiceWiki
04.09.2018	10:37:20	B	Andere	Erstatzteil Bestellung	USV	10		4						Mittel	keine Alternative
04.09.2018	10:27:54	B	Endkunde	Störung	EF	8		1		Einfach					

04.09.2018	10:13:40	B	Endkunde	Technische Unterstützung	TDS	10		2		Telefonisch Schwer Telefonisch		
04.09.2018	09:35:22	B	Endkunde	Erstatzteil Bestellung		7		15	Sonstige			
04.09.2018	09:30:23	B	Endkunde	Störung		8	Disposition	2		Einfach vor Ort		
04.09.2018	08:55:46	B	Endkunde	Störung	USV	5		1		Einfach Telefonisch	Einfach	keine Alternative
04.09.2018	08:32:51	B	Endkunde	Auskunft zu Produkte		6		1			Einfach	per ServiceWiki
04.09.2018	08:27:01	B	Endkunde	Störung	USV	5		1		Schwer Telefonisch	Mittel	keine Alternative
04.09.2018	08:22:23	B	Endkunde	Störung	USV	7	Disposition	2		Einfach vor Ort		
04.09.2018	08:11:12	B	Endkunde	Störung	USV	6		2		Einfach Telefonisch		
04.09.2018	07:55:43	B	Endkunde	Störung		10		2		Einfach vor Ort		
04.09.2018	07:38:29	B	Endkunde	Störung	EF	6		2		Einfach vor Ort		
04.09.2018	14:41:32	C	Endkunde	Terminauskunft	TDS	4	Disposition	1			Schwer	keine Alternative
04.09.2018	14:17:48	C	Endkunde	Störung	EF	6		1		Einfach vor Ort	Mittel	keine Alternative
04.09.2018	13:43:04	C	Endkunde	Terminauskunft	USV	4		1			Einfach	keine Alternative
04.09.2018	13:16:46	C	Endkunde	Störung	MF2	15		1		Einfach vor Ort	Einfach	keine Alternative
04.09.2018	12:58:45	C	Endkunde	Technische Unterstützung	USV	11		1				
04.09.2018	11:27:05	C	Endkunde	Störung	EF	7		1		Schwer Telefonisch		
04.09.2018	10:36:01	C	Endkunde	Technische Unterstützung	USV	8		1				
04.09.2018	10:27:55	C	Endkunde	Technische Unterstützung	SHV	8		1				
04.09.2018	09:51:22	C	Endkunde	Technische Unterstützung	USV	16		1				
04.09.2018	09:27:18	C	Endkunde	Terminvereinbarung	MF2	6		1				
04.09.2018	09:23:30	C	Endkunde	Technische	USV	4		1				

Datum	Zeit		Kunde	Kategorie	Code		Aktion		Bearbeitung				
04.09.2018	08:31:11	C	Endkunde	Unterstützung Technische Unterstützung	MF2	8		1					
04.09.2018	08:22:37	C	Endkunde	Terminvereinbarung	EF	4		1					
04.09.2018	07:56:03	C	Endkunde	Technische Unterstützung	USV	18	Disposition	1				Einfach	per ServiceWiki
03.09.2018	16:20:32	A	Partner (SHK)	Auskunft zu Produkte		2	Vermittlung	2	Email schreiben				
03.09.2018	16:19:07	A	Endkunde	Störung		7	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative		
03.09.2018	16:06:21	A	Endkunde	Terminvereinbarung	TDS	2	Disposition	1	Email schreiben			Schwer	per ServiceWiki
03.09.2018	15:57:57	A	Endkunde	Störung	EF	3	Disposition	1	Email schreiben	Einfach Telefonisch	keine Alternative		
03.09.2018	15:55:59	A	Partner (SHK)	Störung		8	Disposition	3	Email schreiben	Schwer vor Ort	keine Alternative		
03.09.2018	15:55:33	A	Partner (SHK)	Erstatzteil Bestellung		7	Ersatzteil Versand	5	Ersatzteilbestellung				
03.09.2018	15:44:40	A	Endkunde	Technische Unterstützung	SHV	7	Disposition	2	Email schreiben				
03.09.2018	15:37:57	A	Partner (SHK)	Erstatzteil Bestellung		6	Ersatzteil Versand	7	Ersatzteilbestellung			Mittel	
03.09.2018	15:01:40	A	Partner (SHK)	Technische Unterstützung	EF	18		0				Mittel	
03.09.2018	14:53:26	A	Partner (SHK)	Störung	USV	8		0		Einfach Telefonisch	per ServiceWiki		
03.09.2018	14:38:19	A	Endkunde	Terminauskunft		2		0					
03.09.2018	14:35:31	A	Endkunde	Störung	TDS	3	Disposition	2	Email schreiben	Schwer vor Ort	keine Alternative		
03.09.2018	14:31:25	A	Endkunde	Erstatzteil Bestellung	USP	3	Ersatzteil Versand	2	Ersatzteilbestellung				
03.09.2018	14:14:52	A	Partner (SHK)	Technische Unterstützung		3	Technische Support	5	Email schreiben			Mittel	
03.09.2018	14:11:23	A	Endkunde	Störung	EF	2	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative		
03.09.2018	14:08:29	A	Partner (SHK)	Erstatzteil Bestellung		2	Andere	3	Ersatzteilbestellung				
03.09.2018	13:53:08	A	Partner (SHK)	Technische Unterstützung		6		0					
03.09.2018	13:43:05	A	Endkunde	Erstatzteil Bestellung	USV	4	Ersatzteil Versand	2	Ersatzteilbestellung				

03.09.2018	13:40:11	A	Partner (SHK)	Erstatzteil Bestellung		1		0				Mittel	
03.09.2018	13:30:04	A	Endkunde	Terminvereinbarung	EF	4	Disposition	2	Email schreiben				
03.09.2018	13:27:45	A	Endkunde	Terminvereinbarung		5	Disposition	2	Email schreiben				
03.09.2018	13:21:32	A	Endkunde	Störung	TDS	11		0		Einfach Telefonisch	per ServiceWiki	Mittel	per ServiceWiki
03.09.2018	13:03:40	A	Endkunde	Terminauskunft		3	Disposition	2	Email schreiben				
03.09.2018	12:41:26	A	Partner (SHK)	Störung	EF	1		0		Einfach Telefonisch	per ServiceWiki		
03.09.2018	11:59:42	A	Endkunde	Terminvereinbarung	USV	3	Disposition	2	Email schreiben				
03.09.2018	11:55:47	A	Endkunde	Störung	USP	3	Disposition	2	Email schreiben	Einfach vor Ort	per E-Mail	Mittel	
03.09.2018	11:44:21	A	Partner (SHK)	Technische Unterstützung	USV	5		0					
03.09.2018	11:40:01	A	Endkunde	Störung	USV	6		2		Einfach vor Ort	keine Alternative		
03.09.2018	11:32:45	A	Endkunde	Störung	USV	5	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative	Schwer	
03.09.2018	11:25:14	A	Partner (SHK)	Auskunft zu Services		3	Partner (SHK)	2	Email schreiben				
03.09.2018	11:21:47	A	Endkunde	Störung		4	Disposition	1	Email schreiben	Schwer vor Ort	keine Alternative		
03.09.2018	11:18:24	A	Endkunde	Störung	USV	3	Disposition	2	Email schreiben	Einfach Telefonisch	keine Alternative		
03.09.2018	11:16:59	A	Endkunde	Störung		3	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative		
03.09.2018	11:10:16	A	Endkunde	Störung	USV	3		1		Einfach vor Ort	keine Alternative	Mittel	
03.09.2018	11:07:34	A	Partner (SHK)	Auskunft zu Produkte		3		0					
03.09.2018	10:49:24	A	Partner (SHK)	Auskunft zu Wartungsvertrag		2		0					
03.09.2018	10:46:45	A	Partner (SHK)	Auskunft zu Produkte		3		0					
03.09.2018	10:32:05	A	Partner (SHK)	Auskunft zu Ersatzteile		2		0					
03.09.2018	10:26:36	A	Endkunde	Terminvereinbarung	USP	2	Disposition	1	Email schreiben			Schwer	
03.09.2018	09:46:04	A	Endkunde	Technische Unterstützung	USV	3		0					
03.09.2018	09:32:36	A	Endkunde	Terminvereinbarung	EF	2		0					
03.09.2018	09:27:17	A	Partner	Störung		2	Disposition	1	Email schreiben	Einfach	per		

(SHK)

Date	Time		Caller	Category	Product		Subcat.		Action					
03.09.2018	08:52:43	A	Endkunde	Störung	USV	6	Ersatzteil Versand	2	Ersatzteilbestellung	Telefonisch Einfach vor Ort	ServiceWiki keine Alternative	Mittel	keine Alternative	
03.09.2018	08:42:39	A	Partner (SHK)	Störung	USP	8		0		Einfach Telefonisch	per ServiceWiki			
03.09.2018	08:31:28	A	Endkunde	Erstatzteil Bestellung		3	Ersatzteil Versand	2	Email schreiben					
03.09.2018	08:18:02	A	Endkunde	Störung	EF	4	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative	Mittel		
03.09.2018	08:12:31	A	Endkunde	Terminvereinbarung		2	Disposition	2	Email schreiben					
03.09.2018	08:09:20	A	Endkunde	Störung	USP	5	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative	Mittel	keine Alternative	
03.09.2018	07:34:16	A	Endkunde	Störung	USV	3	Disposition	2	Email schreiben	Einfach vor Ort	keine Alternative	Mittel		
03.09.2018	16:29:33	B	Endkunde	Erstatzteil Bestellung		8		2						
03.09.2018	16:18:40	B	Partner (SHK)	Technische Unterstützung		4		2					Schwer	
03.09.2018	16:09:45	B	Endkunde	Störung	EF2	15		2		Schwer Telefonisch	keine Alternative	Einfach		
03.09.2018	15:57:18	B	Partner (SHK)	Erstatzteil Bestellung		5		5					Einfach	per ServiceWiki
03.09.2018	15:37:49	B	Endkunde	Terminvereinbarung	UPS	4		2						
03.09.2018	15:02:38	B	Andere	Technische Unterstützung		5		2					Mittel	
03.09.2018	14:54:53	B	Endkunde	Störung		7		3		Schwer Telefonisch				
03.09.2018	14:38:12	B	Endkunde	Störung		5		2		Einfach Telefonisch				
03.09.2018	14:24:09	B	Endkunde	Störung		7		5	Ersatzteilbestellung	Einfach Telefonisch				
03.09.2018	13:59:25	B	Endkunde	Technische Unterstützung		5		5						
03.09.2018	13:40:56	B	Endkunde	Technische Unterstützung	MF2	2		1						
03.09.2018	13:34:04	B	Endkunde	Technische Unterstützung		5		4					Mittel	
03.09.2018	13:21:47	B	Service Techniker	Technische Unterstützung		5		1					Mittel	
03.09.2018	13:12:48	B	Andere	Erstatzteil Bestellung		5		5						

03.09.2018	13:03:09	B	Endkunde	Terminauskunft	5		5	Telefonat				Mittel	
03.09.2018	11:52:18	B	Service Techniker	Technische Unterstützung	5		2						
03.09.2018	11:39:03	B	Endkunde	Terminvereinbarung	3	Disposition	1	Nachfrage				Mittel	
03.09.2018	11:34:47	B	Endkunde	Technische Unterstützung	7		3	Ersatzteilbestellung					
03.09.2018	11:27:16	B	Endkunde	Terminvereinbarung	4		2						
03.09.2018	11:21:22	B	Endkunde	Terminvereinbarung	4		1						
03.09.2018	10:59:02	B	Endkunde	Technische Unterstützung	5		1					Einfach	
03.09.2018	10:51:57	B	Endkunde	Terminauskunft	5		2					Mittel	
03.09.2018	10:43:17	B	Endkunde	Terminauskunft	3	Disposition	1		Einfach Telefonisch				
03.09.2018	10:39:07	B	Endkunde	Störung	5		2		Einfach Telefonisch				
03.09.2018	10:34:09	B	Endkunde	Störung	5		2	Sonstige	Schwer Telefonisch			Mittel	
03.09.2018	10:24:06	B	Endkunde	Störung	5	Disposition	3	Telefonat	Einfach vor Ort				
03.09.2018	10:19:58	B	Endkunde	Störung	7		2		Einfach Telefonisch			Mittel	
03.09.2018	10:10:23	B	Partner (SHK)	Erstatzteil Bestellung	5		5	Ersatzteilbestellung					
03.09.2018	10:02:29	B	Endkunde	Störung	4	Disposition	2		Einfach vor Ort				
03.09.2018	09:56:55	B	Endkunde	Technische Unterstützung	5		2		Einfach Telefonisch	keine Alternative			
03.09.2018	09:49:12	B	Endkunde	Technische Unterstützung	15		2	Telefonat	Einfach Telefonisch			Schwer	per ServiceWiki
03.09.2018	09:35:00	B	Endkunde	Technische Unterstützung	12		0		Einfach Telefonisch	keine Alternative	Mittel	keine Alternative	
03.09.2018	09:21:44	B	Endkunde	Technische Unterstützung	5		2		Einfach Telefonisch				
03.09.2018	08:58:32	B	Endkunde	Technische Unterstützung	7		2	Sonstige	Einfach Telefonisch				
03.09.2018	08:47:30	B	Endkunde	Reklamation	7	Disposition	2	Email schreiben				Mittel	
03.09.2018	08:33:29	B	Endkunde	Technische Unterstützung	8	Disposition	3	Email schreiben	Schwer vor Ort			Mittel	keine Alternative
03.09.2018	08:26:38	B	Endkunde	Technische Unterstützung	5	Disposition	2	Email schreiben	Einfach vor Ort				
03.09.2018	08:20:30	B	Endkunde	Störung	6	Disposition	3		Einfach vor				

Datum	Zeit		Kunde	Grund	Produkt	Nr	Disposition	Nr	Aufgabe	Schwierigkeit	Alternative	Aufwand	Alternative
03.09.2018	08:13:52	B	Endkunde	Störung		8		4	Ersatzteilbestellung	Ort Einfach Telefonisch	keine Alternative		
03.09.2018	08:07:06	B	Endkunde	Störung		4	Disposition	3		Einfach vor Ort		Mittel	
03.09.2018	08:04:24	B	Endkunde	Störung	UPS	4	Disposition	2		Einfach vor Ort		Mittel	
03.09.2018	08:00:16	B	Endkunde	Terminvereinbarung		3	Disposition	2					
03.09.2018	07:56:13	B	Endkunde	Technische Unterstützung		4		1		Einfach Telefonisch	keine Alternative		
03.09.2018	07:50:23	B	Endkunde	Technische Unterstützung		6		3	Sonstige	Einfach Telefonisch	keine Alternative		
03.09.2018	07:46:37	B	Endkunde	Störung		5	Disposition	3	Email schreiben	Schwer vor Ort		Mittel	
03.09.2018	07:38:07	B	Endkunde	Störung		4	Disposition	2		Einfach Telefonisch			
03.09.2018	16:10:31	C	Service Techniker	Technische Unterstützung	EF	11		1					
03.09.2018	15:49:48	C	Endkunde	Auskunft zu Ersatzteile	UPS	12		1					
03.09.2018	15:48:50	C	Endkunde	Störung	UPS	12		1		Schwer Telefonisch			
03.09.2018	15:04:58	C	Service Techniker	Technische Unterstützung	USV	12		1					
03.09.2018	14:51:01	C	Endkunde	Terminvereinbarung	USV	6		1				Mittel	
03.09.2018	14:30:27	C	Endkunde	Störung	USV	14		1		Schwer Telefonisch			
03.09.2018	14:12:34	C	Endkunde	Störung	UPS	4		1		Schwer Telefonisch		Mittel	keine Alternative
03.09.2018	14:08:09	C	Service Techniker	Technische Unterstützung	EF	8		0					
03.09.2018	13:59:30	C	Service Techniker	Technische Unterstützung	USV	15		0					
03.09.2018	13:45:52	C	Endkunde	Technische Unterstützung	EF	12		1				Mittel	keine Alternative
03.09.2018	13:14:56	C	Endkunde	Terminauskunft	UPS	4		0				Mittel	keine Alternative
03.09.2018	13:10:18	C	Service Techniker	Technische Unterstützung	USV	10		0				Schwer	keine Alternative
03.09.2018	13:02:06	C	Endkunde	Technische Unterstützung	EF	4		1					

Datum	Zeit			Grund										
03.09.2018	12:49:10	C	Endkunde	Erstatzteil Bestellung	SHV	5		1					Mittel	per ServiceWiki
03.09.2018	11:49:49	C	Endkunde	Erstatzteil Bestellung	UPS	7		1						
03.09.2018	11:49:30	C	Endkunde	Terminvereinbarung	UPS	6		1						
03.09.2018	11:35:06	C	Service Techniker	Technische Unterstützung	USV	8		1						
03.09.2018	11:28:39	C	Endkunde	Technische Unterstützung	UPS	10		1					Mittel	
03.09.2018	11:13:30	C	Endkunde	Technische Unterstützung	USV	5		1					Mittel	
03.09.2018	10:48:15	C	Endkunde	Terminvereinbarung	UPS	5		1						
03.09.2018	10:47:58	C	Endkunde	Terminvereinbarung	UPS	4		1						
03.09.2018	10:36:42	C	Endkunde	Technische Unterstützung	USV	5		1						
03.09.2018	10:26:59	C	Endkunde	Technische Unterstützung	USV	5	Disposition	1	Sonstige					
03.09.2018	10:17:10	C	Endkunde	Störung	UPS	6		1			Schwer Telefonisch			
03.09.2018	10:08:56	C	Endkunde	Terminvereinbarung	USV	4		1						
03.09.2018	10:08:12	C	Endkunde	Störung	UPS	4		1			Einfach vor Ort			
03.09.2018	09:56:53	C	Endkunde	Terminvereinbarung	USV	5		1	Sonstige					
03.09.2018	09:48:31	C	Endkunde	Technische Unterstützung	EF	7		1						
03.09.2018	09:38:40	C	Endkunde	Erstatzteil Bestellung	UPS	5		1						
03.09.2018	09:32:15	C	Service Techniker	Technische Unterstützung	USV	8		1					Mittel	per ServiceWiki
03.09.2018	08:49:15	C	Endkunde	Technische Unterstützung	USV	5		1					Mittel	
03.09.2018	08:43:03	C	Endkunde	Technische Unterstützung	UPS	8		1						
03.09.2018	08:34:44	C	Endkunde	Technische Unterstützung	UPS	8		1						
03.09.2018	08:25:36	C	Endkunde	Störung	USV	4		0			Einfach Telefonisch		Schwer	
03.09.2018	08:24:45	C	Endkunde	Technische Unterstützung	USV	6		1						
03.09.2018	08:24:19	C	Endkunde	Technische Unterstützung		5		1					Mittel	

Datum	Zeit		Kunde	Anliegen	Gerät				Aktion					
03.09.2018	08:15:05	C	Endkunde	Störung	EF	6		1		Einfach Telefonisch				
03.09.2018	07:54:44	C	Endkunde	Störung		5		1		Einfach Telefonisch			Mittel	
03.09.2018	07:47:07	C	Endkunde	Technische Unterstützung	USV	6		1					Einfach	
03.09.2018	07:38:34	C	Endkunde	Technische Unterstützung	UPS	5		1					Mittel	keine Alternative per ServiceWiki
31.08.2018	11:47:31	B	Endkunde	Technische Unterstützung	USV	4	Andere	1	Telefonat	Einfach Telefonisch			Mittel	
31.08.2018	11:17:15	B	Endkunde	Störung		10		3	Telefonat	Einfach Telefonisch				
31.08.2018	10:56:36	B	Partner (SHK)	Technische Unterstützung	UPS	7		3	Telefonat	Einfach Telefonisch	per ServiceWiki			
31.08.2018	10:20:15	B	Andere	Störung	USV	8	Disposition	2		Schwer vor Ort	keine Alternative	Mittel		
31.08.2018	10:11:46	B	Endkunde	Technische Unterstützung		7	Disposition	3	Nachfrage	Schwer vor Ort				
31.08.2018	09:53:30	B	Service Techniker	Terminvereinbarung		5		2			keine Alternative	Mittel		
31.08.2018	09:42:14	B	Endkunde	Technische Unterstützung		6		2		Einfach Telefonisch	keine Alternative			
31.08.2018	09:39:15	B	Endkunde	Terminauskunft		4		2						
31.08.2018	09:35:58	B	Endkunde	Terminvereinbarung		4		2		Einfach Telefonisch	keine Alternative	Mittel	keine Alternative	
31.08.2018	09:32:50	B	Endkunde	Technische Unterstützung		7		2	Telefonat	Einfach Telefonisch				
31.08.2018	09:32:12	B	Partner (SHK)	Terminvereinbarung		3		3	Dokumentation	Einfach Telefonisch	keine Alternative			
31.08.2018	08:44:57	B	Endkunde	Technische Unterstützung		7		2	Sonstige	Einfach Telefonisch				
31.08.2018	08:40:37	B	Endkunde	Terminauskunft		3		1	Nachfrage					
31.08.2018	07:46:15	B	Endkunde	Störung		6		2	Telefonat	Einfach Telefonisch				
31.08.2018	07:41:42	B	Endkunde	Störung		5		1	Sonstige	Einfach Telefonisch	keine Alternative			
30.08.2018	16:04:26	A	Partner (SHK)	Erstatzteil Bestellung		3	Ersatzteil Versand	2	Ersatzteilbestellung					
30.08.2018	15:21:52	A	Partner (SHK)	Auskunft zu Produkte		2		0						
30.08.2018	14:31:05	A	Partner	Erstatzteil		6	Ersatzteil	3	Ersatzteilbestellung				Einfach	keine

Datum	Zeit	Gruppe	Kundentyp	Grund	Produkt	Anzahl	Zusatz	Anzahl2	Aktion	Komplexität 1	Komplexität 2	Komplexität 3	Bewertung
			(SHK)	Bestellung			Versand						Alternative
30.08.2018	14:14:28	A	Partner (SHK)	Technische Unterstützung	USV	2	Versand Ersatzteil Versand	2	Ersatzteilbestellung				Mittel
30.08.2018	13:46:19	A	Partner (SHK)	Technische Unterstützung		15	Ersatzteil Versand	8	Ersatzteilbestellung				Mittel
30.08.2018	13:19:38	A	Partner (SHK)	Technische Unterstützung	PFP	4		0					Einfach
30.08.2018	13:13:58	A	Partner (SHK)	Technische Unterstützung		2		0					Einfach
30.08.2018	13:12:11	A	Endkunde	Störung	USP	5		0		Einfach Telefonisch	per ServiceWiki		
30.08.2018	13:07:11	A	Partner (SHK)	Störung	USV	4		0		Einfach Telefonisch	keine Alternative	Mittel	
30.08.2018	11:42:31	A	Partner (SHK)	Störung	EF	6		0		Einfach vor Ort	per ServiceWiki		Mittel
30.08.2018	10:44:51	A	Partner (SHK)	Störung	EF	5		0		Einfach Telefonisch	per ServiceWiki		Einfach
30.08.2018	10:20:06	A	Partner (SHK)	Technische Unterstützung	EF	2		0					
30.08.2018	08:41:26	A	Partner (SHK)	Störung	PFP	18		0		Einfach Telefonisch	per ServiceWiki		Mittel
30.08.2018	08:09:48	A	Partner (SHK)	Störung	SHV	8		0		Einfach Telefonisch	per ServiceWiki		Mittel
30.08.2018	07:37:28	A	Partner (SHK)	Störung	SHV	3		0		Einfach Telefonisch	per ServiceWiki		
30.08.2018	16:02:59	B	Endkunde	Terminauskunft		3		1	Telefonat				Einfach
30.08.2018	15:39:04	B	Endkunde	Störung		4	Disposition	3	Email schreiben	Einfach vor Ort			Mittel
30.08.2018	15:34:01	B	Endkunde	Technische Unterstützung	EF	5		2	Sonstige	Einfach Telefonisch	keine Alternative	Schwer	
30.08.2018	14:06:30	B	Endkunde	Technische Unterstützung		10		3	Angebotserstellung	Einfach vor Ort			Mittel
30.08.2018	14:04:58	B	Service Techniker	Erstatzteil Bestellung		5		2	Ersatzteilbestellung				Einfach
30.08.2018	14:04:24	B	Endkunde	Störung		7		2	Telefonat	Einfach Telefonisch			Mittel
30.08.2018	14:02:44	B	Endkunde	Terminvereinbarung	UPS	5		1	Nachfrage				Mittel
30.08.2018	13:42:10	C	Endkunde	Terminvereinbarung	UPS	5		2					Mittel
30.08.2018	13:41:29	C	Endkunde	Terminauskunft	USV	10		2					Mittel
30.08.2018	13:40:17	C	Endkunde	Erstatzteil Bestellung	EF	3		1	Ersatzteilbestellung				

Datum	Zeit												
30.08.2018	13:39:10	C	Endkunde	Terminvereinbarung	MF2	2		1	Sonstige				Mittel
29.08.2018	16:09:23	A	Partner (SHK)	Störung		10	Ersatzteil Versand	5	Ersatzteilbestellung	Einfach Telefonisch			
29.08.2018	15:58:35	A	Partner (SHK)	Störung		6		0		Einfach Telefonisch	per ServiceWiki		
29.08.2018	15:49:09	A	Partner (SHK)	Störung		9		0		Einfach Telefonisch	per ServiceWiki	Mittel	
29.08.2018	14:52:38	A	Endkunde	Störung		3		0		Einfach Telefonisch	per ServiceWiki		
29.08.2018	13:49:54	A	Service Techniker	Technische Unterstützung		3		1				Mittel	
29.08.2018	12:09:44	A	Endkunde	Störung		3		1		Schwer vor Ort	keine Alternative		
29.08.2018	11:35:18	A	Partner (SHK)	Technische Unterstützung		8		0				Mittel	
29.08.2018	11:25:21	A	Endkunde	Technische Unterstützung		7		0					
29.08.2018	10:34:44	A	Endkunde	Technische Unterstützung		2		0					
29.08.2018	10:33:12	A	Partner (SHK)	Technische Unterstützung		3		0				Einfach	
29.08.2018	10:31:15	A	Partner (SHK)	Auskunft zu Ersatzteile		3		5				Mittel	
29.08.2018	09:57:50	A	Partner (SHK)	Erstatzteil Bestellung		1	Ersatzteil Versand	2	Ersatzteilbestellung			Mittel	
29.08.2018	09:48:20	A	Endkunde	Terminvereinbarung		2		2					
29.08.2018	08:55:21	A	Partner (SHK)	Technische Unterstützung		2		0				Mittel	
29.08.2018	08:19:38	A	Partner (SHK)	Technische Unterstützung	USV	4		0					
27.08.2018	15:47:05	A	Partner (SHK)	Auskunft zu Ersatzteile		4		0				Mittel	
27.08.2018	15:27:37	A	Partner (SHK)	Auskunft zu Rechnung		4		0					
27.08.2018	15:24:36	A	Partner (SHK)	Technische Unterstützung		5		0				Mittel	
27.08.2018	15:02:43	A	Partner (SHK)	Technische Unterstützung		7		0				Mittel	
27.08.2018	14:52:58	A	Partner (SHK)	Technische Unterstützung		11		0				Mittel	
27.08.2018	14:41:51	A	Partner	Störung		6		2		Einfach vor	keine	Mittel	

Datum	Zeit		Kunde	Thema				Aktion	Ort	Alternative	
27.08.2018	13:22:09	A	Partner (SHK)	Technische Unterstützung	15	Disposition	1	Email schreiben			
27.08.2018	12:46:02	A	Partner (SHK)	Terminvereinbarung	5	Disposition	3	Email schreiben			
27.08.2018	11:58:56	A	Partner (SHK)	Technische Unterstützung	2		0				
27.08.2018	11:57:49	A	Partner (SHK)	Technische Unterstützung	3		0				
27.08.2018	11:50:20	A	Partner (SHK)	Erstatzteil Bestellung	4	Ersatzteil Versand	2	Ersatzteilbestellung			
27.08.2018	11:42:40	A	Partner (SHK)	Technische Unterstützung	4	Disposition	2	Email schreiben			
27.08.2018	11:21:58	A	Partner (SHK)	Störung	3		0		Einfach Telefonisch	per ServiceWiki	
27.08.2018	11:07:37	A	Partner (SHK)	Technische Unterstützung	5	Ersatzteil Versand	3	Ersatzteilbestellung			Mittel
27.08.2018	10:59:33	A	Partner (SHK)	Erstatzteil Bestellung	4	Ersatzteil Versand	5	Ersatzteilbestellung			Mittel
27.08.2018	10:54:39	A	Partner (SHK)	Technische Unterstützung	2		0				
27.08.2018	10:52:41	A	Partner (SHK)	Erstatzteil Bestellung	2	Ersatzteil Versand	2	Ersatzteilbestellung			
27.08.2018	10:46:07	A	Partner (SHK)	Auskunft zu Ersatzteile	2		0				
27.08.2018	10:42:18	A	Partner (SHK)	Technische Unterstützung	2	Disposition	1	Email schreiben			
27.08.2018	10:26:58	A	Partner (SHK)	Technische Unterstützung	3		0				
27.08.2018	10:18:09	A	Partner (SHK)	Auskunft zu Ersatzteile	3		0				Mittel
27.08.2018	10:13:12	A	Partner (SHK)	Störung	2	Disposition	1	Email schreiben	Einfach vor Ort	keine Alternative	
27.08.2018	10:11:26	A	Endkunde	Technische Unterstützung	1	Technische Support	1	Email schreiben			
27.08.2018	10:09:25	A	Endkunde	Auskunft zu Services	3	Disposition	1	Email schreiben			
27.08.2018	10:05:34	A	Endkunde	Technische Unterstützung	4		0				Schwer
27.08.2018	10:01:25	A	Partner (SHK)	Auskunft zu Ersatzteile	4		0				
27.08.2018	09:52:38	A	Partner	Erstatzteil	4	Andere	0	Sonstige			

			(SHK)	Bestellung						
27.08.2018	09:49:25	A	Partner (SHK)	Terminvereinbarung	2	Disposition	1	Email schreiben		
27.08.2018	09:45:53	A	Endkunde	Terminauskunft	2		0			Mittel
27.08.2018	09:41:33	A	Endkunde	Technische Unterstützung	4	Disposition	1	Email schreiben		
27.08.2018	09:33:26	A	Endkunde	Technische Unterstützung	5	Disposition	2	Email schreiben		
27.08.2018	09:28:33	A	Partner (SHK)	Technische Unterstützung	3		2			
27.08.2018	08:36:13	A	Partner (SHK)	Technische Unterstützung	1		0			
27.08.2018	08:21:17	A	Partner (SHK)	Terminvereinbarung	1	Disposition	1	Email schreiben		
27.08.2018	07:57:58	A	Partner (SHK)	Technische Unterstützung	4		0			Schwer
27.08.2018	07:52:38	A	Endkunde	Erstatzteil Bestellung	5	Ersatzteil Versand	3	Ersatzteilbestellung		
27.08.2018	07:42:53	A	Endkunde	Technische Unterstützung	4		0			
27.08.2018	07:38:16	A	Partner (SHK)	Auskunft zu Ersatzteile	2	Ersatzteil Versand	2	Nachfrage		

Appendix 2: Technical support target process, detail level 3

Technical Support

Servicehotline malfunction

pick up phonecall and receive information (customer, malfunction number, ...)

call for information from ERP Software

Who is the customer?

Endcustomer with partner → Reference to partner

Endcustomer/ SHK

Did the partner solve the malfunction?

No / Yes

"Documentation" (trasmit information about malfunction and solution to ERP)

Documentaion — End

Reading information about malfunction

get additional (history) about device (id = devicenumber)

call for information from ERP Software

receive additional (history) information about device (id = devicenumber)

Is it possible to solve the malfunction with remote maintenance?

No / Yes

Solve the malfunction with remote maintenance

Is device working?

No / Yes

"Documentation" (trasmit information about malfunction and solution to ERP)

End — Documentaion

Problem solveable via Servicehotline?

No / Yes

Contact customer via servicehotline

Attempt to solve the malfunction via servicehotline

Problem solving via servicehotline

Is device working?

No → Scheduling

Yes

"Documentation" (trasmit information about malfunction and solution to ERP)

End — Documentaion

Disposition Software

Receive and process the information (location,...)

Allocation of an identification number to the service order

calculation of optimal dates with service technician

Show disposition the possible dates

send link(SMS, Email, WA,...) with date proposals to the customer

block dates until reveption of customer decision

Did the customer choose a date?

Yes / No

receive choosed date

wait until one day befor the first proposed date

Confirmation of choosen date

Did the customer choose a date?

Yes / No

Date gets the status "Confirmed" and the delete other blocked dates

Inform Disposition

End

Disposition

Read notification with information about malfunction, device and customer

Email/ Contact form HP

Who is the customer?

Endcustomer with partner → Reference to partner

Endcustomer/ SHK

Did the partner solve the malfunction?

Yes / No

"Documentation" (trasmit information about malfunction and solution to ERP)

Documentaion — End

Is it necessary to send a service technician to solve to problem?

Yes → Scheduling

No → Trasmit notification with Information about malfunction to Technical Support

Choose the type of service order and create it

Transmit the information (location,...) to disposition software for scheduling via

See possible dates and start sending notification about dates to customer

Read notification and contact Customer via Servicehotline

Propose possible dates to Customer

receive choosed date

enter choosen date in softwareinterface

End

ERP Software

call for information from ERP Software

call for additional (history) information (id = devicenumber)

transmit additional (history) information (id = devicenumber)

End

creation of service order

Transmit the information (location,...) to disposition software for scheduling via

Documentaion

Store Information about malfunction

End.

Customer

reading the notification about malfunction and possible solving solutions (ServiceWiki)

permission to inform KWB HQ and for remote maintenance?

No / No / Yes

Can Customer solve the malfunction on his own?

Yes / No

Read information about malfunction and that KWB HQ is informed about malfunction

Contact KWB HQ

Solve the malfunction

Contact via?

Email/ Contact form HP

Servicehotline malfunction

Problem solving via servicehotline

follow instructions of technical support

Receive proposed dates and verify himself

Choose one proposed date

End

Conformation of date

Receive phonecall

Choose one proposed date

End

Conformation of date

Comfort Online

technical malfunction

technical malfunction detection by Comfort Online

Has Comfort Online the permission to inform KWB HQ and for remote maintenance without customer knowledge?

No / Yes

transmit notification to customer about malfunction and provision of possible solving solutions

Transmit notification to KWB HQ (ERP) about malfunction

Asking for permission to inform KWB HQ

Transmit notification to customer about malfunction and that KWB HQ is informed

wait for process answer and no further action

End

Solve the malfunction

Measure if device works

Is device working?

Yes / No

Ask for permission to trasmit information about the malfunction to KWB HQ

permission to trasmit information about the malfunction to KWB HQ?

No / Yes

Transmit information about malfunction to KWB HQ

Documentaion

End

Solve the malfunction with remote maintenance

Measure if device works

End

Receive, store and process information (malfunction code, devicenumber, location, owner, ...)

Transmit notification with relevant information (devicenumber, malfunction code, customer information,...) to disposition

End

Appendix 3: Disposition target process, detail level 3