Sample Solutions as First Step to Knowledge Management
A Case Study

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ABSTRACT

Knowledge Management and Customer Care are regarded to be able to strengthen the competitive capability of a company. Knowledge Management is supposed to increase the innovative power for problem solving whereas Customer Relationship Management is supposed to increase the customer satisfaction and thereby the customer loyalty. This case study followed a mixed approach to combine aspects from the Knowledge Management and the Customer Relationship Management. Matter of this study was a small-size organization that had a demand for a ticket system for the 2nd and 3rd level support as part of their customer service. Because of an increasing volume of incoming requests, it was necessary to change the system from e-mail clients to a ticket system. Additionally, the company wanted to assure that all agents are able to process all types of requests in order to keep up good service quality even if the experts are not available. For this reason, the concept of this study was not only to introduce a ticket system, but also to implement a Knowledge Base storing the knowledge how to solve the requests in shape of sample solutions.

The aim of the study was to find out whether such an approach would be possible, what the success influencing factors would be and what effect such an approach would have on the overall Knowledge Management practices. For this purpose the study made use of qualitative research methods, like interviews and observations, throughout the whole project's duration.

As a result, the project was not able to deliver the desired insights completely. The introduction of the pure ticket system was very successful as the employees reported an improvement of their working processes. The Knowledge Base however was not used during the observation period at all. As a standard risk for projects, late hardware delivery, turned into a problem and used up the planed buffers, the remaining time for observation, whether the Knowledge Base would be used or not, was too short. Therefore, it is necessary to do a follow-up study and assess whether the effect only is late or there is no effect. It might even be necessary to prove the approach in another environment, as the studied company very much relies on the personalization approach for Knowledge Management. Because of the well developed communication culture at the studied company, the employees prefer direct communication for knowledge sharing and knowledge transfer. That inhibits knowledge codification as a Knowledge Management approach. This itself, of course is a valuable insight.

Keywords: Knowledge Management, Customer Relationship Management, Customer Knowledge Management, Ticket System, Customer Care

Contents

1   Introduction

The following report describes a project with a lot of different facets. First, the project can be characterized being a Knowledge Management initiative:

In business Knowledge Management has gained a lot of attention during the last years as many companies experience the pressure from increased competition through globalization and they assess knowledge to be of importance for gaining competitive advantages [Suye et al. 03]. Because of such considerations many companies have started establishing conscious processes which are dealing with the corporate knowledge. These undertakings are subsumed under the term of Knowledge Management. Knowledge Management may include the design and operation of special databases which are used to store documented knowledge. The introduction of such a Knowledge Base was one aspect of this project. An introduction on **Knowledge Management** is provided in **section 2**.

The second facet of the project relates to the concept of Customer Relationship Management:

Similar to knowledge the relationship to the customers is assessed to be an important success factor in business [Chal 05]. This relates to the demand being able to serve the customer according to his needs in the best possible way in any situation. Customer Relationship Management is exactly aiming for this. Specific knowledge of the customer as well as of the own organization and its services and products is required for this. The integration of Knowledge Management and Customer Relationship Management into Customer Knowledge Management therefore is a logical consequence [Buer et al. 05]. Therefore, this project's approach combined an aspect of Customer Relationship Management with a measure of Knowledge Management: For the customer service a communication tool, a ticket system, which integrates a Knowledge Base, was introduced to a small company of the telecommunication domain in the North of Germany. The Knowledge Base was meant to store sample solutions provided as help for processing the incoming requests. The underlying concept was to capture these sample solutions for types of requests for which customer care usually would have to seek for help among other departments of the company. These sample solutions were supposed to be stored within the system from which the requests are processed – which is the ticket system. This should have reduced the number of inquiries to other departments and therefore increased the overall processing speed. Introductory explanations of the concept of **Customer Relationship Management** are provided in **section 3**.

From the fact that this project was taking influence on the working processes and the systems, it resulted that this project also is a change project. This is another facet which needed to be considered:

Being a change project, this project had to focus to motivate every single employee to adjust his or hers working processes to the new situation, i.e., to use the new system. In literature many success factors for this are discussed [Nich04], [DeLi03], [BoPl05], [Kara06], [Smit05]. Accompanying to other activities special measures, addressing these success factors, were taken to support the project's success. In this context, it is necessary to also define the project's success, or rather the project's aim, as well as to define the risks threatening the success. **Section 4** on the **Project Characteristics** therefore is concerned with these aspects.

To be able to select a system as the new ticket system and Knowledge Base, it was necessary to capture the requirements the company had for such a system. This reflects the next facet of the project, i.e., selecting a standard software system on basis of the results of a requirements engineering process:

Requirements engineering was conducted as part of a detailed pre-study. The pre-study made use of interviews, observations, and small talk. That way the relevant processes and the requirements for a ticket system which derived from the processes were identified. Furthermore, the Knowledge Management situation at that company has been analyzed in order to be able to assess which impact the project had on the Knowledge Management practices. **Section 5** provides the details on the approach for and the results of the **Pre-Study**.

Thereafter, **section 6** describes the **Implementation of the System.**

To be able to evaluate the project according to its success and the impact on the Knowledge Management situation, the project ended with a project evaluation. **Section 7** contains the **Project Evaluation and Discussion** on the results. Finally, **section 8** draws the **Conclusion** from the project's outcome.

All in all, these facets add up to a case study in the relatively new field of Customer Knowledge Management. It concentrated on the introduction of a ticket system with an integrated Knowledge Base for sample solutions which were supposed to help customer care in providing service to the customers. The matter of research is whether such a mixed approach would be possible and if it would have an impact to the Knowledge Management of an organization. As there is no description of such an approach in pertinent literature, this case study may contribute to reveal some particularities of Customer Knowledge Management.

This report contains detailed descriptions of deep insights about the studied company. Because of ethical considerations, it was decided not to use the company's real name. Therefore from now on, the company is referred to as Company A.

1.1 Terms in Telecommunication Business in Germany

The telecommunication domain in general and in Germany in particular uses some specific terms, which also are used within this report. Additionally, some terms are specific for Company A. At this place these terms shall be explained.

Billing usually describes the process (and the department) of producing the invoices with the data from the telecommunication systems, such as switches.

Customer usually describes another company, which offers a product for the mass market, e.g., a hotline.

An **end-customer** is a person who actually uses a service provided for the mass-market, e.g., a hotline.

Offline Billing is a special way of invoicing calls. The general concept is as follows: An end-customer of telecommunication provider x calls a service number located in the net of telecommunication provider y. This service number has a variable tariff, which telecommunication provider x does not know. Nevertheless, the call is invoiced by telecommunication provider x. To be able to do this, telecommunication provider y has to send the necessary billing data to telecommunication provider x who adds this to the invoice for the customer. For many end-customers it is not clear, how this procedure works, therefore, and because many of the service numbers are very expensive, many requests in business of German telecommunication providers concern this so called offline billing.

Encashment is the process of collecting outstanding debits. In Germany, working as a debt collecting agency, a company has to fulfill special requirements and needs to have a special permission.

T-Com is a short brand name of the former monopolist in the Germany's telecommunication market, the Deutsche Telekom. Many aspects of the telecommunication business in Germany still include the Deutsche Telekom as a process element.

Porting is the process of switching a phone number from one telecommunication provider to another. When changing the telecommunication provider in Germany, like in other countries as well, it is possible to keep the phone number and move it to the new telecommunication provider. To be able to locate the right provider (for purpose of routing phone calls to this number correctly) a central database keeps record of the information when and to which provider the phone number is moved.

Company A uses the term **service provider** for customers that offer phone services like hotlines or information services. These services usually use premium rate service numbers. Company A provides those numbers and operates them whereas the service provider delivers the content.

A **reseller** is a customer who keeps the direct contact to the end-customers and makes use of a telecommunication product provided by Company A. A good example are cable TV networking companies, who want to offer telecommunication products via their nets, but do neither have the

size nor the knowledge to be able to develop and operate telecommunication products themselves.

Interconnection partner and **carrier** are other names for telecommunication providers.

2 Knowledge Management

Knowledge Management, in this study, is seen as a set of deliberate activities and arrangements which try to make relevant knowledge available to the right person at the right moment with the aim to increase the decision making capacity and quality, as well as the innovative power for problem solving. Knowledge Management has gained a lot of attention in the recent past [DaPr00], [Hans et al. 99]. This section intends to provide an overview on the basic concepts of Knowledge Management, its limitations, and different approaches how Knowledge Management can be carried out. Additionally, at the end of this section the approach used for this project is discussed.

2.1 Basic Aspects

Knowing and being able to share knowledge, e.g., through language, probably is a fundamental aspect of mankind. However, analyzing the relationship of being human, being able to know, being able to gain new knowledge, and the language is matter of anthropology and therefore not part of this study. Instead, to provide access to Knowledge Management, knowledge shall be defined first. As this is very difficult, and many researchers and authors have different opinions, other terms are included and their relationships to knowledge are discussed. In the author's opinion, these terms describe a hierarchy in which knowledge is one part.

On the lowest level of this hierarchy is the symbol. Symbols are things like an alphabetic letter, an icon, a hieroglyph, or even something like a gesture or a sound. Without context a symbol does not represent a thing. A cross itself has not much meaning. A cross on a map could mark the spot where a treasure is hidden. This is the case, when the map is a treasure map. The context defines the meaning of the symbol.

Data is on the second level of the hierarchy. Data is a combination of symbols, e.g., figures. Data – similar to symbols – without context has no meaning. A table full of figures does not represent anything unless the person reading it identifies the table as the sales data of the last month, for instance.

The third level of the hierarchy is built by information. Information is another set of symbols. Additional to data, information is able to trigger something, or has an impact. Again, the context is important. Looking at the same table of sales data, this table is information only if the person looking at the data is able to relate the table's content to an area of interest, for instance.

Finally, knowledge builds the top of the hierarchy. Knowledge is not only the mere knowing of data or information, but the deep understanding of what the data and information means and also how it can be used to do something. Knowledge is the basis for problem solving and decision making, for instance.

Figure 1 on page 5 shows this hierarchy of symbols, data, information, and knowledge. Something can be symbols, data, information, and knowledge at the same time. This is depending on the ability to interpret something and the context in which it is presented. An example shall illustrate this relationship: Meteorological measurements are presented in figures. These figures are nothing else but symbols. For a meteorologist, figures on things like temperature, barometric pressure, wind speed and direction, or cloud patterns certainly are data, as he would be able to identify them as belonging to his domain. As he would be able to understand those things and would know what they mean, they are information too. And finally, he would be able to draw conclusions and use the information, e.g., for a weather forecast. That would make it knowledge to him. For anybody, not being a meteorologist, these things just mentioned certainly also are symbols as he can recognize them. Additionally, they are data, as he might understand them in the sense that he knows they belong to the meteorology domain and describe the current state of the weather at some place. They even might be information to him, as his own actions might be influenced. This could be the case if the data represent the current weather conditions at a place he might want to go to. The weather conditions might
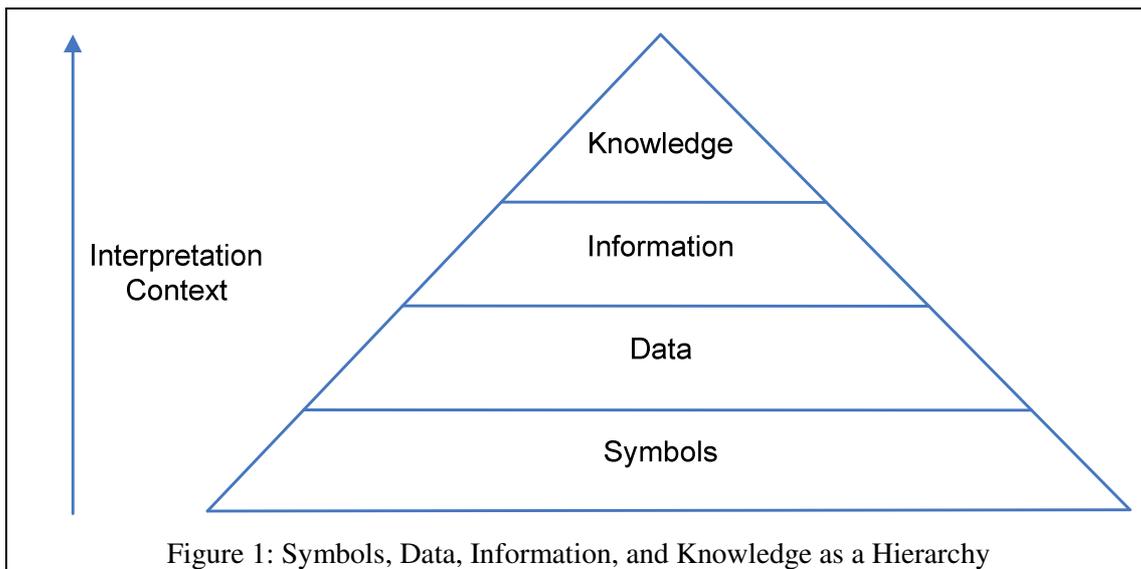
Figure 1: Symbols, Data, Information, and Knowledge as a Hierarchy

cause him not to go, if the weather is really bad. However, it is doubtful that he would be able to perceive the mentioned values as knowledge. He would not be able to do anything meaningful with the reported weather conditions. This example shows that the previously mentioned ability to interpret something is related to the knowledge one has in the specific field: The meteorologist has a wide knowledge of meteorology. Unlike the other person, he is able to understand reported weather conditions in a way that he is able to relate them to the knowledge he gained in this domain. From the view presented here, this is a general pattern: To be able to interpret symbols, one needs the knowledge what they mean. The alphabet is a set of symbols, for instance. For the interpretation of a word as a set of symbols, one has to know the alphabet and the language the word is written in. The same relationship between knowledge which is already present and new things is valid for the other levels of the hierarchy. The already present knowledge elevates something up in the hierarchy of symbols, data, information, and knowledge. How far something is elevated depends on the available knowledge. The example of the weather observations shows that the meteorologist is able to elevate the observations much higher in this hierarchy than somebody from outside the domain would be.

It was previously mentioned that there is no common definition of knowledge. Stenmark provides a good overview on the different views some well known researches in the field of Knowledge Management have on this issue, i.e., how to distinguish data, information, and knowledge (compare [Sten02], Table 1 on page 6).

The definitions of data show several different views on data and they all differ from the view presented in this study. This may be the case as with symbols another level has been introduced. Spek and Spijkervet define data as "not yet interpreted symbols" [SpSp97]. Without any interpretation, symbols remain symbols. As discussed above, there is some knowledge necessary to transform symbols into data. Quigley and Debons regard data being "text that does not answer questions to a particular problem" [QuDe99]. This definition has a very narrow scope, as it focuses on text only. Additionally, it is problematic linking anything to a problem. The example of the weather conditions shows that there is the possibility for something being data without a direct connection to a problem. Davenport and Prusak define data as "a set of discrete facts" [DaPr00] and Choo et al. define data as "facts and messages" [Choo et al. 00]. From this work's point of view, the classification of data being facts is wrong. Data itself can hardly be facts, but represent facts. In that sense data is regarded as measured values. This leads over to the last definition Davenport provides, data being "simple observations" [Dave97]. This is closer to the view presented in this work. However, this is extended by some more aspects: Data are observations of facts or events in shape of values or descriptions.

The definitions of information provided by the different authors have in common that they all regard the information itself to include the aspect necessary to distinguish between data and information. This perspective does not describe the character of information sufficiently. As

discussed above the same thing can be data or information depending on the receiver and his knowledge about the issue. Wiig's definition of information being 'facts organized to describe a situation or a condition' [Wiig99] therefore defines data. The definition by Quigley and Debons is narrowing the scope too much on text only. In their opinion information is "text that answers the questions who, when, what, or where" [QuDe99]. The four definitions ("a flow of meaningful messages" [Nona95], "data with meaning" [SpSp97], "data with relevance and purpose" [Dave97], and "data vested with meaning" [Choo et al. 00]) all have in common the aspect already mentioned: They all miss the extension "for the receiver". The only definition that includes this aspect is the one by Davenport and Prusak: "A message meant to change the receiver's perception" [DaPr00]. The problem with this definition is that it focuses only on messages and relies on the intention of the sender of this message. In this report, information is understood as interesting and meaningful data in the eyes of the receiver that has an impact on him.

Probably it is impossible to give a deterministic definition of what knowledge really is. Knowledge in the eyes of the cited authors is about truths, beliefs, concepts, commitments, and experiences. This all includes almost philosophical aspects. Davenport and Prusak provide a more descriptive definition of knowledge:

"Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluation and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms." [DaPr00]

This definition, although vague and descriptive instead of precise and deterministic, contributes to the understanding of what knowledge is: First of all it relates knowledge to experience. Knowledge therefore is connected to something that someone experienced in the past. This means that participation is an important aspect of knowledge. Including values into the definition shows that knowledge also depends on the individuality. Part of this is the general perception that is depending on personal and cultural imprint. The personal background influences the perception of the surrounding world. The contextual information picks up an aspect that has been mentioned before: The context being important to elevate something in the

Table 1: Definitions for Data, Information, and Knowledge (according to [Sten02])

Author(s)	Data	Information	Knowledge
Wiig	-	Facts organized to describe a situation or a condition	Truths and beliefs, perspectives and concepts, judgments and expectations, methodologies and know-how
Nonaka	-	A flow of meaningful messages	Commitments and beliefs created from these messages
Spek and Spijkervet	Not yet interpreted symbols	Data with meaning	The ability to assign meaning
Davenport	Simple observations	Data with relevance and purpose	Valuable information from the human mind
Davenport and Prusak	A set of discrete facts	A message meant to change the receiver's perception	Experiences, values, insights and contextual information
Quigley and Debons	Text that does not answer questions to a particular problem	Text that answers the questions who, when, what, or where	Text that answers the questions why and how
Choo *et al*.	Facts and messages	Data vested with meaning	Justified, true beliefs

hierarchy of knowledge and the ambiguity of knowledge and information. Expert insight addresses a deep understanding of something. This adds nothing new to the definition. Expert insight is nothing else but knowledge itself. The "framework for evaluation and incorporating new experiences and information" addresses the ability for interpretation of new things. Finally, the definition states that knowledge only can be created in the mind and that it only can be applied in the mind. This seems contradictory to the statement that knowledge should be embedded in routines, processes, practices, and norms. However, the routines, processes, practices, and norms are designed by knowers. This does not mean that they represent all the knowledge that was necessary to design them. Doing something the one or the other way is expression of the knowledge that the way picked is reasonable.

As the result of this discussion Table 2 presents an overview of the definitions on symbols, data, information, and knowledge.

Table 2: Definitions for Symbols, Data, Information, and Knowledge

Symbols	Symbols are entities recognizable by one of the senses (especially by vision, hearing, and the sense of touch) representing something the designer of the symbol wants to present.
Data	Data are observations of facts or events in shape of values or descriptions.
Information	Information is interesting and meaningful data in the eyes of the perceiver that has an impact on him.
Knowledge	"Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluation and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms." [DaPr00]

2.2   Tacit and Explicit Knowledge

Researchers and authors often distinguish between several types or categories of knowledge (compare [Krog et al. 98]). Although this all is relevant in several situations, here the focus is kept on the categorization according to the possibility to express knowledge only. Polanyi was the first to define the category of tacit knowledge [Pola66]. Tacit knowledge is characterized by being hard to express [Nona94]. Common examples for tacit knowledge are music (how to play the piano), arts (how to paint a picture), or sports (how to play golf) [Krog et al. 98], [DaPr00]. For these types of activities it is hard or even impossible to express how this should be done best. This limits the possibility for knowledge transfer and for the capturing of the knowledge outside people's minds, e.g., in documents. For the knowledge transfer of tacit knowledge special strategies are necessary. Learning how to play golf, for instance, requires an intensive guidance through a teaching professional and continuous practicing. An interesting aspect about this is that it seems impossible to write down how to play golf, but it certainly is possible to teach and to learn how to play golf. This means that a transfer of knowledge is possible also for tacit knowledge [ScJo01]. This example shows that transfer of tacit knowledge requires direct conversation or interaction.

Explicit knowledge on the other hand is knowledge that can be expressed by words (or some sort of structured language) rather easily [DaPr00]. Explicit knowledge can be found in shape of, e.g., textbooks, documents, process descriptions, manuals, and diagrams. Therefore the transfer of explicit knowledge is much easier: Someone seeking for knowledge would be able to gain access to it by reading those documents, for instance.

The borderlines between knowledge being either tacit or explicit are not sharp [GaRi05]. Knowledge always has tacit and explicit aspects. Depending on the possibility to express it, the knowledge is more tacit or more explicit rather then just tacit or explicit. Additionally, it is possible that only parts of the knowledge are tacit whereas other parts are explicit. Figure 2 on page 8 provides a visualization of how knowledge can consist of tacit and explicit parts at the same time or can be tacit and explicit to certain degrees, respectively. The ordinate represents

Figure 2: Tacit and Explicit Aspects of Knowledge
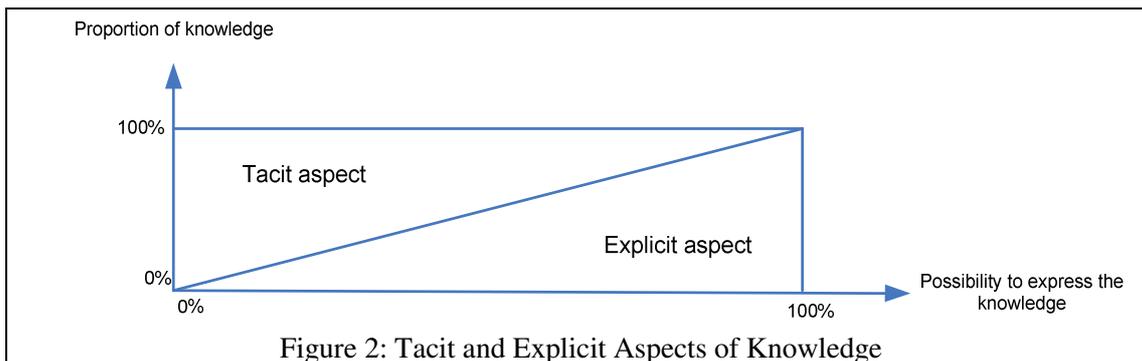
the proportion of knowledge being either tacit or explicit. If, e.g., 80% of the knowledge is tacit, 20% necessarily is explicit. The abscissa represents the possibility to express the knowledge. For this example, it would be possible to express the knowledge up to 80%.

The difference of how tacit and explicit knowledge can be transferred has a severe impact for the Knowledge Management approach. There are two major strategies for Knowledge Management, i.e., codification and personalization. These two strategies are matter of the next section.

2.3   Codification and Personalization

Making knowledge available for those who seek knowledge is the most important aspect of Knowledge Management. Because of the two general types of knowledge, knowledge being either more tacit or more explicit, there are two general strategies for Knowledge Management [Hans et al. 99]. These strategies are either the codification strategy or the personalization strategy [Hans et al. 99].

The codification strategy relies on storing the organization's knowledge in documents. There are some important advantages of the codification strategy: By codifying knowledge, it is available whenever someone needs access to it [Hans et al. 00]. This is independent of the availability of the person who originally owned, gained, or codified it. This also includes the aspects of fluctuation. The risk for an organization of loosing valuable knowledge when someone leaves the organization can be reduced by codifying the knowledge. However, the codification strategy also bears some problems and limitations: Not all knowledge is expressible (compare section 2.2 and [DaPr00]). Tacit knowledge or the tacit elements of knowledge are by definition hard or impossible to express. This relates to the risk of losing some aspects of the knowledge through codification [DaPr00]. Probably it is an impossible undertaking to codify all of an organization's knowledge. Furthermore, judged from experience documenting is not very interesting and often employees are not able to spend the time necessary. This means that motivating the employees to contribute to the company's documented knowledge needs special attention and management has to provide the extra time that is needed for documenting [Hans et al. 99]. Following the codification strategy, the organization has to provide a place where to store the documents. This place usually is called a Knowledge Base or Knowledge Repository. A Knowledge Base is a designated database for collecting items of an organization's knowledge. It contains documents describing concepts, ideas, solutions, articles, processes. It also might contain white papers and manuals. A Knowledge Base allows structuring these items of organizational knowledge and supports the user in finding required knowledge.

The second strategy for Knowledge Management is the personalization strategy. The personalization strategy relies on the direct communication between the knowledge owner and the person seeking for knowledge [Hans et al. 99]. Instead of looking for documents containing the requested knowledge, someone seeking for knowledge has to address the knowledge owner. The knowledge then is transferred by person-to-person communication. The major advantage of the personalization strategy is that there is no extra effort necessary to capture the knowledge. On the other hand, the knowledge only is available when the knowledge owner is available. This includes the risk for the organization to loose valuable knowledge when somebody leaves the organization.

Independent of the respective strategy, a problem for the knowledge seeker in both cases is the localization of the required knowledge. The documents or the knowledge owners have to be known as a potential source for the requested knowledge. One approach to fulfill this request is the development of knowledge maps. Knowledge maps are presented in the next subsection.

2.3.1 Knowledge Maps

Finding the appropriate knowledge is a major concern when thinking about Knowledge Management [DaPr00]. It does not help a lot to have a large variety of sources (in shape of documents and smart people), when the person desperately seeking for knowledge does not know where to look for it. It even might happen that the person has no idea the knowledge would be available within the own organization. "I didn't know we had people doing that!" is how Davenport and Prusak describe this phenomenon [DaPr00].

An approach to overcome problems like those just described, is the use of knowledge maps. Knowledge maps can take several shapes. An actual map would display areas of knowledge and their sources or how different knowledge areas relate to each other. "Yellow pages" and expert locators are tables that define knowledge entities and a link to their source (e.g. documents and persons). All different types of knowledge maps have the aim to display the know-how, the know-what, the know-who, and the know-why [Eppl01]. The knowledge map, in contrast to a knowledge repository, does not store the knowledge itself, but shows the path where to find requested knowledge [DaPr00]. Knowledge maps are relevant for both Knowledge Management strategies, i.e., codification and personalization [Suye et al. 03].

2.4 Knowledge Management and Enabling

As defined in section 2.1, knowledge strongly is connected to humans' minds. This makes knowledge something intangible. The question that derives from this is whether knowledge can be managed at all: "to manage" means "to handle or direct" [@MWODb]. This means that someone only can manage what already is there. The knowledge creation in this context cannot be managed, but has to be enabled. "To enable" means "to provide with means or opportunity" [@MWODa]. In the Knowledge Management context, both views are applicable. However, as knowledge itself is intangible, only their carriers, i.e., documents and owners, can be managed. Knowledge Management has to include both parts: the mere management and the enabling. Knowledge enabling in this context includes several activities and arrangements. The first aspect of knowledge enabling is to establish so called knowledge markets [DaPr00]. As any market, knowledge markets also serve as a forum for buyers and sellers to meet each other. Knowledge markets can be internal markets (within an organization) as well as external markets (spanning over more than one organization) [DeAw03], [Ment et al. 06]. Establishing those markets, management has to consider all kinds of possibilities for employees to meet each other and ways for – preferably – direct communication [DaPr00]. This includes, but is not limited to, design of the workplace (office layout), conference rooms, places for informal meetings (lunch rooms, place of water cooler) [DaPr00]. Additional, it addresses the corporate culture concerning meetings, conferences, and management's attitude to small talks [DaPr00]. Within environments where direct conversation is not always possible, e.g., because of geographical separation, communication technology can substitute direct communication to a certain degree [DaPr00]. Phone, e-mail, audio- and video-conferencing systems, chat, newsgroups, and discussion boards are just some examples of available systems. This all addresses the organization's capability for knowledge transfer or the flow of knowledge. An important aspect Davenport and Prusak emphasize is that people are not willing to share knowledge without expecting anything in reply. This means that knowledge markets have their own pricing system. A pre-requisite for any "dealing" of knowledge in this context is trust [DaPr00]. Both, the knowledge seller and the knowledge buyer, have to trust each other. This is necessary as giving away knowledge in the eyes of many people means to give away power [DaPr00]. Trust helps to overcome this friction as the seller would not have to fear that the buyer would use the knowledge to weaken the seller's position in the organization. Beside

trust, as pre-requisite, there are the different currencies which influence the willingness for knowledge sharing [DaPr00]:

- Repute
  For some knowledge sellers, reputation is a sufficient reason for sharing knowledge. They want to be recognized as a valuable source of knowledge. Davenport and Prusak argue that this may also increase the job security, or aid a promotion [DaPr00]. Above all, repute provides credits for the second possible pricing mechanism, reciprocity.

- Reciprocity
  A reason for someone to sell knowledge could be that he expects to get credits for the sharing of his knowledge. When reciprocity is involved, the seller would expect to be able to buy knowledge in return for the knowledge he shared himself. Being a well known knowledge seller, i.e., having a reputation as knowledge seller, advances the own position as a knowledge buyer [DaPr00]. In this work reciprocity is regarded as the number one currency for knowledge markets.

- Altruism
  Finally, there is the possibility that someone just likes to help others. This could also include the sharing of knowledge [DaPr00]. People with this trait of character do not expect something in return for sharing their knowledge.

2.5   Knowledge Management Initiatives

Many Knowledge Management initiatives are reported having no meaningful effect [Yoaf04]. In this section, the main of the enablers and disablers for successful Knowledge Management initiatives described in literature are presented. This is especially important, as for the design of this case study these influencing factors were assessed with the aim to make this project as successful as possible. Factors influencing the Knowledge Management initiative's success can be categorized in six areas:

- Knowledge Management and Business Strategy
  A very important factor for a Knowledge Management initiative's success is to develop a Knowledge Management strategy that goes align with the overall business strategy [Alha et al. 06], [Hans et al. 99]. Hansen, Nohria, and Tierney especially emphasize the personalization and codification strategy (compare section 2.3). According to them, companies offering standard processes, products, or services should look for the codification strategy, whereas companies with many different and individual products and services should look for the personalization approach. Additionally, organizations shall develop clear business goals for Knowledge Management [Ghas et al. 04]. Such a business goal helps to focus on that knowledge which is important for the organization [Ghas et al. 04] and helps to define reasonable and realistic objectives for the Knowledge Management [Rawi04].

- Top Management
  Top management's commitment is important for any type of project. DeMarco and Lister identify the lack of top management commitment and support as a common risk for any project [DeLi03]. The top management's commitment is especially important, as top management decides about additional budgets and resources for projects in general and for Knowledge Management in particular [McBu04], [DaPr00]. During the project's progress therefore it is important to secure and check for top management's support [Rawi04], [StBa00].

- Knowledge Analysis
  For any meaningful Knowledge Management, first the important knowledge has to be identified [Ghas et al. 04]. This means that the organization shall identify which type of knowledge is important and should be captured or shared [Ghas et al. 04]. A potential disabler of successful Knowledge Management in this context is an overload [Mesa04]. Many companies tend to capture everything, independent of whether it is meaningful or not [Ghas et al. 04]. Another aspect of the knowledge analysis is the assessment of the

available knowledge in order to identify gaps that need to be closed [Ghas et al. 04]. This goes along with the definition of business goals mentioned above.

- Environment
  Literature puts a lot attention on the environment in which the Knowledge Management initiative is launched. The environment has to foster communication, cooperation, and learning [Alha et al. 06]. This might require changing the organizational design [McBu04]. Especially the behavior and relationship of knowledge sellers and buyers are important for successful Knowledge Management [Ghas et al. 04]. Potential disablers in this context are a knowledge hoarding culture [Mesa04] and general lack of a common language [Mesa04], [DaPr00]. To stimulate the organization's member to share their knowledge, it has to be ensured that everybody understands the advantages of sharing knowledge [StBa00]. This and mutual trust between the organization's members (compare section 2.4) are important pre-requisites for successful Knowledge Management [DaPr00].
  As direct contact for knowledge sharing and transfer cannot be substituted by technology tools in all cases [DaPr00], virtual and mobile workforces are further potential disablers [Mesa04]. Closely connected to this aspect is the lack of time for meetings and the lack of meeting places [DaPr00], which is an indicator for an under optimized infrastructure [Mesa04].
- Reward system
  According to Davenport and Prusak, people do not share knowledge without expecting something in return. Therefore, organizations have to reward knowledge sharing [DaPr00]. However, Gal states that many reward systems for knowledge sharing are not effective as they do not relate the reward individuals' performance enough [Yoaf04]. DeMarco and Lister do not recommend any reward systems in team orientated organizations, as they call them 'teamicide' [DeLi99].
- IT
  Any exclusive focus on IT systems for Knowledge Management will not lead to successful Knowledge Management [Pick04], [Bate05], [DaPr00]. Knowledge Management should make use of adequate IT systems, but should not be technology driven [StBa00].

For this project, the six areas of disablers and enablers presented in this section are addressed in more detail as part of the pre-study in section 5. A general aspect of a Knowledge Management initiative is that it is a change project. This aspect is discussed in more detail in sections 4.1 and 4.4 on the project's characteristics and project's risks respectively.

2.6   Knowledge Management Approach for this Project

This project intended to follow what Huysman and de Witt suggest as "Second Wave of Knowledge Management" [HuWi04]. The observation Huysman and de Witt take from their study on Knowledge Management initiatives, is that many initiatives are facing resistance [HuWi04]. Initiatives from the "first wave" are ignoring the individuality-aspects of knowledge and the power the individual has over his or her knowledge: *"…people will only share knowledge if there is a personal reason to do so. As knowledge owners, people have the power to decide if, when, how, and with whom they will share knowledge. It is an illusion to think that these decisions can be forced upon individuals."* [HuWi04] Bates addresses the same point: Knowledge Management initiatives are successful, when knowledge sharing is immediately understood of being valuable by those who are supposed to share their knowledge [Bate05].

The first wave of Knowledge Management in this context was driven by top management with the aim to achieve a competitive advantage with the Knowledge Management. A reason for this most probably is the hype that was created around Knowledge Management. In the recent past Knowledge Management was initiated because it was "in" – and with unrealistic expectations [Rawi04]. The second wave as described by Huysman and de Witt has to look more for the individuals: All the activities around Knowledge Management (transfer, sharing,

codification, etc.) shall be done when there is a need to, not because top management says so [HuWi04]. Bates calls this the "What-is-in-it-for-me-approach" [Bate05]. The Knowledge Management is done buy those who own and need knowledge [HuWi04]. Knowledge Management in this context has to focus on the enabling and stimulating aspect. The similar suggestion by Bates is to emphasize the advantages of knowledge sharing and to create an environment in which knowledge sharing is supported [Bate05].

Another important aspect is the question with which size to start with Knowledge Management: Either to start organization spanning or start in a functional department. Raub and Wittich emphasize that Knowledge Management is a gradual process [RaWi04]. This means that a Knowledge Management initiative can not deliver a complete Knowledge Management in one step. Davenport and Prusak state that any Knowledge Management program should start with a pilot [DaPr00]. This was the concept for this project: To start small and observe whether it would be possible to make Knowledge Management grow by only planting a small seed.

2.7   Summary

Knowledge is an elusive target for definition. It is connected to symbols, data, and information. Together these four entities form a pyramid in which knowledge is at the top. To move something up in this pyramid contextual knowledge is required. Knowledge is related to experience, to personal values and beliefs, and the cultural and personal imprint. Together these aspects form the framework which determines how someone perceives what is meant to be knowledge and his ability for understanding and interpretation.

Knowledge often is characterized to be tacit or explicit. Tacit knowledge is difficult to put into words, whereas explicit knowledge is easy to express. Instead of knowledge being either tacit or explicit, it combines tacit and explicit aspects. Knowledge therefore is either more tacit or more explicit. From this classification, two main strategies for Knowledge Management have evolved: personalization and codification. The personalization approach is applicable for knowledge being more tacit and relies on enabling the communication between the members of an organization. In this context, communication is regarded as only possibility for knowledge transfer. The codification strategy on the other hand relies on writing down knowledge to documents. This is only possible for knowledge that is easy to express, i.e., explicit knowledge. In both cases, it is necessary to have a method to identify the knowledge available and the source where to find it. For this purpose, often knowledge maps are used. Knowledge maps are searchable (key words, type of knowledge, topics the knowledge relates to) repositories which point to the source of knowledge.

As knowledge is intangible, Knowledge Management has to include the aspect of knowledge enabling: Knowledge enabling is the undertaking to design the workplace, provide infrastructure, and to shape the organizations culture in order to facilitate a rich and open communication. This includes to establish markets for knowledge transfer and to consider the different relevant currencies for these markets: Repute, reciprocity, altruism.

Knowledge Management initiatives have to evaluate the business strategy, top managements commitment, the knowledge's structure, the corporate culture, an appropriate reward system, and the use of supporting IT systems. Depending on this evaluation, the initiative has to be designed according to the specific situation. This project is designed as a small initial step of Knowledge Management and looks at the individuals and the advantage the employees can gain from sharing their knowledge.

3   Customer Relationship Management

The increasing pressure on business due to globalization and technological development makes it necessary for companies to differentiate from their competitors. One approach for this differentiation is Customer Relationship Management [Chal05]. Customer Relationship Management is the strategy of focusing on the customer, the cross-functional view on all customer-related processes, and the aggregation of all customer-related data, information, and knowledge. This section provides an overview on the concept of Customer Relationship Management. Furthermore, the importance of knowledge for successful Customer Relationship Management is discussed.

3.1   Basic Concept

The basic concept of Customer Relationship Management (CRM) integrates several activities and functional departments in one customer orientated view [ChPo03], [FoSt01], [Bose02]. Customer Relationship Management includes marketing, sales, and customer service [Buer et al. 05], [Chal05], [ChPo03], [Gold00]. Together, the three functions define a lifecycle of the service or product the customer uses or intends to use [Buer et al. 05]. Figure 3 displays the elements of Customer Relationship Management and how they form up this lifecycle. The customer can be addressed through various media. Nowadays, the electronic media gain more importance every day and for Customer Relationship Management they are playing a key role [Chal05]. Important electronic points of contact are the internet, e-mail, phone, and fax (compare Figure 3; [ChPo03]). Additionally, the traditional points of contact (e.g., letter, store, representatives) are important as well [ChPo03]. For the customer it shall not make any difference which way of communication she selects [Crei00]. Whether it is by phone or going to a store, the agents shall be able to deliver the same service. Changing the tariff for the mobile phone shall illustrate this: A customer wants to change an aspect of her mobile phone contract. She can do this online, could call her mobile phone provider and talk to an agent, or she could go to a store of her mobile phone provider and talk to a shop man directly. From the Customer Relationship Management view, she should be given the same attention and offered the same products. To be able to do this the organization has to organize the data, information, and knowledge on the customer and the own organization (e.g. products and services) in a certain way, so that they are available at any place and time. This shows the importance of information technology for Customer Relationship Management. Although Customer Relationship Management is more than the implementation of an IT system, without an appropriate IT system, Customer Relationship Management would not be possible [Chal05], [Bose02]. This is

Figure 3: Customer Relationship Management ([ChPo03])
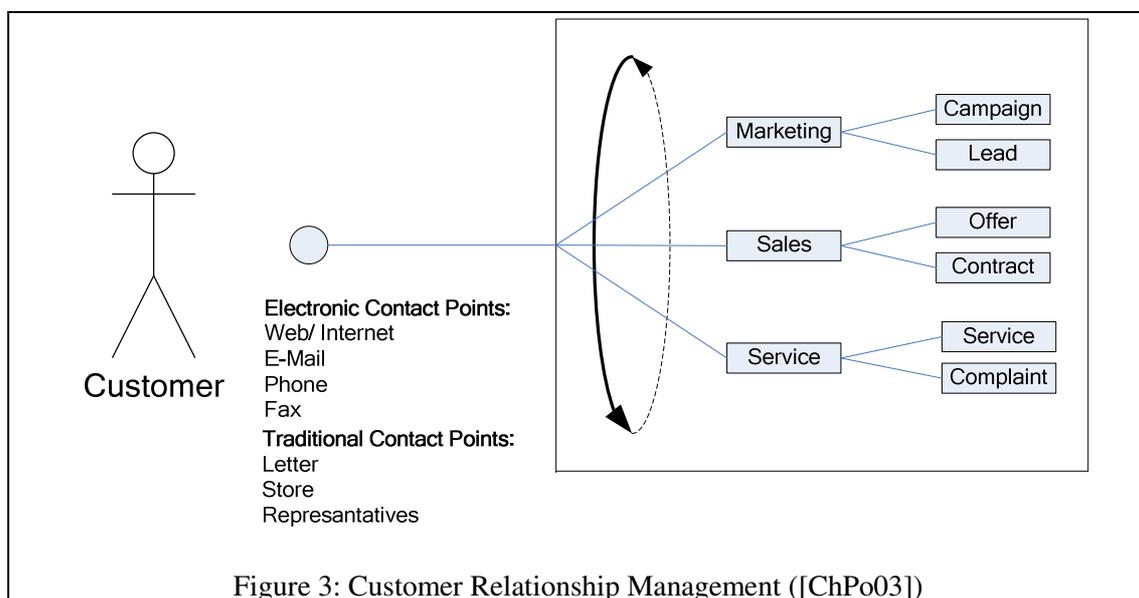
the first aspect of Customer Relationship Management: The integration of several different contact points [ChPo03]. The second aspect is the integration of marketing, sales, and service [Buer et al. 05], [Bose02]. The marketing process starts with addressing a potential customer via a campaign. Lead management consolidates the information on potential customers as a starting point for sales [Buer et al. 05]. Within the sales process the offers are developed and in case the customer is convinced by the offer, sales create and maintain the contract [Buer et al. 05]. The service process finally includes the general services that are part of the product or are related to the product, and the complaint management that handles the customers' complaints. The professional handling of the service tasks and especially the complaints is recognized as corner stone in long term customer loyalty [Griff03], [Grön00]. As winning a new customer usually is assessed to be more expensive than keeping an existing customer, customer service is important for the overall success of the company [ChPo03], [DeAw05]. Loyal customers will come back for new products and services [Gold06]. This aspect completes the Customer Relationship Management lifecycle: An existing and loyal customer can be addressed with a new campaign.

3.2   Customer Care, Service Desks and Help Desks

In the previous section the service was identified as one important aspect of Customer Relationship Management. Within organizations, this service often is centralized in an organizational unit. Different names for these organizational units are Customer Care, service desks, or help desks. According to Dawson, Customer Care shall act as a mediator between the customers' interests and the company [Daws06]. This means that Customer Care works as a single point of contact, or as a gateway, for all service related requests from customers. Therefore, Customer Care preferably answers (and solves) the incoming requests. If this is not possible, Customer Care has to forward the request to the appropriate experts within the organization [Hekl05]. With the feedback of these experts Customer Care can solve and answer the requests. Requests in this context can be anything from a simple question to a product, up to a notice about dysfunctions of systems or a complaint about the quality of a product.

It is obvious how important Customer Care's ability, to solve requests by themselves is: Any forwarding to experts would distract those experts from other tasks and would cause a loss in performance in giving feedback to the customer. How knowledge and information can prevent this from happening is discussed in the next section.

3.3   The Importance of Knowledge for Customer Orientated Processes

In a previous project (the development of a small tool for Customer Relationship Management) the head of sales requested additional text fields for the data-records on contact persons. Those fields were used in an astonishing way: The head of sales collected things like which football team the customer was supporting. Being asked, what he used this knowledge for, he stated that he uses this knowledge as starting point for small talk. The aim of chatting about the latest football results and how the favorite team of the customer performed at the weekend was to create a pleasant atmosphere and to start the ongoing sales activity from some sort of common ground. Although in business many things are supposed to be purely rational, humans do not stop being humans. This means that mutual sympathy also is a decision influencing factor. The proper use of personal knowledge like which football team the customer supports in this context, in the end could make the difference in the customer's purchase decision. Of course much more knowledge is relevant for customer orientated processes. Anything related to the customer as well to the own organization and its products and services is of importance. The employees being in contact with customers have to know about the customer's needs, wishes, and previous experiences in order to address him in the appropriate way [Buer et al. 05], [Gold05]. Additionally, there is the process orientated knowledge: Customer service agents need to know, how to provide the requested service (e.g. to solve a problem, to answer a question). Therefore, Customer Care needs the support of the whole organization [Daws06]. This means that the other parts of the organization have to contribute to

the customer service in those cases where Customer Care has not the required knowledge or expertise. Knowledge Management therefore has gained a lot attention in the context of Customer Relationship Management [Flei04], [Hekl05], [Daws06], [Holl02]. Bueren, Schierholz, Kolbe, and Brenner even make the suggestion of an integration of Customer Relationship Management and Knowledge Management: The Customer Knowledge Management [Buer et al. 05]. The concept of this approach is to provide the agents with the knowledge they need to serve the customer [Buer et al. 05], [Herr03]. Another important aspect is the job satisfaction, as Hollman points out. For Customer Care agents, the job gets more existing and interesting, when they are able to solve a broad variety of requests without having to ask a specialist every time [Holl02].

3.4   Ticket Systems

A common tool for customer care processes are ticket systems [Grun04]. Other names for a ticket system are trouble ticket system or ticket request system. Main tasks of these systems are to capture the incoming requests, to assign the requests to appropriate employees for processing, and the tracing of the progress [Grun04], [Scha99], [JaUn98]. An important aspect of the system is the ticket itself. The ticket presents all information belonging to a certain request. This includes who is the source of the request, the description of the problem or request, and the documentation of all activities that are undertaken to solve the request, as well as all communication events that belong to the request (e.g. phone calls and e-mails). Tickets usually are generated from incoming e-mails (automatically) or from phone calls, fax messages, and letters (manually by the agents) [Wint03]. The ticket systems allow structuring incoming requests. This is especially important in case not all agents are able to process all types of requests. For this purpose, ticket systems usually provide a mechanism (often referred to as queues) where the different requests wait for their processing [Grun04]. Finally, ticket systems allow monitoring the progress a ticket takes. In case the duration for processing is too long, alerts or notifications are generated. This mechanism is known as escalation. A typical lifecycle for a ticket (representing the request) is shown in Figure 4. The first state a ticket can take is "new". From this state, the ticket is assigned to an agent. This happens in the moment the agent opens a ticket which is in his area of expertise. The agent may in some cases decide that the ticket has to wait for a while. When this deliberately shall happen, the ticket moves to a pending state. This prevents the ticket from escalating, i.e., the system would create alerts or notifications that the ticket takes too long for being processed. When the agent has resolved the request, the ticket is closed. However, it may happen that the customer is not satisfied with the solution. Then the ticket would be reopened.

Figure 4: Ticket Lifecycle
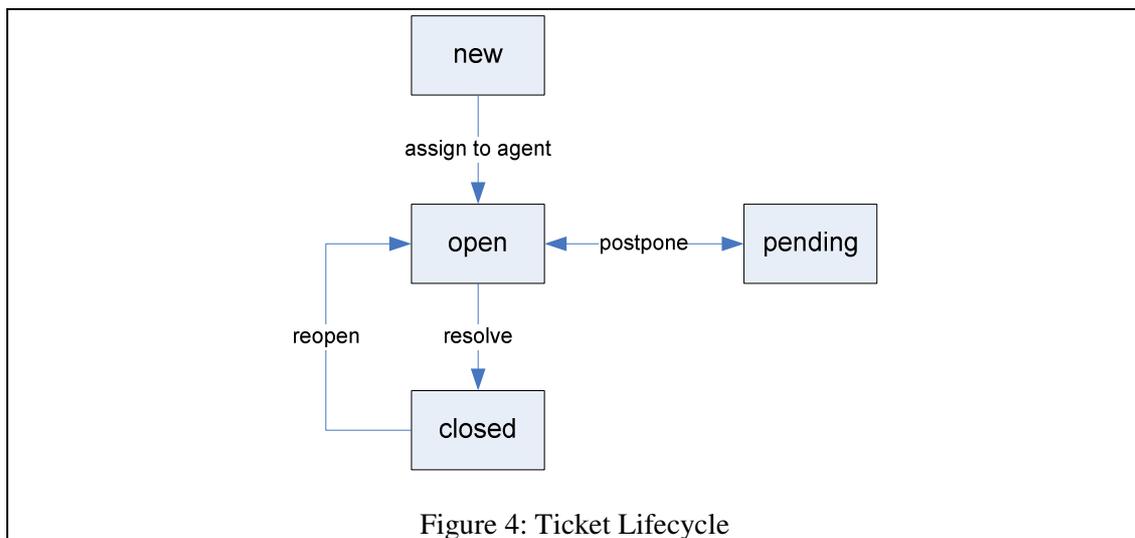
3.5   Knowledge Base Functionality of Ticket Systems

Many ticket systems recently have implemented a Knowledge Base[1]. Very often this Knowledge Base has the shape of a FAQ base. FAQ (meaning frequently asked questions) is a concept that emerged during the internet age. It tries to prevent the same question to be asked over and over again (by different persons) by providing answers to common questions at designated place on a web-page, for instance. FAQ bases in ticket systems contain descriptions of known problems or common requests customers have. Additional to the problem's description, it contains the description of a possible solution, of course. Those How-To-Dos are meant for the customer care agents. Some of the systems allow publishing the FAQs to the organization's web-page [Flei02], [Holl02]. The idea to let the customers find the answers to their questions themselves (by browsing through the FAQs online) is an appealing one. However, it will not "prevent" customers from getting in contact with the company directly. This is especially true for companies that provide products which are used by people without a specific relationship to new technologies, the internet in particular. Additionally, there are requests that are not simple questions but problems, e.g., dysfunctions, which need special attention.

For this project the approach was not looking for the frequently asked question to be published on the company's web page. This task had been completed already. Also, those constantly recurring problems and questions were not of interest. There simply is no need to capture everyday's requests and answering those questions does not require any additional knowledge. What had been addressed during this project was what one may call casual and seldom asked questions. Those requests only appear once in a while. When this happens, the agents have to look for help through the organization and have to disturb experts of the area the requests relate to. To prevent this from happening again the agents were encouraged to capture what was necessary to solve such a request. This would allow the agents to look up this description in case this type of problem recurs.

3.6   Summary

Customer Relationship Management is the conceptual view on marketing, sales, and service as one single customer orientated process. It integrates different activities, organizational departments, and communication media into a complete concept. The aim of Customer Relationship Management is to increase the quality of any customer related processes and to provide an optimal attendance of the customers at any stage of the lifecycle starting with marketing activities, continuing with sales, and ending with service. A special role for customer satisfaction, and therefore for long term customer loyalty, plays the customer service. Customer service often is centralized in one functional department, but has to make use of the company-wide knowledge about the customer and the own products and services. Therefore, this knowledge has to be available for customer service to enable processing incoming requests at high speed and quality. Any forwarding to specialists would cause a delay. This aspect reveals the importance of knowledge for customer service processes.

Often ticket systems are used as a tool for processing the requests of customers. Ticket systems allow capturing incoming requests and provide structure and other mechanisms to ensure an outright processing of the requests. These ticket systems recently have been extended by Knowledge Bases. This project focuses on storing knowledge in such a Knowledge Base that contains sample solutions which help with the processing of incoming requests.

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[1] E.g. OTRS (www.otrs.org), Omnitracker (www.omninet.de), Ticketxpert (www.ticketexpert.net) , i-net HelpDesk (www.inetsoftware.de)

4 Project Characteristics

Projects have in common to be unique. In order to succeed with a project, this uniqueness has to be considered. This section therefore provides a discussion on those issues that make this project a project and how these issues are addressed. This includes the research design, the study context, and the risks.

4.1 Research Design

The subtitle of this report already identified this project being a case study. At this point, this classification shall be justified. To be able to do this, first the research activities are presented: In the first phase, the current state of Knowledge Management was analyzed. This included also the attitudes towards knowledge sharing and knowledge codification. Additionally, the demands for the ticket system were collected. These tasks were carried out as interviews, group interviews, and observations (compare section 5). The first phase ended with the selection of a ticket system.

In the next phase, the ticket system was set up, i.e., the system was customized according to the needs of the organization. Furthermore, the related Knowledge Base was prepared for population with sample solutions. During this phase training and support for the use of the system was provided. Observation of how the employees reacted and how they use the system is the main research method of this phase (compare section 6).

Finally, the changes during the project concerning the daily work of the employees, the attitude towards knowledge sharing and knowledge codification were analyzed. To uncover the desired information, a questionnaire, statistics from the system, and observations were used (compare section 7).

The appliance of these methods characterizes this project as a qualitative case study [Cres03]. Creswell provides several characteristics which make this classification possible [Cres03]:

- The research takes place at the participants' site. This gives the chance for thorough analysis and understanding of the participants' experiences, beliefs, and behavior.
- Qualitative research relies on interactive and humanistic methods for data collection. This study made use of observations and interviews.
- Many aspects within a qualitative research emerge during the study. They are not pre-designed. Depending on the situation the researches it confronted with, it might happen that aims and objectives are changed during the study.
- The collected data is interpreted by the researcher. The data is gained through interviews and observations. The recognition of this data is an individual process. It is not possible, to carry out an objective interpretation.

Besides being a case study, this project also is a change project. And as "people hate change", as DeMarco and Lister point out [DeLi99], this aspect needs some special consideration. Change often causes resistance by those people who are affected by the change. In a previous project, the author of this study conducted, this aspect has been neglected. For this reason, the system that was implemented there had very little acceptance only. Learning from this experience and following the "Do's" for change projects, as presented by Karacsony [Kara06], therefore was one objective for this project (in addition to the primary aims and objectives listed in section 4.1.1). The Do's are:

- Involve all staff from the beginning.
  This aspect was picked up as part of the pre-study (compare section 5).
- Communicate the reason for the change often and explain the benefits of the change.
  The demand for the ticket system is something that emerged from inside the company and through first talks delivered the immediate feedback that the system is appreciated very much. For this reason no measures to remind the employees at Company A of the reason were taken.
- Address concerns as they arise.

This aspect also was part of the pre-study (compare section 5).

- Explain that training will be provided to ensure that everyone can perform successfully. The project included training sessions before the launch of the system.
- Reassure staffers that there will be support after the launch date to help with problems. During the time after the system's launch, a main activity was helping with the usage of the system. Additionally, this issue was especially addressed as probable cause for a lack of commitment to use the system (compare risk R5 in section 4.4).

4.1.1 Aims and Objectives

The aim of this research project was to find out which factors influence the success of a Knowledge Management initiative and how the introduction of a ticket system can be utilized for the introduction of Knowledge Management awareness.

The objectives (formulated as questions) were

- What is the current state of Knowledge Management practices at Company A?
- What are the attitudes according to Knowledge Management aspects (creation, codification, sharing) that can be found in the organization?
- How do the Knowledge Management practices and knowledge awareness change after the implementation of the ticket system?

4.1.2 Validity and Generalization

As this study is a qualitative research project, validating the findings of this study needed some consideration. The common methods applied in qualitative research, such as interviews and observations, always bear the risk of misunderstandings. This risk becomes apparent through questions like "Did the interviewee understand the question correctly?" and "Was the answer understood correctly?" Furthermore, the risk for incompleteness is present: "Were the relevant questions asked?" To overcome these risks, Creswell suggests using the following strategies [Cres03]:

- **Triangulation** makes use of several different sources for information to build up a consistent representation of the actual situation that is studied [Cres03].
  In this study, all employees at Company A were interviewed. In addition to the interviews, also observations and small talk were used. This ensured to shed light on the matter of interest from all sides.
- **Member-Checking** takes results (e.g. a report or an interview transcript) back to the participants (e.g. an interviewee) to ensure that the document represents the truth from the participants point of view [Cres03].
  All interview transcripts were given to the interviewees for approval before they were processed any further. Moreover, some members of the organization were interviewed twice. In case of any uncertainties, it was possible to ask about this in small talks, to ensure the accurate picture of the matter of interest was taken.
- A **rich, thick description** of the findings is supposed to transport some of the particularities in shape of shared experiences to the reader [Cres03].
  A large part of this report describes Company A and the findings gained through studying Company A.
- **Negative issues** concerning the study object are also something to expect. To increase the credibility of the study it is necessary to include these negative issues in the presentation [Cres03].
  At several places negative aspects are mentioned and discussed. Especially the discussion on risks (compare 4.4) and the findings of the pre-study (compare 5) address negative aspects.
- **Prolonged time** spent at the studied organization helps to achieve a deeper and better understanding of the study object [Cres03].

During the project's duration the researcher was working at the company's office on a fulltime basis. This gave the opportunity to understand the domain and the company, but especially to develop a basis of mutual trust with the employees at Company A.

As presented, several measures were taken to increase the validity of the findings. From this perspective, the validity was expected to be very high. More problematic is the possibility for generalization: As this is a case study, a generalization is very difficult. Study object is one single organization of a very particular domain from one society. From that point of view a well founded generalization is not possible. For a generalization, a study would have to assess several case studies of the same type, but from different organizations. For a broad generalization, it would be necessary that those studies additionally are from different domains and different societies.

4.2　　Related Work

In this section the classification of this study in the context of academic work from the fields of Knowledge Management, Customer Relationship Management, and the newly evolving field of Customer Knowledge Management.

This project is an initiative with the aim to introduce conscious Knowledge Management to a small company. Thereby, this project is related to numberless Knowledge Management initiatives, which had to fulfill the same task. Analyses of the success or failure of these initiatives are already part of scientific libraries. In this work, the success factors, found by those analyses, are discussed in section 2.5. In section 2.6 the approach for this study, following the so called "Second Wave" of Knowledge Management initiatives [HuWi04], has been presented. This approach is being characterized by focusing on the advantage the individual can gain from Knowledge Management. Therefore, the motivation to contribute to Knowledge Management is of special importance. This approach of Knowledge Management does not focus on managing very much and certainly avoids enforcing something. Instead, it focuses on creating environment that assists and fosters Knowledge Management. Providing a structured repository for storing knowledge documents can be regarded as part of the environment in this context [Bate05], [DaPr03].

Despite the classification of this study being a Knowledge Management initiative, this study also deals with the service aspect of Customer Relationship Management. The focus in this context is put on the service quality, which in this project is defined by processing speed and the complete solution of the incoming requests. In section 3.3 the relationship between Knowledge Management and the service aspect of Customer Relation Management has been discussed. At this place, this relationship shall be revived, since this study is especially concerned with the "Customer Knowledge Management", as this field is named by, e.g., Bueren, Schierholz, Kolbe, and Brenner [Buer et al. 05]. The importance of Customer Knowledge Management from both points of views, as research area and as important for competitive advantage in business, already has been identified ([Buer et al. 05], [DeAw05], [FeTi05], [Gebe et al. 03], [Gibb et al. 02], [RoHa05], [Salo et al. 05].

Basically, three different types of Customer Knowledge are differentiated [DeAw05], [FeTi05], [Gebe et al. 03]:
- **Knowledge about the customer** is about the customer's motivation, wishes, expectations, requirements, and previous experiences, and therefore valuable source for addressing the customer appropriately.
- **Knowledge from the customer** is about products and services of competitors in the market, and therefore valuable source for suggestions for new ideas and improvements.
- **Knowledge for the customer** is about the products and services which are offered to the customer.

In this study, only the knowledge for the customer is addressed, as the project is aiming to provide knowledge on how to solve customers' requests relating to services provided by Company A. Frameworks for successful Customer Knowledge Management point out the importance of the cross-functional process orientation [Buer et al. 05], [Gebe et al. 03]. This

project introduces a process-assisting ticket system. This system incorporates the different aspects: Knowledge Management in shape of knowledge for the customer, the service aspect of Customer Relationship Management, and the cross-functional process-orientation.

As many ticket systems have recently been enlarged by Knowledge Bases (compare section 3.5), the general approach, to integrate a ticket system and a Knowledge Base, certainly is not new. Searching for case studies on introducing ticket systems that include Knowledge Bases on the other hand delivered no results[2]. Even though the search has been conducted thoroughly, combining several different combinations of different terms, it is possible that related case studies are missed. However, having not found a single case study this way indicates that this field has not been studied intensively.

4.3   Company A

Company A was founded 2004 and is located at one single office in the North of Germany. Among the shareholders are some of the employees, especially the top management. Additional shareholders are from the region the company is located in.

Company A is a small telecommunication provider operating its own telecommunication network. They offer access to this network and related services to cable networking providers (television), who want to extend their own portfolio with voice and internet products. Usually those cable networking providers miss the necessary infrastructure and knowledge for entering the telecommunication market. In this area of business, Company A handles about 120.000 end-customers.

Another area of business is any kind of service phone numbers: Free phone numbers, shared cost numbers, premium rate numbers, and offline billed services. Company A in this context provides the technical infrastructure whereas the content (the service which can be accessed with the respective number) is provided by other companies, the service providers. In total, Company A handles more than 370.000 end-customers in this area of business.

From these two areas of business, most of the incoming requests result. In total Company A processes about 200 request each day. These 200 requests split up to the different channels (phone, fax, letter, e-mail). Relevant for the ticket system are about 100 requests a day that reach the company by e-mail.

Clearing is another service, Company A provides. Clearing is closely related to the area of offline billing. Company A in this context helps other telecommunication carriers to identify the customers who have made use of an offline billed service provided by that carrier. For this purpose, Company A operates a database with the porting information of all phone numbers in Germany. This database allows finding the customer by the phone number and the responsible telecommunication carrier. With this information it is possible to do an accurate invoicing.

The next area of business is the service of a system house in the area of telecommunication services. This is a consulting service meant for telecommunication providers of all kind that need help with special issues. This includes but is not limited to law and regulation, engineering (voice networking), and process engineering.

The last area of business is the encashment of outstanding debits. This service is closely connected to the other areas of business and completes the portfolio for service provider and cable net carriers.

This portfolio finds its representation in the formal organization of Company A (compare Figure 5 on page 21). Engineering is the organizational unit that plans, realizes, and operates the telecommunication infrastructure. Within the Engineering unit there are two teams. One team is concerned with the planning and the other is concerned with the operation. However, this separation of the teams is not valid for all projects or any type of projects. The IT unit plans, realizes, and operates the computer based systems. These are systems that transport and process the data the telecommunication systems deliver. Additionally, such things as the client

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[2] Basis of the search have been journal databases (like Emerald, IEEE, Springer, ACM), Meta-Search tools (Electronic Library Information Navigator – ELIN@Blekinge by Blekinge Tekniska Högskola) and internet based search engines (http://scholar.google.com).

administration and general IT support (printer, software, etc.) are part of their work. Billing is responsible for processing all relevant data (call data) and the invoicing of this data. Customer Care's task is to provide the service for the customers for all type of requests a customer might have. Accounting is concerned with the bookkeeping. As many issues require a consideration from a perspective that includes law and regulation aspects, there is a Law unit. Some aspects of the encashment also are strongly connected to this unit. Finally, Sales is concerned with the acquisition of new customers.
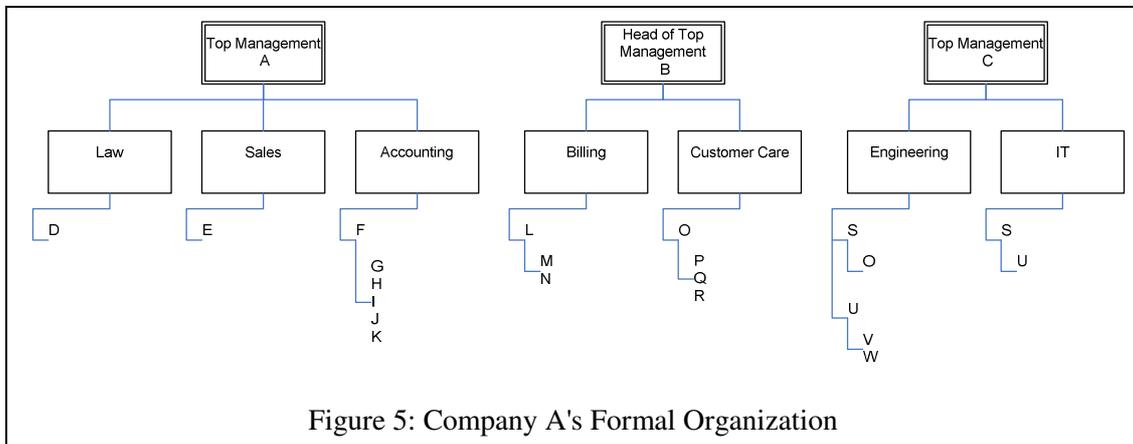
Figure 5: Company A's Formal Organization

Company A looks back on a very rapid development during the last three years. In 2004 the company started with 8 employees. Currently, Company A has 28 employees. It is planned that in the end of 2007 Company A will employ 38 persons. Even more impressive is the development of the financial figures: The annual turnover increased from 1.6 million Euro in 2005 up to 13.3 million Euro in 2006. Table 3 provides an overview of these key figures for the years 2004 to 2006 including the target values for 2007.

Table 3: Company A's Key Figures

	2004	2005	2006	2007
Annual Turnover	5 T€	1.602 T€	13.320 T€	25.800 T€
EBITDA	-514 T€	-649 T€	3.097 T€	4.150 T€
Total Assets	2.273 T€	4.854 T€	9.470 T€	12.250 T€
Employees	8	15	25	38

4.4   The Project's Risks

As there were some major risks connected to this project, it is reasonable to shed some light on those risks. The first important aspect of any type of risk management is the risk identification. Boehm points out that you can only manage what you know about [Boeh91]. For risk identification there are several different methods, like checklists (risks from previous projects aggregated in a list of common and probable risks), brainstorming (interactive group sessions with the aim to stimulate each other to think about probable risks), experts (domain experts who help to identify project specific risks) [Boeh91]. Risk management is a project escorting process that continuously tries to identify risks, to analyze risks (impact according to schedule and costs), to develop coping strategies (such as emergency plans), to plan for necessary buffers (extra time and money), and to monitor the risks [DeLi03]. As previously noted, risk management needs more than just the risk identification. However, the risk management aspect is not the primary aim of this project or this report. Therefore, the presentation of the risks is somewhat limited to their characteristics and how they were addressed. In that sense, this section does not represent an ideal risk management process.

To be able to define risks for the project, first of all it is necessary to define the project's success. This is not an easy task, as there are two perspectives: The perspective of Company A

and the academic perspective. From the company's point of view, the implementation of the ticket system and its active use is the criterion to decide whether the project was successful or not. From the study's perspective, being able to give answers to the aims and objectives of this study is the criterion for success of this project. As the aims and objectives are formulated as open questions (compare section 4.1), even negative answers (e.g., it is not possible to initiate Knowledge Management utilizing a ticket system) are a successful outcome of the project. The following discussion includes the risks for the project's success from both perspectives. The risks were identified from a risk checklist, a brain writing (brainstorming as an individual process), and by the interviews that were conducted as part of the pre-study (compare section 5).

R1 **Timeframe and scope of the project**: The implementation of a ticket system, the analysis of the current Knowledge Management practices, and the analysis of the change impact all in all have a dimension which is very big for a project of 20 weeks duration. This risk was addressed by extending this timeframe: The literature study was completed before the actual project began. Additionally, there was extra time planed after the completion of the project at the company to be able to finish writing the report. Additionally, for the project a milestone planning was done, to be able to identify delays early and to take according measures.

R2 **Resistance**: Both parts of the project, the ticket system and the Knowledge Base, have something in common: The ticket system provides increased transparency on what has be done and who has done it. The Knowledge Base provides increased transparency on how things are done. For both systems to be successful, it is necessary that the employees make intensive use of it. This means that they have to be willing to share what they know and how they work. They also must not be afraid of others looking into their day-to-day work. The risk is hard to address, as it depends very much on the trait of character of the persons. The whole approach of this project however addresses this risk, as it emphasizes the advantages every person gains from sharing knowledge (compare section 2.6).

R3 **Key personnel not available**: At a very early stage of the project it became apparent that the head of IT due to workload would not be able to care about the ticket system and how it shall be integrated in the system environment within the first month of the project. As this person was very busy generally, the risk that he would not have been able to attend the project at later stages was evident. This risk in deed materialized, as DeMarco and Lister name a risk turning into a problem [DeLi03]. On one hand it was impossible to bypass this person's competence and on the other hand he was not available. One attempt to increase this person's commitment (and thereby to gain some of the limited time), was to look for a system he had favored, Microsoft CRM 3.0. This system however is not appropriate as a ticket system. In total the friction losses and the additional evaluation of the MS CRM 3.0 and analysis of possibilities for customizing caused a delay of about four weeks. Even though, this risk in the end did not cause a failure, it would have had the power to do so. This risk is a good example for showstoppers (compare [DeLi03]). DeMarco and Lister recommend communicating those risks up in the hierarchy to make them visible on the next management level. This does not prevent the risk from turning into a problem, but it helps to some extend to discharge oneself from the failure. In this case, it was decided not to follow this recommendation. The reason was to prevent the head of IT to get the impression being defrauded or groundlessly accused – this would have made cooperation difficult. Actually, this was a very bad situation. The "solution" was to stay patient.

R4 **Hardware not available**: This risk relates to risk R3. As the head of IT also is responsible for the hardware procurement, a late hardware delivery was very likely to happen. To overcome this risk, a top management member responsible for IT has been addressed. Additionally, to the late procurement, the system supplier was not able to deliver in time. In total, this problem caused a delay of about 6 weeks according to the original schedule.

R5 **Lack of commitment to use the ticket system**: Some employees might lack the commitment to use the ticket system. That would put the whole system at stake as one

single employee not using the system would cause the system to be meaningless as the tasks of this employee would not be fulfilled. This risk was addressed by several ways. First of all, one of the pre-study's aims was to get all people involved early in the project (compare sections 4.1 and 5.1). Many employees were concerned about this issue and brought it up during the interviews that were part of the pre-study (compare section 5). This indicates the appreciation of the risk. Because of this risk a set of requirements for the system evaluation has been defined. They all address the usability of the system (compare section 5.4). Finally, the project included training and support for the usage of the system. This also addresses the willingness of the employees to use the system.

R6 **Lack of commitment to use and to contribute to a Knowledge Base**: Actually, this was not a risk of this project; this was matter of this project. As a Knowledge Management initiative of the "Second Wave", this project was designed to stimulate knowledge codification and sharing. More about this approach already has been discussed in section 2.6. The overall result is discussed in sections 7 and 8 in more detail.

R7 **The demand for a Knowledge Base exceeds the capability of a FAQ-Database of a ticket system**: During the pre-study it became evident that Company A has a much bigger demand for a Knowledge Base than it was expected. Basically all employees mentioned that they want to codify much more of their knowledge (compare section 5.3). For knowledge beyond sample solutions however, the FAQ-Databases of ticket systems are not appropriate. The discussion of this aspect led to the conclusion that Company A needs both: A FAQ-Database as part of the ticket system for the sample solutions and a more sophisticated Knowledge Base for other different types of knowledge. The reasoning for this assessment is the different structure and characteristic of the knowledge. Whereas the sample solutions usually follow a symptom-problem-solution-approach, other types of knowledge need a much more flexible structure. This knowledge is more of the type of system and process documentation. Additionally, the sample solutions shall be available right at hand for the employees when processing incoming requests. Searching for the sample solutions in another system would reduce the efficiency. The different target groups and the different structure of the knowledge allow operating two independent Knowledge Bases.

4.5   Summary

In section 4 the project characteristics have been discussed. The project has been classified as a case study. The used qualitative research methods (interviews, group interviews, and observations) as well as other characteristics (research at participants' site, interactive humanistic methods, and interpretation of the collected data) led to this classification. This study is not only a case study, but also a change project, as the way of working is supposed to change with the introduction of the ticket system. Change projects require special attention, as people might resist the change. This requires involving everybody from the beginning, communicating the reason for the change, addressing concerns, and providing training and support.

Further points in section 4 were the aims and objectives. The study aimed to assess success influencing factors of a Knowledge Management initiative, which tries to integrate the introduction of a ticket system and a Knowledge Base in one project. For this purpose, the Knowledge Management situation is assessed. To ensure the validity of the study, it made use of triangulation (to assess the matter of interest from different point of views) and member-checking (to ensure that captured information represent the interviewees' opinions properly). The possibility of generalization is limited due to the fact that this case study only represents findings from one environment.

Section 4 also included the classification of the study in the research context. This case study relates to the Second Wave of Knowledge Management initiatives as well as to Customer

Relationship Management and the newly emerging field of Customer Knowledge Management. Focus in this area is on cross-functional process orientation. Introducing a ticket system and a Knowledge Base in one system hardly is new, as those systems are available. However, there were no related cases studies found that describe a comparable attempt.

Moreover, section 4 presented the study object: Company A is a telecommunication provider which handles about 500.000 end-customers. Major areas of business are the market of premium rate services and providing telecommunication services to cable networking providers to enable them to provide telecommunication services to their end-customers.

Finally, the project risks were discussed. These risks mainly are the size of the project itself, which is very big and therefore might exceed the possibilities of 20 week duration. This risk was addressed with planning for buffers. The second area for risks is lacking commitment or resistance to use the system. This risk was addressed by paying special attention to involving the affected people and to the usability of the system. The risk of not available key personnel the related risk of late hardware delivery actually turned into problems and caused a delay of about 8 weeks in total.

5 Pre-Study

An important aspect of this project is the analysis of the Knowledge Management situation at Company A. The situation before the project is assessed with a pre-study. In this section, the aim, the design, and the findings of the pre-study are presented.

5.1 Aim of the Pre-Study

First of all, aim of the pre-study was to discover the company's requirements for the ticket system. There are many ticket systems available and the concept was to select one of those standard systems instead of developing a new ticket system. To be able to choose an appropriate ticket system it was necessary to understand the requirements. For this purpose basic requirements engineering was done. The second important aim of the pre-study was to asses the Knowledge Management situation at Company A.

To be able to perform this pre-study meaningfully, an important task was to get to know the domain specific issues and the company's processes. This was necessary to understand the specific language, the use of the systems, as well as the organization and the corporate culture. Although the telecommunication domain in Germany was not totally new to the author, this company and some of the services it provides were. Therefore, some time was spent to "get into" the company and domain. This was assisted by the layout of the office and "My seat" (compare Figure 6), which allowed listening to the employees talking and chatting with each other.

Finally, getting all employees informed and involved as early as possible was another aim of the pre-study. The necessity for this has been discussed in a previous section (compare section 4.1).

5.2 Approach of the Pre-Study

For the pre-study mainly three different techniques were used. The techniques that were applied are described to be successful for requirements engineering (compare [KoSo98], [HiDa03], [Robe01]) and for ethnography (compare [Cres98]).

Observation

In the very first phase of the pre-study the employees who are involved in the customer orientated communication processes were observed. Observation was used to get into the company and to get a first impression of the communication processes. Additionally, observing is an appropriate method to understand peoples' interaction with systems and the requirements they have [Robe01]. Observation also has the advantage to save the time of the observed persons as they may continue with their daily work [HiDa03]. During the complete project, observation had been continued. Later, the thinking aloud technique was used to understand the different processes in detail. The thinking aloud technique asks the observed persons to commentate what they do and how they do it [KoSo98]. Hereby, the observing person can develop a better understanding of what is done exactly [Rowl04]. The borderlines to interviews get blurred, as it is common that the observing person asks questions during a thinking aloud session.

Small Talk

Small talk at the first view does not seem to be a scientific research method. However, also small talks can help to develop a better understanding of the studied issues. Just as the importance of arenas for knowledge transfer is emphasized by the discussion of Knowledge Management (compare section 2.4), small talks make use of the same principle, the direct communication. The advantage of small talk is that it emerges out of the situation and – as there is no agenda – by chance may touch issues none of the participants would have thought about. Small talk was used to verify and clarify findings from the interviews and from the observations. The possibility for small talk is facilitated by the company's office layout (open office, compare section 5.3).

Interviews

Interviews were the basis for the pre-study. Three different types of interviews were conducted. The first type of interviews was looking for the communication processes the different teams are involved in. Interviewees for these first interviews were team leaders and members of the teams. In total seven interviews took place. The results are presented in Appendix D. Within the interviews a template to capture the different aspects of the communication process was used. This template ensured that no aspects were left out. Additionally, the filled out templates were carried back to the teams for member-checking (compare section 4.1.2). The template is orientated to how use cases often are described [KoSo98], [Jaco87], [Somm04]. This includes looking for involved persons, necessary information, used systems and tools, triggers, pre-conditions, post-conditions, interferences, variants, the volume (i.e. the number of cases), the general description, and a diagram for visualization of the process.

The second type of interviews was addressing the individual assessment according to the project, expectations of the system, and the Knowledge Management situation at Company A. For these interviews, a questionnaire was designed (compare Appendix A). The design of the questionnaire made use of open questions (questions that do not provide the possibility to answer with yes or no only) mainly. As qualitative information was of interest, answers like a simple 'yes' or 'no' would have been of almost no value. Open question provide to possibility for the interviewee to elaborate his answer [RaJo07], [Vint93]. The design of the structure of the questionnaire included a brief description of the project for warm up, questions on the ticket system, the internal communication, and the Knowledge Management culture at Company A. Several aspects were covered by more than one question. This ploy helps to get answers to important aspects even in case the interviewee does not respond to a question. Posing basically the same question just with other words can help to overcome this problem [Vint93], [DeLi03]. In total, eight interviews with top management and team leaders were conducted.

Finally, group interviews with the team members of every team were conducted. The questionnaire for the group interviews was similar to the one used for the interviews with management (compare Appendix A). The reason to have group interviews was that the employees should feel more comfortable in the interview situation [StBe06]. In total, four group interviews with in total twelve team members were conducted.

Field Notes

An important point of qualitative research is to capture the findings [Cres98], [Rowl04]. For the interviews, interview transcripts were taken and the templates for the communication processes as mentioned above where filled out. Issues that were recognized by small talk or observation were captured with the classical pen and paper method and later compiled it to a structured document. The interview transcripts, the communication descriptions, and this additional material are the basis of the following discussion.

5.3   Findings and their Implications for the Project

In this section the results from the interviews with the management, the team leaders, and with the team members as well as from observations and small talks are presented and discussed.

5.3.1   Analysis of the Interviews and Field Notes

In order to be able to analyze the interviewees' answers and what was captured as part of observation and small talk, the following approach, suggested by Creswell, was used [Cress98]: First of all the interview transcripts and the field notes were put into order and arranged according to their sources. This includes distinguishing between the different types of interviews (teams, team leaders, top management). In the second step, the complete material was studied with the aim to identify general aspects and tendencies. This was assisted by the structure of the questionnaires used for the interviews (compare Appendix A). This allowed classifying the answers and notes into categories. These categories are used as sub-headings within the next sections. Then the information that has been arranged was described and

interpreted. This includes the transformation of qualitative information into quantitative information. This was necessary as during the interviews a lot of open questions were asked (compare Appendix A), e.g., "What do you expect from the project?" The answers to this type of questions are not "countable" as it would be with questions that can be answered with "Yes" or "No". Therefore an interpretation that allows quantifying the answers was necessary. However, in many cases the answers were similar. The question "What gets improved in best case?", for instance, delivered nine different areas of improvement (compare Table 5 on page 28). The area of transparency shall be used to describe, how the interpretation was carried out. Some interviewees directly used the term "transparency", when they have been asked about the improvement. Others stated something like: "It shall be possible to find all original requests, to follow all processing steps, and to finally find the answer sent to the customer." This second type of answer also relates to the transparency and additionally to the traceability. In that context, this answer was counted twice.

5.3.2   General Worries, Expectations, and Experiences with Ticket Systems

One part of the interviews was addressing the worries, expectations, and experiences with ticket systems. One reason for this was to identify risks for this project (compare section 4.4). Additionally, directly asking the employees concerns, gives the opportunity to address these concerns and find solutions. That way it is ensured to maintain the employees' commitment.

Worries about the project and the system
In general, the answers concerning this aspect were quite positive. However, nine out of 20 interviewees remarked that it was very important that everybody would use the system. In their opinion a single person not using the system could put the whole project at stake. One interviewee made this concern more concrete when mentioning that there is the risk a person might even deliberately boycott such a system. This both relates to the risks R2 and R5 in section 4.4. In addition it was mentioned by one interviewee from top management that the company integrates a couple of very strong personalities, who have a very own working style and might be displeased by systems (i.e. the ticket system and the Knowledge Base) which increase the transparency of their work and what they know. Furthermore, this interviewee remarked that change always is a potential source for problems, as people – even in case they are used to change and are change drivers themselves – in the first moment do not like it when they have to adapt to new things and change their own way of working. This concern relates to risk R5 und R6, mentioned in section 4.4. The team members do not have any specific worries about the system. All team members (twelve out of twelve) expect an improvement of their day-to-day work and were looking forward to the launch of the system.
The high awareness of the importance of the active use by all members of the organization was something very positive. It ensured that from the beginning the commitment using the system was high. The weakened the probability for the risks R2 (resistance) and R5 (lack of commitment) to turn into problems.

Assessment of the general acceptance
Part of this aspect was already answered within the previous category: Among interviewees from the team leader level there are three (out of eight) who assess the acceptance to be varying. However, five out of eight interviewees expect their team members and colleagues to accept the system and would use it. One limitation is the usability: It was mentioned six times (out of twenty) that for a high acceptance to use the system it is necessary that the system is easy to use. That especially includes the effort necessary to learn how to use it. This concern has been addressed with the discussion on risk R5 (compare section 4.4). Another important point mentioned by the three interviewees from top management was that management has to show its commitment for the system by using it and thereby motivate all employees to use it.

Experiences with ticket systems

Many of the interviewees (nine out of twelve) from the teams already have made experiences with ticket systems. These interviewees assess systems like this as a valuable tool that have shown to be able to improve the process compare to normal email.

Importance of the system

Beings asked for the importance of the system, the team leaders replied that they regard the system to be helpful or important (on a scale from 'bothering me' to 'important'). This goes along with the high expectations of the improvements. Table 4 provides the actual rating.

Table 4: Assessment of the Ticket System's Importance

Important	Helpful	Indifferent	Bothering
4	4	0	0

Expectations for improvements and worsening

The improvements the ticket system was expected to achieve are very high: The system is expected to improve transparency, speed of processing, quality of service, the possibilities for analysis and reporting, and the communication's efficiency and effectiveness. Four interviewees were hoping for improved discipline to give feedback on requests from colleagues. Three interviewees mentioned the effect on the recognition by the customers. They are looking for more professionalism in the day-to-day work and making this visible to the customers. Moreover, there are team members who looking for better structure and overview on requests and an easier way to distribute tasks among the team members. Table 5 on page 28 shows how often the different areas of improvement were mentioned. The improved transparency is the number one expectation for the system as it is mentioned 17 times (out of 20 possible).

On the other hand some interviewees (three from the team leaders and management) fear that the formalism such a system may create can be used to hide oneself behind. The concern was that the system might be used to excuse not having done anything. Statements like "I do not have a ticket for this!" are feared to become common when someone is not willing to cooperate with fulfilling a task.

Table 5: Expectations for improvements

Area of Improvement	Number of Team Members (total 12)	Number of Team Leaders/ Management (total 8)
Transparency	11	6
Speed of Processing	6	2
Quality of Service	3	3
Analysis and Reporting	3	2
Communication's Efficiency and Effectiveness	0	4
Discipline for Feedback	2	2
Structure and Overview	2	1
Divide up the Work within the Teams	5	1
Documentation	3	0

Discussion

All in all there are not too many worries about the new system. As many interviewees had used ticket systems before and had made good experiences with those ticket systems, the general expectation was that there should not be any problems with convincing to use the ticket system. Top management showed their commitment to this project with its initiation and the time they were providing for the interviews. Additionally, top management was aware that they have to show that they use the system themselves. Everybody in the organization was aware of the

reason for this project and the system. Nobody mentioned the worry that the introduction of this system could aim for a staff reduction.

From that point of view, worries have not been a serious issue for the project. Instead, the high expectations for improvements were a potential area for disappointments. Much of what the employees expect from the system (e.g. more discipline in giving feedback within the organization) judging from the observations seemed to be matter of the style of working of individuals and not a problem with communication systems like mail or ticket systems.

5.3.3   Expected Use of the System at Company A

Several questions of the interviews were looking for the expectations of how the system would be used. These questions were aiming on standard and non-standard requirements the ticket system in question has to fulfill.

Processing duration for requests
All interviewees from the teams stated that most requests from customers are solved within one working day. There are only few that take longer. This is not the case for standard requests. However, it happens that requests get lost or out of sight.
The ticket system is not going to change the mere processing speed. However, it is able to provide assistance in structuring the incoming requests according to their priority.

Capturing of solved requests
There is no common way how requests are documented. Two out of four teams capture the request by maintaining the Navision Chronology. The two other teams do not capture anything. Some of the requests reach Company A by phone and are solved immediately. In those cases, nine out of twelve team members are not willing to spend additional time in capturing the problem and what they have done to solve it. This issue needs some consideration for the reporting: As not all requests are captured in the ticket system, it is not possible to provide a complete reporting from the ticket system. That means that for reporting purposes additional statistics have to be maintained for the phone requests.

Type of support provided by the system
The type of support the system shall provide is regarded differently by the team leaders and management. Three interviewees want to use the system mainly for internal communication in cases where a task is not given to one person rather than a team. Then the system is expected to make it easier to divide up the workload and to improve the transparency on who is processing the different tasks. Another group of three interviewees want to use the system for external communication with customers and end-customers. Two interviews define the third perspective that focuses more on the volume of communication and wants to use the system for any communication paths that are used with high frequency.

Internal communication
According to the internal communication, seven interviewees (out of 20) want support for communication paths were some kind of reaction is required. This is especially the case, when a task needs participation of members from more than one team. However, eight interviewees (out of 20) do not want to use the system for internal communication (only in case the communication process includes someone from extern), while one team leader expects the system to become a more or less complete substitution for e-mails.

Workflow support
The opinions whether the system should provide special workflows (predefined steps, a ticket shall follow through the organization) vary from 'not at all' to 'yes, definitely' (compare Table 6). In any case it should be possible to handle a ticket outside specific workflows as well. Some interviewees mentioned that a workflow might develop too much formalism.

Table 6: Workflow Support Required

Yes, definitely	Yes	No	Definitely no
1	11	7	1

It was mentioned once that even though a ticket might follow a predefined workflow the initiator must be able to keep supervision on the ticket.

Task administration
Similar to the workflow support, the opinions on whether the ticket system shall be used to administer tasks vary a lot. Eight interviewees think that it would be useful, to administer tasks for the teams. Nine interviewees would not use the ticket system for task administration. And finally there is a team that even would consider administering all tasks (also personal tasks) with the ticket system.

Project task administration
It is not expected that project management will make use of the system.

Usability of software systems
All interviewees do not have particular problems to learn how to use a new software system. However, being asked about general requirements about the system, number one aspect was the usability. The system has to be easy to use, fast in response, and without a complex structure. Table 7 provides an overview on the systems that were used to identify preferred systems. A "-" represents a negative response, "o" means the system is just ok, and "+" means that the interviewee regarded the system as good. Out of the software that is used at Company A and by the employees at home and how they like it, MS Outlook, MS Word, MS Excel, Firefox, and web mail systems are preferred. This interrogation was aiming for assessing to the different types of clients that are in use for ticket systems. Many systems are web-based. That is why the MS Internet Explorer, Mozilla Firefox, and web mail systems were also on this list. Other systems are imitating MS Outlook or are realized as an MS Outlook Integration. MS Navision and Dialogika are systems that are in use at Company A

Table 7: Preferred Standard Software Systems

Navision	Outlook	Word	Excel	IE	Firefox	Dialogika	Webmailer
----				--	-	-	-
oooo	oo	ooo		oooo	ooo	o	oo
++	++++++++	+++++	+++++ +++++	++++	+++++	+++	+++++++

Specific requirements
Besides other aspects the group interviews were looking for specific requirements. The requirements are presented in section 5.4.

Interfaces to other IT systems
It would be nice if the ticket system would be enriched by data from other systems. However, this was regarded as an area of development once the system is in place. Nevertheless, it would be most helpful if the tickets which relate to an end-customer, whose data are maintained in Navision, are visible in Navision's customer chronology.

Customer and end-customer access
For this aspect there is no clear answer: 14 interviewees do not want that customers or end-customers would have access to the tickets. And four interviewees think that there might be some customers for which it might make sense that they would have access to the tickets. And finally, there are two interviewees who think, customers as well as end-customers should have access to their tickets. An approach that was mentioned was first to look how the ticket system

is used, what the service quality looks like, and then to decide whether to open the ticket system for customers and end-customers or not. Additionally, the suggestion was made that the decision which customers shall have access to their tickets is taken on a case-to-case basis.

Confidential levels for teams or management
The general opinion on this topic is that anything like this is not needed (16 out of 20). Four out of eight team leaders mentioned that confidential information would be kept out of the system anyway. However, one interviewee from middle management thought that for the management level there should be a confidential level. From the teams, there was one team which had a specific concern about confidential levels. Additional to a special level for the team, they consider having different levels within the team.

Discussion
The opinions on how the ticket system is going to be used partly differ enormously. This is especially true for the internal communication between the employees and the use of the ticket system as a task management system. One finding of the pre-study is the cognition of employees that requests are not replied at all or not replied fast enough by their colleagues. This causes the wish for a system which makes it possible to assign a task to someone and continues to remind to answer the request. Therefore, a ticket system might be appropriate for this purpose. On the other hand, a ticket system is meant for mass-communication with customers and end-customers via e-mail. Using the Ticket-System for both functions means to mix up two very different areas. This might reduce the clarity where to find internal and external communication processes. Whether internal communication really was going to make use of the ticket system, was not predictable, but had to be found out once the system is established (compare section 7.3)

Another aspect for deviating valuation is the workflow support the ticket system shall provide. Again, the opinions split almost evenly. The interviewees who were supporting the idea of having workflows stated that workflows on the other hand may cause too much inflexibility. Therefore, in the first step, the ticket system was implemented without any pre-defined workflows. Nevertheless, the system to be selected hast to support workflows.

The access to the ticket system by customers and end-customers via a web-interface was another point which has been assessed differently. A very sensible suggestion was to test whether the system would be reliable and suitable for every day use. Then it is necessary to decide whether access shall be granted and who of the customers and end-customers shall have access. This means that the system has to provide a customer web-interface, of course.

The question for the necessity of different confidential levels can be easily answered with no. This means no extra limitation for the choice of the system. Still, it would not hurt, if the system would allow setting up a sophisticated security- and access-concept.

5.3.4   Knowledge Management Situation

Further questions of the interviews were addressing the Knowledge Management situation at Company A. The questions were especially looking for the informal aspects of knowledge enabling as presented in section 2.4. Therefore, the aspects like the office layout, the communication culture, and mutual trust were addressed by the questions.

Office layout
It was a deliberate decision by management to have an open office layout. Even though the disadvantages (noise, distraction, lack of privacy) are well known, in the opinion of management the advantages outweigh the disadvantages. The major advantage is seen in the direct and open communication the open office layout enables. Another aspect is the flow of information by coincident. It is intended that employees listen to others talking and take part in the discussion when there is something they can contribute to. These are aspects, for which research has found evidence: An open office layout often strengthens the communication, the team work and the overall performance [TeTe00], Figure 6 on page 32 presents the office layout as it is present at Company A.
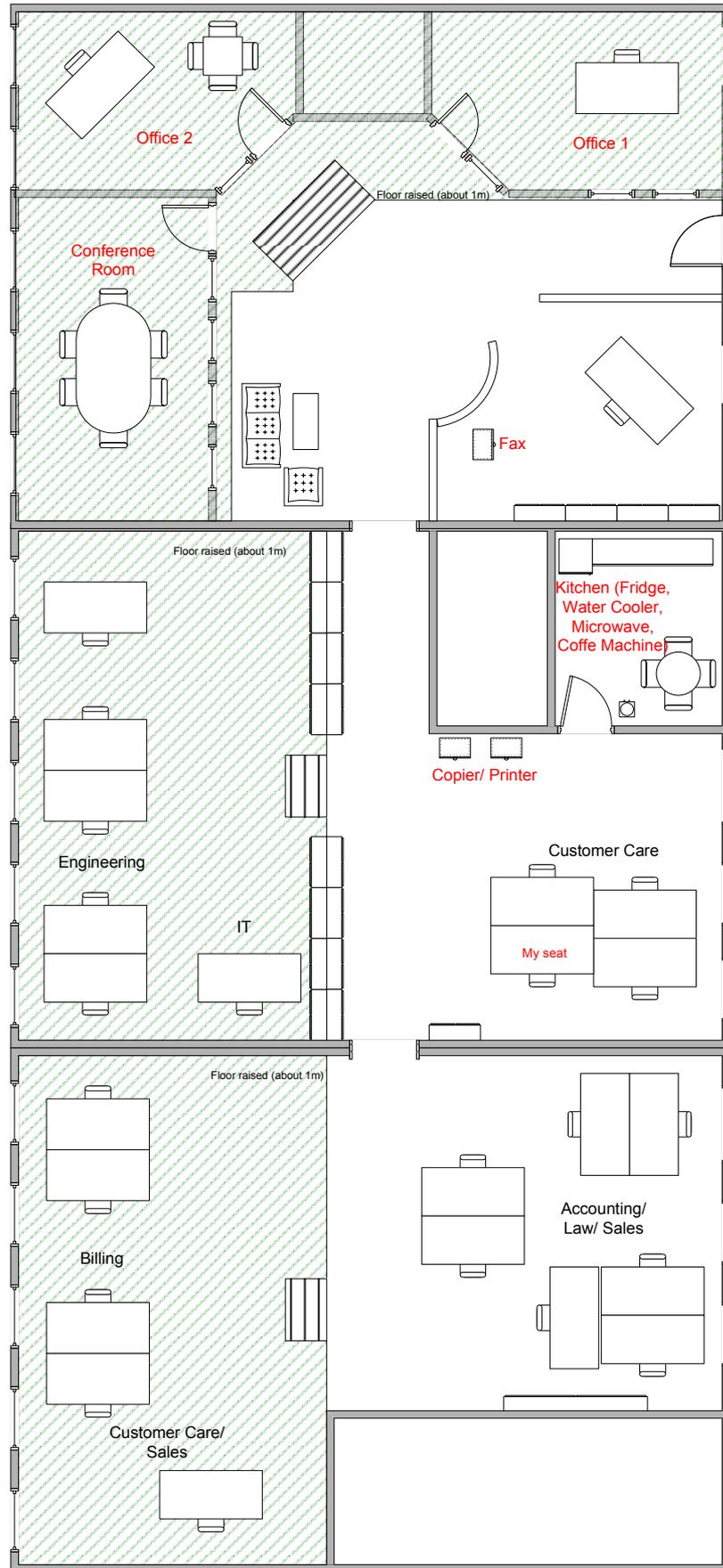
Figure 6: Company A's Office Layout

The place from where this study was conducted ("My seat") was perfectly suitable for observing how the employees at Company A work. This was especially true as it was close to the kitchen where practically all persons at Company A come along from time to time to pick up a cup of coffee. From "My seat" it was possible to listen to them talking or even better arrange it to join them for a small talk in the kitchen. Observing the ways the people are communicating at Company A, it is possible to judge that the appraisal of top management how the open office layout would assist a free and immediate communication is only partly true: The walls between the different areas of the office and the mere distances between the seats do not allow the communication top management expects. Very often it was recognizable that employees from Customer Care would call their colleagues from Engineering by phone. Taking a close look at Figure 6 on page 32, one can see that both teams are sitting in the same area of the office. This shows that the advantages of the open office layout are burned up very quickly: The two teams (in this case Engineering and Customer Care) are not communicating directly as they use the phone. On the other hand, they are distracting each other from their work, as they all create some noise because of other phone calls or when they are talking to each other (over their desks within the teams). Although the noise level is lower than it can be experienced at other companies, it sometimes reaches a level where meaningful work is not possible anymore. DeMarco and Lister have focused on this issue very much [DeLi03]. They argue that although team work is necessary and an open office facilitates team work, only about 30% of the total working time is spent with team work. The other 70% are spent with individual working. For this 70% silence would be most valuable [DeLi03]. Lacking silence and privacy are regarded as major disadvantages of the open office concept [Cars02].

Looking at the office layout another time, one can see that not all teams are located at the same area. This means that for a direct communication, a team member from Billing or Accounting who wants to meet somebody from Customer Care or Engineering would have to walk through the office anyway. From that perspective a door between the different areas would not hurt but would reduce the noise. Of course, at this place personal opinion gets visible: The author of this study does not regard open offices to be as valuable as they are seen frequently. The advantages of an open office disappear very quickly with the size of the office. However, there are a lot of studies that emphasize that the advantages of open offices outweigh the disadvantages and that in today's project and team orientated work situations, open offices are required (e.g. [Gross02]. [Lall95], [TeTe00], [BeSt95]).

Besides the noise, there are other aspects to be considered from the Knowledge Management perspective. In section 2.4 the importance of arenas and of direct communication was presented. Company A's office provides facilities for formal meetings (conference room, also the offices are used for this) as well as for informal meetings (kitchen, the areas in front of the printers and the fax). Additionally, some of the employees formed a habit to have a "walk to talk" (sometimes referred to as "Nordic talking") after they had lunch in the kitchen. Although often private issues are matters of these talks, also business issues are addressed. The office layout and how it is used, shows the awareness of management and of the employees how important direct communication is. This certainly is assisting any Knowledge Management initiative. The place for the kitchen, copier, and fax provide good opportunities for meeting each other by coincidence.

Knowledge Management basics within this project

In the opinion of four interviewees from the team leader and management level the approach to integrate the introduction of a Knowledge Base in this project makes sense. The other four interviewees do not see a direct or 'natural' connection between the introduction of the ticket system and introducing a Knowledge Base in the same project. One interviewee mentioned that it is going to be tough to do both in one project as it would take a lot of work to put both systems in action. This addresses the risk R1 (compare section 4.4). The interviewee remarked, it would be better to concentrate on one aspect and deliver one working system than trying to do both and end up with two systems finished only to the half.

Sample solutions
During interviews and small talks, the employees at Company A assessed sample solutions as very helpful. All teams (12 interviewees out of 12) are willing to contribute to the Knowledge Base storing the sample solutions. The place where the team members would search for the sample solutions is the intranet as a web-based system. The preferred capture method for the sample solution named the teams is a simple editor and the possibility to add attachments for things like screenshots.

Knowledge Base and documentation
All interviewees (20 out of 20) regarded a Knowledge Base as most important. Right now, only some things are stored within a central folder structure. 13 out of 20 interviewees pointed out that there are a lot of knowledge owners who have exclusive knowledge. They regard this aspect as a real threat for the company and want to change this. Three out of seven team leaders already have initiated a process to codify more of what and how the different team members do. The workload is regarded as the number one disabler for investing more time into documentation.
Company A's employees but especially the team leaders and management are aware of the problems exclusive knowledge owning may cause. From that perspective, Company A is aware that a more conscious Knowledge Management is necessary. This high awareness is regarded as one important pre-condition for any Knowledge Management initiative [RaWi04], [Mesa04].

Chatting and small talks
For all team leaders and top management it is no problem to see people standing in the kitchen (or elsewhere) and have a talk. They regard this type of communication as a necessary part of the company's communication culture. The estimation to which degree this chatting is about job or personal issues varies a lot. Two interviewees expect the private part to be about 80%, four interviewees expect it to be about 50% and two interviewees expect it to by about 20%. Often management and team leaders are involved in the small talk.
Independent of the actual rate of private and personal small talk, top management's attitude to small talk enables a rich and vital communication culture. In contrast to some managers, cited by Davenport and Prusak, who think that talking is not part of work [DaPr00], Company A's management apprehends talking and small talks as valuable communication platform for the organization.

Direct knowledge transfer (knowledge sharing)
All 20 interviewees prefer to seek for an expert instead of looking into documentation. Four interviewees pointed out that this is because only little documentation is available. If more documentation would be available, management thinks that this could change and people would first have a look into the documents. Although, direct communication is not intended to be replaced by documentation, the aim is to make the knowledge accessible in those cases as well when the knowledge owner is not available. One interviewee mentioned that some persons have a lack of confidence in the skills of others. The team leader identified this as a disturbing factor for effective knowledge transfer. All members of the organization are willing to help when they are asked for and all of them stated that they get the help they are looking for. Nevertheless, three interviewees stated that it is necessary to find the right way of asking for help with some colleagues.
The willingness for knowledge sharing is well developed at Company A. There are only a few aspects that might influence this. The major factor mentioned is time pressure. This was mentioned five times. These interviewees stated that time pressure they feel, might cause a reduced willingness to help others. When requesting help from others, this help usually is provided, as all interviewees stated. However, three interviewees mentioned that it is necessary to find the right way how to address some persons. It might be important to explain why this piece of knowledge would help solving a task, for instance. Revisiting the currencies for knowledge sharing, the main currencies for knowledge sharing at Company A are reciprocity and altruism.

Holiday-filling-in-hand-over

In all teams it is common to hand over the work when leaving for holiday. This process is similar in all teams: When someone is leaving for holiday, she or he explains the work that has to be done during absence to a co-worker. This co-worker takes notes where appropriate. It is quite common that the colleagues either have to bother the person on holiday or that some of the work piles up until the person is back from holiday. Eight out of 20 Interviewees reported, that disturbances during holiday, and up piled work is common.

This reinforces the general perception that a lot of tasks are assigned to single persons and a lot of knowledge exclusively is owned by single persons.

Mutual Trust

The trust between members of the same team is intact according to all team leaders and management. However, five of these eight interviewees have doubts that all teams trust each other. From the four teams, two teams do not perceive any problems with trust within the teams or between the teams, one team perceives a problem within the team and no problems between the teams, and one team perceives no problems within the team but regards the trust between the teams to be disturbed a bit.

From the observing perspective it was not possible to notice any problems with distrust between members of the teams or between whole teams. However, there is another aspect that is not mentioned in literature. This aspect is to like each other. This is discussed in more detail later in this section.

Flow of information and news

On management level there is a regular meeting where current issues are discussed. Only one team has a team meeting on a regular basis. Otherwise, meetings on team level are held only when there is a special demand for. Three of four teams mentioned that they are eager to be informed more frequently and more complete about what is going on in other teams, but especially about the 'hot topics' that might affect the whole company such as a new customer, decisions about new products, etc. By now, being informed is a matter of coincidence. News concerning the company and new projects or customers is not spread around through a defined channel. Five out of eight team leaders think that the process of spreading news needs improvement. There used to be a meeting of the complete staff. Because of the recent growth of the company this meeting is not conductible efficiently anymore.

Top management expects the employees to go 'shopping' for news. The structure of the company allows everybody to pose questions. And if someone hears a rumor and wants to know more about it, he or she is expected to ask top management.

Top management's idea of utilizing the unofficial communication for the purpose of spreading news and the expectation that the employees would ask about the rumors is an appealing one. The office layout and management's commitment for free and open communication is assisting this approach. However, rumors have the characteristic to be unofficial. This means that someone who has heard something might have the feeling he or she should not know about it and therefore would not ask top management about it. Additionally, there is the "Chinese Whisper"-effect. Every time news gets forwarded, there is the risk for unintended variation.

From this perspective, probably it would be better to use an official channel for spreading news, e.g., email or the intranet.

Criteria for new employees

When recruiting new employees, Company A has no formal process to follow, as the team leaders and top management stated. Beside necessary skills in the respective area, a new employee shall be able to work team orientated (mentioned eight times out of eight), has to be a good communicator (4 times), shall not isolate her or himself (three times), and has to fit to the existing team (4 times). It is a matter of instinct whether a candidate fulfils these demands or not. One remarkable aspect one interviewee mentioned was that the candidate has to be a nice person. More about this aspect is discussed as part of the following discussion.

Discussion of the Knowledge Management Situation

In section 2.5 six important areas for Knowledge Management initiatives have been identified. How these six areas for enablers and disablers of Knowledge Management initiatives relate to the findings of the situation at Company A is discussed in this section.

- Knowledge Management and Business Strategy

  An important goal for the 2nd level support of Company A is to keep up the service quality on a high level. This means to be able to respond quickly (all requests shall be answered within one day) and to solve all incoming requests to complete satisfaction of the customers. The Knowledge Management approach chosen for implementation addresses the need of the Customer Care agents to have the knowledge at hand how to solve requests. This knowledge is provided through documents. This means the codification strategy is followed. Following this strategy is assessed to be possible because the required knowledge focuses on recurring requests that are processed according to an algorithmic process. That means it is possible to give a description of how to process the different types of requests. The knowledge therefore is explicit.

  On the other hand, Company A also delivers tailor-made technology solutions of a high level of difficulty. These solutions very often have to be invented. According to Hansen, Nohria, and Tierney for this type of products the company should follow the personalization strategy [Hans et al. 99]. However, as discussed above, the 2nd level support follows the documentation strategy. As the field and the way of working (technology development and Customer Care) differ a lot, it is reasonable to follow different approaches for the different teams or a mixed approach for the company, respectively. However, the Knowledge Management beyond the sample solutions is out of the scope of this project (compare the discussion for risk R7 in section 4.4).

- Top Management

  Top management is especially concerned with the service quality. There is a visible commitment to take the necessary steps to maintain or where possible increase the service quality. The ticket system and the sample solutions are welcomed measures and in fact initiated by top management. Top management commitment is regarded as most important pre-condition for any project in general (e.g. [Nich04], [DeLi99], [DeLi03]) and for Knowledge Management initiatives in particular ([McBu04], [DaPr00] [Rawi04], [StBa00]). From this perspective, the project did not lack of any top management support.

- Knowledge Analysis

  As the approach chosen for this project has a limited scope on the sample solutions for Customer Care only, an extensive knowledge analysis is not necessary. Additionally, the suggested strategy addresses not all types of requests, but those which are not relevant every day. This approach ensures that an overload is avoided.

- Environment

  Analyzing the environment of Company A was one aim of the pre-study. Aspects like the office layout, mutual trust, and communication culture are discussed throughout this section.

  During the interviews, it became evident that many people at Company A expected the ticket system to improve the internal communication. Through the observation of how people at Company A communicate with each other the impression emerged that the perceived problems in communication are not due to technology shortcomings but due to individual traits and how those traits of different individuals clash together. One interviewee made this point very clear: The company integrates a broad variety of strong personalities and these traits of characteristics sometimes do not fit to each other. Additionally, the employees at Company A represent a broad variety of educational backgrounds: Electrical engineers, communications engineers, mathematicians, office administrators, computer scientist, and business economists. This background often is the reason for the use of a domain specific language. Outside this own domain, this language is not very well understood. This also is a problem for the communication – and thereby for knowledge sharing – which was possible to identify at Company A.

This has been identified as potential disabler for successful Knowledge Management (compare section 2.5 and [Mesa04], [DaPr00]). Probably, there is not much one can do about a common language but to communicate with each other. Additionally, one has to be aware of the problem that there is no common language. This means one should ensure that everybody comprehends the matter of interest the same way. This would help to identify and solve misunderstandings immediately.

Another environmental aspect of Knowledge Management relates to the mutual trust. It was mentioned above that at least one team leader looks for 'nice persons' during the recruiting process. Being nice and to like each other, strongly relates to the mutual trust that is often discussed in literature (compare section 2.5). Therefore, mutual sympathy probably is an important enabler for knowledge sharing. The concept of involving the future team members of an applicant in the recruiting process (as suggested by DeMarco and Lister [DeLi04]) gains reinforcement from the Knowledge Management perspective. At Company A this is not yet part of the recruiting process and maybe worth a consideration for the future.

- Reward system
  The management's belief about reward systems is similar to DeMarco's and Lister's assessment of reward systems being 'teamicide' [DeLi99], i.e., it is harmful to elevate a single person out of a team. This is poisoning the team spirit, as DeMarco and Lister argue [DeLi99]. As top management regards the whole company as one team, there is only the possibility to reward the whole company. This is exactly what has been done: Although it is not common anymore to pay any Christmas bonuses in Germany, management decided to pay a Christmas bonus for 2006. All members of the organization received the same amount as a reward for the overall performance in 2006, independent of their annual salary or their position. Although this reward system is not focusing on the Knowledge Management aspect, it shows management's commitment to reward good performance and effective team work. This certainly is helpful also from the Knowledge Management perspective.

- IT
  In section 2.5 it was pointed out that a Knowledge Management initiative should not be technology driven. This project makes use of a ticket system which integrates a Knowledge Base (in shape of a FAQ base). From that point of view it is technology driven. However, the technology of this Knowledge Base is not very dominant.

A general finding when analyzing the Knowledge Management approach at Company A is that Company A focuses on the knowledge enabling very much and has reached a high level in this. However, problems with undocumented knowledge are evident. The company is very much relying on the presence and the availability of their employees. Often holidays have to be interrupted because of issues only the person on holiday is able to solve. There is almost no redundancy in the knowledge owning.

5.4 Requirements for the Ticketing System

One objective of the pre-study was to discover the requirements for the ticket system. Many requirements Company A poses for a ticket system are fulfilled by many systems anyway. However, there are some requirements that limit the basis for the choice of the system or at least give cause for customizing. In the following part, those non-standard requirements are listed and their implications are explained. An overview on typical features of a ticket system (such as ticket attributes or ticket transactions) is provided in Appendix B and Appendix C.

Interviewing the employees at Company A and observing their work, delivered some requirements that exceed the usual feature list of a ticket system. At first there are some additional ticket attributes.

5.4.1 Ticket Attributes

Navision Customer ID
The leading system for customer data at Company A is Navision. To be able to relate a ticket to a customer, the customer ID from Navision needs to be mentioned within the ticket. This only applies in cases, where the ticket relates to a customer of course. In case the ticket relates to something else, the customer ID shall be left empty.

Phone Number
Many requests concern about technical issues which relate to the phone number of the customer. For the processing of a ticket through the organization it is very helpful to have the customer's phone number right at hand. This also only applies in those cases where the ticket relates to a customer and issues with the number itself or calls started from this number. In case the ticket does not relate to those cases, the phone no. shall be left empty.

T-Com Customer Information (Customer ID, Invoice No., Invoice period)
Many processes in telecommunication in Germany involve the former monopolist, the Deutsche Telecom (T-Com). Especially, offline billed services are invoiced by making use of the customer data provided by the Deutsche Telekom. An explanation of the concept of offline billing is provided in section 1.1. To be able to process those requests, it is necessary that customer information is available. The customer ID, the invoice no., and the invoice period are needed to find the calls which are matter of the request. In case the request is not related to offline billing, the T-Com customer information shall be left empty.

Foreign Ticket ID
In some cases a request made to Company A requires Company A's employees to make contact to other organizations. Some of those use their own ticket system. In this cases it is helpful, to capture the foreign ticket ID within the own ticket. In case the request is not related to a foreign ticket, the foreign ticket ID shall be left empty.

Reminder ID
In some cases it is inevitable, to remind someone to pay his or her bill. In case this person gets in contact with Company A, it is very helpful to capture the reminder ID, as this makes it a lot faster to access the relevant information. In case the request is not related to a reminder letter, the reminder ID shall be left empty.

Discussion of the Additional Required Attributes
The additional required attributes make it necessary to find a ticket system that allows the expansion of the ticket easily. From these requirements for additional attributes, the general requirement for simple extensibility derives.

5.4.2 General Requirements

Interface to Navision
This requirement relates to the ticket attribute 'Navision Customer ID'. Navision provides a chronology for contacts and events for every customer. This chronology is maintained by the employees of Company A and a valuable source for information about the 'history' of the customer. Therefore, it is very helpful to be able to see the tickets that relate to the customer not only directly within the ticket system, but as well from Navision.

Workflow Support
The general workflow in a ticket system is as simple as 'new', 'open', 'closed' (compare Figure 4). This workflow does not allow ensuring that a ticket makes special predefined steps through the organization. Especially, when a ticket shall be processed by different persons or teams, a workflow support is necessary. Such a workflow support has to provide the possibility to define a path through the system a ticket has to take. This includes a predefined sequence of teams or persons who would have to work on the ticket in order to fulfill the related tasks.

Confidential Levels for Teams and Management
For some type of requests, especially internal requests, it might be appropriate, to limit the access (both writing and reading) to only a few people in the organization. For this purpose it is required to have a mechanism that allows defining rights for different types of tickets.

Ease of use
A general requirement which was mentioned in almost every interview was the ease of use. It is quite hard to give a good description of what this means. Instead, the assessments, of how the different interviewees rate well known standard software and specific software used at Company A, were of interest (compare section 5.3.3).

Platform
Company A is interested to keep their systems as homogenous as possible. As by now they focused on systems based on Microsoft technology, this is a general requirement for all new systems.

Discussion of the General Requirements
Additional to the extra attributes, the general requirements demand for a system that in its whole is easy to extend, change, or in other words: customize.

5.5   Requirements for the Knowledge Base

As discussed above, the demand for a Knowledge Base is higher developed than expected. Nevertheless, this project kept its focus on the sample solutions as part of the ticket system. For the FAQ-Database as part of the ticket system, the requirements are presented here.

Place to search for
The FAQ database has to be part of the ticket system. This way it is ensured that the Customer Care agents would not have to look into a separate system to find the knowledge they are looking for when working on customer requests.

Structure
The FAQ-Database shall provide a possibility to structure the Knowledge Base articles by categories and key words.

Capturing
The employees are not interested in using difficult tools for capturing the sample solutions. They expect the possibility to use something like a text editor, perhaps MS Word.

Attachments
The possibility to attach additional documents to a Knowledge Base article is assessed to be very important. It shall be possible to attach all type of files to an article.

Search
In order to find all relevant articles, the interviewees regarded a powerful possibility to search for the articles as very important. In best case this search functionality shall support a fuzzy search and should be able to search through the attachments as well.

Discussion of the Requirement for the Knowledge Base
The requirements for the Knowledge Base are not too unusual. Ticket systems that provide an FAQ-Database will support the stated requirements.

5.6   Summary

Aim of the pre-study was to discover the company's requirements for the new ticket system and to assess to current Knowledge Management situation. Objective was getting to know the employees, learn the specific language, and understand the corporate culture. Additionally, the pre-study intended to get everybody in the organization involved in the project at an early stage. For these purposes, the pre-study made use of observations, small talk, and

interviews. The observations were focusing to help identifying and understanding the customer related communication processes. Small talk was used to verify and clarify these findings and to discover new issues by chance. Three types of interviews were focusing on identifying additional communication processes the individual assessment of the project and the individual requirements for the ticket system and the Knowledge Base.

The pre-study found out that there are no serious concerns with the project or with the acceptance of the new ticket system. To have a ticket system is assessed to be helpful, or even important. The members of the organization expect the ticket system to increase the transparency and the processing speed of incoming requests. Additionally, they expect the ticket system to improve internal communication and discipline in giving feedback. Judging from the observations, it is doubtful that a ticket system can take this effect, as these frictions are more about individuality and ways of working.

Even though the judgments on how the system actually is going to be used at Company A vary, it was possible to determine some general requirements: The system shall support workflows and provide a web-interface for customer and end-customer access. Most of all, the system has to provide an excellent usability. Because additional required ticket attributes, the new ticket system has to allow alterations and customizations.

Assessing the Knowledge Management situation, the pre-study found out that Company A relies on the personalization approach. For this purpose the office was deliberately designed as an open office. This assists direct and immediate communication, but also bears the problem of noise and distraction. Company A has taken measures to ensure enough room for formal and informal meetings. Having small talks is encouraged and regarded as valuable part of the cooperate culture. The employees' mutual trust is intact and they are willingly helping each other and thereby transferring knowledge. There is no defined process for spreading news which often is regarded as shortcoming. The type of knowledge that is supposed to be put into documentation makes it possible to follow a mixed Knowledge Management approach for Company A. Even though personalization is the dominating Knowledge Management approach, it is possible to put sample solutions in a Knowledge Base without perishing effective Knowledge Management. This is because Company A integrates a wide bandwidth of business activities and ways of working. The Knowledge Base mainly is meant for clerical work in Customer Care and Accounting rather than the inventive work of the engineers.

6 Implementation of the System

A very important and interesting phase of the project was the actual implementation of the ticket system at Company A. In this section, the choice of the system, the performed customizing according to Company A's demands, and the reactions of the employees are described.

6.1 Choice of the System

As part of the pre-study several expectations and wishes for the new ticket system were recorded. For the choice of the new ticket system, it was important to fulfill as many criteria as possible. The consideration of the usability as well as the limitations for the system's platform had played a decisive role. For this reason the different criteria and their fulfillment by the different systems that have been under consideration were assessed. As part of this assessment process, a decision-making memo has been developed (compare Appendix E). Company A agreed to the made suggestion to use the Open Ticket Request System (OTRS)[3] as the new ticket system. OTRS is an open source solution, which is significantly developed by founders and previous employees of the SuSE GmbH (a large Linux distributor). The OTRS GmbH[4] provides professional and commercial support for the system. OTRS fulfills all requirements found during the pre-study. The decisive reasons to choose this system were the low costs and the possibilities for customization. The reason for the comprehensive possibilities for customizing is the openness of the source code and the internal architecture of OTRS. Additionally, users and administrators report via the forums[5] and the official mailing lists[6] that the system is very easy to use. Similar statements are made by the reference customers[7].

6.2 Customizing

OTRS, as a widely used ticket system, provides all necessary functionality. However, as part of the implementation, some customizing was necessary. Especially important were the setup of additional fields as ticket attributes. The setup of the additional fields followed the requirements that were collected as part of the pre-study (compare section 5.4.1). These additional fields are modifiable at almost every view of a ticket. Furthermore, users and rights were implemented according to the organizations needs. However, the limitations through the security concept are not very strict. Basically, every user is allowed to read every ticket and in almost all cases to work on it. In the first step, the setup of customer users was not done. The system later shall be opened to customer users as well, but this was not planned for the initial phase. Very important was the setup of the different e-mail accounts. This addresses the incoming mails as well as the outgoing mails. OTRS is capable to administer any number of e-mail accounts. The incoming mails are structured according to rules that were setup as well. These rules look for special attributes of the incoming mails (e.g., the sender's domain) and set special other attributes (e.g. the customer number). The structure in which the tickets are organized is set up by so called queues. More about the structure is presented in the next section.

6.2.1 Queues

Queues build up the backbone of OTRS. A queue is comparable to an in-tray in which the tickets are kept. Therefore, many of the queues relate to e-mail accounts that already have been present. Additional queues have been set up for the different teams. In general, the incoming requests (i.e., tickets) are processed from the queues that work as in-trays for the e-mail

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[3] http://otrs.org

[4] http://www.otrs.com

[5] http://otrs-forum.de

[6] http://list.otrs.org

[7] http://www.otrs.com/en/references/

accounts (1st and 2nd level support). In case the request could not be processed on that level, e.g. because an agent is not capable of solving the related problem, it is possible to assign the ticket to the appropriate team by moving the ticket into the respective queue (3rd level support). Figure 7 displays the queue-structure that is implemented for Company A. The top level displays the existing e-mail accounts. These e-mail accounts are assigned to specific services Company A offers or to specific customers or customer groups. OTRS automatically fetches new mails from the e-mail accounts and creates new tickets within the queues that work like an in-tray. These queues are displayed on the second level. Besides those in-queues which are filled automatically with new tickets, there are also two queues, for which the tickets are created manually. However, manual creation of tickets is possible within all queues. The 3rd level represents the queues that relate to the different teams. It is possible to move a ticket freely between the queues.

Besides the organizational and contextual structure that is provided by the queues, many other things are controlled by the queues as well. This relates to security, escalation durations (how much service time is allowed in normal cases), senders e-mail address (e-mail address that is used for outgoing mails from the system), salutation and signature (which shall be used in the answers), standard responses, and automated responses. Setting up these elements also has been part of the customizing.
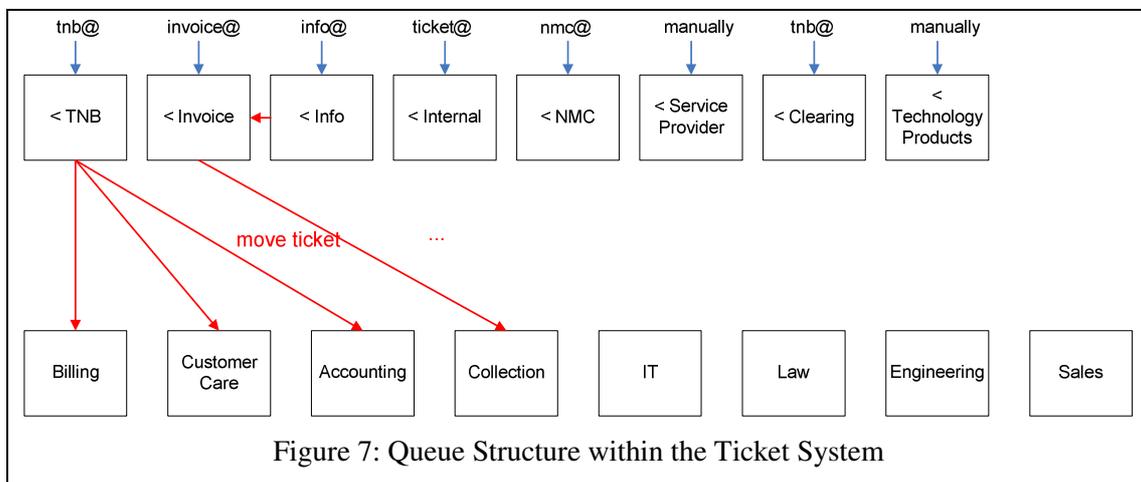
Figure 7: Queue Structure within the Ticket System

6.2.2   Reporting

One of the main reasons for the implementation of a ticket system at Company A was to maintain the quality of service in answering requests of any kind. Important aspect of this quality is to ensure that none of the requests is missed or gets lost. This is ensured by the fact that it is not possible to delete tickets from OTRS and that open tickets will escalate sooner or later and will thereby remind the agents to solve the issue. Another quality aspect is the response time that is used before the customer receives an answer. For this reason, it was required to have detailed reporting how much service time is used before a ticket is closed. This used service time should be displayed broken down to the different departments that are involved in processing a ticket. This reporting shall help to identify quality problems early and help to identify probably reasons, such as work overload in one department. Table 8 provides an example how this Service Time Report may look like for one customer and one category. The

Table 8: Service Time Report

Customer	Category	Queue	Number	Average Service Time (min) in the Queue
Example1	Invoice Requests	< Invoice	40	642
Example1	Invoice Requests	Billing	3	865
Example1	Invoice Requests	Accounting	2	22
Example1	Invoice Requests	Collection	1	291

tickets that accrued for this customer and category are broken down to the different queues they passed through their lifecycle. This makes it possible to calculate the service time, the tickets spent in the different queues (and thereby departments).

Another important area for the reporting is the billing of the customers. For this purpose the processed tickets of a month have to be broken down to customer and category. From these figures the invoices are generated. Table 9 provides an example of how such a report could look like. Besides the mere number of tickets, the report also provides the lowest, the highest, and the average service time used to answer a request. The highest service time provides the possibility to judge whether the contractual agreement for response time was kept in all cases.

Table 9: Service Time per Customer and Category

Customer	Category	Number	Lowest Service Time (min)	Highest Service Time (min)	Average Service Time (min)
Example2	Customer Care	11	9	2881	757
Example2	Open Items	1	539	539	539
Example2	Porting	23	59	570	459
Example2	Invoice Requests	4	37	511	174
Example2	Dysfunction	5	304	540	431

In order for both reports to deliver the required information, it is necessary that the agents select the according category for every ticket while processing them.

6.3 Training and Support

Despite the fact that OTRS is easy to use, there was the necessity for at least some basic training for the use of the system. For this purpose in total 20 training sessions were conducted. These training sessions were attended by 1 to 3 employees and took between 30 and 90 minutes. The average duration was about 45 minutes. The training session were aiming to show all relevant functions to the future users. There were no training cases used during the sessions as this would have extended the duration too much. Emphasis was put on the queue structure by explaining it on basis of its graphical representation (compare Figure 7 on page 42). The sequence of the training sessions was aiming to get the future power users involved early. The power users have been identified through the request type analysis (Appendix D), which was part of the pre-study (section 5). These power users are employees of Customer Care, Engineering, and Accounting and Collection. For those users the training session duration has been extended largely (more than 60 minutes). After these initial trainings, the first e-mail account was switched over to the ticket system. Thereby, it was ensured that those users who just have been trained had to process their first tickets right away. By and by more and more e-mail accounts were switched to the ticket system according to the ongoing trainings. Thereby, more and more employees were involved in the use of the system. The power users at this stage acted as multiplier, as they were helping the "novices" with the use, were answering the occurring questions, and were helping with occurring problems. In one case that even made it possible that one employee did not participate in a training session and despite this is able to use the system properly. Naturally, many questions also had to be answered directly during this phase. The average number of questions in the first two weeks was about 20 questions per day which drop down to three questions after two weeks. Another week later, then number of questions was three for the whole week. All questions could be answered immediately.

Additionally to the training and providing help desk service, the system and its actual use were monitored very closely. The focus was to identify operating errors made by the users. In total, during the first three weeks, only 21 real operating errors occurred. This number has to be related to the overall number of tickets of over 2000 which were processed during this period of time. The error rate was as low as 1%. In case such mistakes were identified, the employees

were informed about the mistake. This was linked with the offer for help in any cases of problems or uncertainties. The number of errors dropped down to 1 in the fourth week of usage.

The low number of questions and mistakes correlates with the immediate rating of the usability of the system right after the training sessions. Table 10 displays this rating: The usability was assessed to be good to very good. Only two employees rate the systems usability to be bad. Additional two employees were not able to rate the usability. Surveying the usability was repeated after four weeks. The result of this survey is part of the project evaluation in section 7.

Table 10: Immediate Usability Evaluation of the Ticket System

☺☺	☺	😐	☹	☹☹	?
8	10	0	2	0	2

Besides the questions according to the use of the system, the users also had requests for changes and improvements. This led to further adjustments or, to be more precisely, to additional customizing. This additional customizing was especially concerned with standard answers, salutations, signatures, escalation durations, and the number and type of automatically sent out e-mails (e.g. when the ticket owner changes or the escalation duration is exceeded).

The usage of the ticket system in this context has been very pleasing. However, the usage of the integrated Knowledge Base in contrast was not: During the complete observation duration (four weeks) not a single new Knowledge Base article has been written. Possible reasons for this are discussed in more detail in section 7. At this place, a description of questions and problems with the use of the Knowledge Base is not applicable, as because of lacking use there have not been any questions or problems.

6.4   Summary

Company A decided to choose the Open Ticket Request System as their new ticket system. The decision was made on the basis of the requirements that were found during the pre-study. OTRS fulfills all of the requirements. The low costs and the possibilities for customization of OTRS have been of particular importance. As part of the implementation phase, OTRS was customized according to the specific requirements at Company A. This especially includes the setting up of the queue structure. The queue structure represents the existing e-mail accounts for customer and end-customer communication and the organizational structure found at Company A. This means that for each e-mail account, special 2nd level support queues, and for each team special 3rd level support queues were set up. Another important area of customization was the reporting. The developed reports are able to provide information about the number and the total processing duration (and its allocation within the different teams) for each customer and each type of request. This is especially important for billing purposes and for verifying the service quality.

During the implementation of the system, training and support were provided. For this purpose, training sessions were conducted that were aiming to provide a complete overview on the system's functionalities. Additionally, the employees were encouraged to make use of the help desk in any case a question occurred. The sequence of the training sessions were designed to first address the power users and use them as multipliers to spread around the knowledge how to use the system.

7 Project Evaluation and Discussion

In this section the project's outcome is analyzed and discussed. This includes the aims and objectives of the study. Further aspect is the evaluation of the introduced system, especially its usability, the impact on work processes, processing speed, and transparency.

7.1 Aim of the Project Evaluation

The project evaluation first of all aims to give answers to the research questions. For this purpose, the evaluation has to find out whether the approach to link a ticket system introduction and a Knowledge Management initiative was a reasonable approach. This is only possible by assessing the project's impact on Knowledge Management.

Furthermore, the success of the ticket system introduction has to be examined. This includes evaluating the actual use of the ticket system according to the expectations that were originally linked to the introduction of a ticket system at Company A. Additionally, not or under-fulfilled requirements have to be identified in order to be able improving the system further. For this purpose, the evaluation has to capture opinions about the system, especially its usability.

Finally, the project in all has to be analyzed according to success factors and disablers. This includes revisiting the project's design and the risks.

7.2 Approach of the Project Evaluation

The project evaluation made use of some of the methods which already have been used for the pre-study (compare section 5.2). These are observations and small talk. From these methods, again field notes were taken and afterwards used for analysis. Additionally, a survey (using a questionnaire) was conducted, a qualitative analysis by reading tickets in the system took place, and statistics from the system were taken.

Survey (Questionnaire)

As part of the project evaluation a survey was conducted. This survey was based on a questionnaire (compare Appendix F). The questionnaire contained eleven questions on the ticket system and another seven questions on the integrated Knowledge Base. Answering the questionnaire should be fast and easy in order to save the participants' time und thereby guarantee a high response rate [ChPa05], [Jane06]. For this reason, the questions were designed in a way that makes it simple to understand and answer them [Jane06]. In most cases it was sufficient, to answer the question by marking a predefined answer with a cross or to provide an answer with a few words. Important aspect for any questions it not to push the participant into one direction by the formulation of the question. This would compromise the quality of the results [ChPa05], [Jane06]. For some of the questions scales were used for the predefined answers. The scales were not using any text, but icons instead. Table 11 presents the scale used as part of the questionnaire.

Table 11: Scale for the Survey's Questionnaire

☺☺	☺	😐	☹	☹☹

Visualization like this makes answering easier [Davi et al. 97]. However, it has to be considered that participants tend to avoid the extremities (☺☺ and ☹☹) and tend to favor the medium (😐) [ChPa05]. Many further questions had to be answered with "Yes" or "No". The option "Do not know" was deliberately left away. This was possible, since the questions were looking for changes. It was assumed that a participant would answer with "No" in case he was not able to assess any change. The questions on the ticket system were especially looking for information about the usability, the original expectation according to processing speed, transparency, and feedback provided by colleagues. The questions on the Knowledge Base were looking for reasons for not-using the Knowledge Base. For both areas also open questions have been used. Open questions were necessary to assess the attitudes towards these topics. This only can be

done with open questions [ChPa05], [Jane06]. In total, 19 questionnaires were handed out, 13 were returned.

Qualitative Analysis of the Tickets
An unusual procedure for the project evaluation emerged as result of the training sessions: To ensure that the tickets are being processed within the terms of the system and no systematic operator error would creep in, the tickets were read along. From this some hints for the users how to use the system were derived. Additionally, this allowed observing how the system is used in general.

Statistics from the Systems
Another source for the project evaluation is data, which were captured from the ticket system. For this purpose queries were directly run against the database system of the ticket system. These analyses were focusing on the distribution of the actual use of the system. This includes statistics of the total number of tickets, tickets per day, tickets per user, used service time, and the number of users who were working on one ticket.

7.3 Findings and their Implications

In this section, the project evaluation's findings are presented and discussed. This begins with the expectations, the employees had according to the improvements the ticket system would cause. These expectations were identified and assessed as part of the pre-study (compare section 5.3). Particular attention was paid to the expectations for which no uniform opinion had shaped during the pre-study.

7.3.1 Expectations for Improvements

Impact on Work Processes
The survey has shown that the ticket system in total had a positive effect on the work processes. Although five out of 13 respondents were of the opinion nothing would have changed and one person was of the opinion that the work processes have worsened, seven persons experienced an improvement of the work processes. In this context the availability of standard responses was mentioned of being extremely helpful. This assessment can be reinforced by the activities during help desk service: Adding new standard responses was a major task during this phase. Especially Customer Care's processes in the field of offline billed premium rate services took benefits from the standard responses. Furthermore, the improved structure and the better overview on open requests were highlighted. This also addresses the improved transparency and traceability.

Transparency and Traceability
Nine out of thirteen participants regarded the ticket system having improved the transparency and traceability. Two do not assess an improvement in this field. Another two have not given any answer to the question. The functionality that every processing step and every e-mail from and to the customer is documented in the chronologic sequence is regarded as very useful and has been especially appreciated. Several times the increased traceability was emphasized during talks. The possibility to print out the complete ticket including all these information also was highlighted. This is especially important for documentation and proving purposes. This is reinforced by the fact that nothing in the system can be deleted either by purpose or accidentally. This also means that nothing gets lost or to provide feedback is forgotten.

Processing Speed and Feedback
The own processing speed is regarded to have increased by five participants, six do not see any change and two noticed a decrease. From the observation, small talk, and notes on the survey questionnaire, the increase of the processing speed can be explained by the availability and the easy accessibility of standard responses. The two participants, who assessed a decreased processing speed, traced the decrease of processing speed back to the fact that the system still is very new, and they need more practice using it.

Three out of eleven respondents regard the speed with which the colleagues provide feedback to have increased. Seven do not asses any change, and one has not given an answer. Although not all experience a change according to this aspect, there is a change.

Internal Communication

During the pre-study the wish for a support for internal communication was mentioned quite often (compare section 5.3.3). Through reading along the tickets, it was possible to determine that the ticket system is not at all or only to a very small degree used for internal communication. With exception of users trying out specific functions of the system, it is used for customer and end-customer related processes only. These processes always include communication with the customer or end-customer.

Task Administration

Another thought by employees of Company A was to use the ticket system for task administration as well (compare section 5.3.3). Similar to the internal communication, this also only happens in case a customer or end-customer is involved. However, in those cases no extra tickets with the task description is created, but instead the "pending" functionality is used. This was possible to observe in the field of Collection: It occurs that end-customers ask for a deferment of payment. For these cases, a ticket is set pending to the date at which the payment is due. This ensures to check, whether the end-customer kept the agreement. Despite this no tasks are captured within the system.

Workflow Support

The next point of uncertainty during the pre-study was the workflow support. The chosen ticket system provides the functionality. However, the ticket system was introduced without any pre-defined workflows. Being asked directly ("Which features do you miss within the ticket system"), none of the respondents mentioned they would miss the workflows.

Customer and End-Customer Access

The discussion on whether the system shall provide access for customers via a web interface, by fact is obsolete: New customers have the clear expectation to have a web interface for their tickets. Thereby, the solution which was elaborated as part of the discussion in 5.3.3, to decide this from case to case, is followed.

Discussion

The improvement of transparency and traceability are a clear general advantage of ticket systems over normal mail clients. In fact increasing the transparency and traceability was a minimum requirement, which in any case had to be fulfilled for the introduction of the ticket system to be assessed successfully. Therefore, this objective is proven to be achieved.

More spectacular is the impact the system seems to have on the speed and discipline for feedback. Regrettably, it is not possible to reinforce this impression by means of a quantitative comparison as there are no appropriate data available for the time before the system's introduction. Since five out of 13 respondents have experienced independently from each other, getting feedback faster, this aspect needs consideration. This is especially true, as the employees at Company A had hoped for this change, which was discovered by the pre-study. However, as a result of the discussion in section 5.3.2 the system was not expected to have such an impact, as the problem was assessed to be related to personal style of working. Possible reasons for the experienced change might be that the ticket system sends out emails for all cases the service time has been used up, i.e., the ticket escalated. Every member of a team, the ticket is assigned to, receives a mail for each escalated ticket. This does not happen only once, but instead twice a day, as long as a ticket remains unresolved. These notifications include the term "Eskalation", which is German for escalation. Both, the constant reminders as well as the term, which has a very negative aspect in German language, might be the cause for the change. Additionally, when the first tickets escalated, help desk was directly asked what these notifications mean and how it would be possible to prevent something like this to happen. The number of escalated tickets decreased during the first weeks. During the observation phase after the system's introduction, the number of escalated tickets per week dropped from ten for the first week and

Table 12: Number of escalated tickets during the observation phase

Week 1	Week 2	Week 3	Week 4
10	11	7	3

eleven for the second week down to 3 for the fourth week. Table 12 on page 48 provides the overview on this development.

According the requirements for assisting the internal communication and the task administration it can be said that the system established itself as what it is designed for: As an assisting tool for mass-communication via e-mail. That means that anything in the system is directly related to customer or end-customer requests.

7.3.2 Acceptance of the Ticket System

During the pre-study it has been detected that the employees did not have any concerns according to the acceptance of the ticket system (compare section 5.3.2). However, as pre-condition for this, the usability was emphasized. At this place the usability and the actual use of the system shall be examined.

Usability

In section 6.3 the assessment of the usability right after the training session was mentioned. This assessment resulted in an overall rating of the usability as somewhere in between good and very good (☺ to ☺☺). The survey as part of the project evaluation posed the question for the usability again. One question was querying for the usability assessment right after the training session and the other for the usability assessed from the point of time when the survey took place. The results for these two questions are presented in Table 13. The first row of values represents the results for the first question, the second row for the second question.

Table 13: Assessment of the Usability of the Ticket System

☺☺	☺	😐	☹	☹☹
1	10	2	0	0
2	9	2	0	0

The survey delivered a somewhat different picture as the respondents assessed the usability with good (☺) in average. However, it is necessary to take into account that for the survey the questionnaire was using scales, whereas the employees were asked at the end of the training session. As respondents tend to avoid the extremes and tend towards the medium ([ChPa05]), this result can be explained by this effect. It is important to notice that in average of all replies to this topic, the usability is assessed to be good.

Actual use by users

In average, 130 tickets are closed on every working day. During the observation period after the system's introduction, in total 2576 tickets have been processed. The average service time used on the basis of all tickets is 308 minutes. This includes tickets that were deliberately set to "pending". These tickets made up to a total of 108 tickets. Leaving these tickets out of account, the average service time drops down to 204 minutes. In average a ticket reaches a processing depth of 1.3. This means that in average 1.3 employees are necessary to solve a request. Related to the 2576 tickets, this means that 3296 processing steps took place. The ABC-analysis in Figure 8 on page 49 provides on overview how these processing steps are distributed among the employees at Company A.

The figure clearly shows that the biggest part of all processing steps is done by only very few users: About half of all processing steps are done by one single user. The first five users (about 20% of all users) already carry out about 90% of all processing steps. More than the last 50% of all users at the company do less than 2% of the processing steps.

ABC-Analysis

Figure 8: ABC Analysis of the Processing Steps
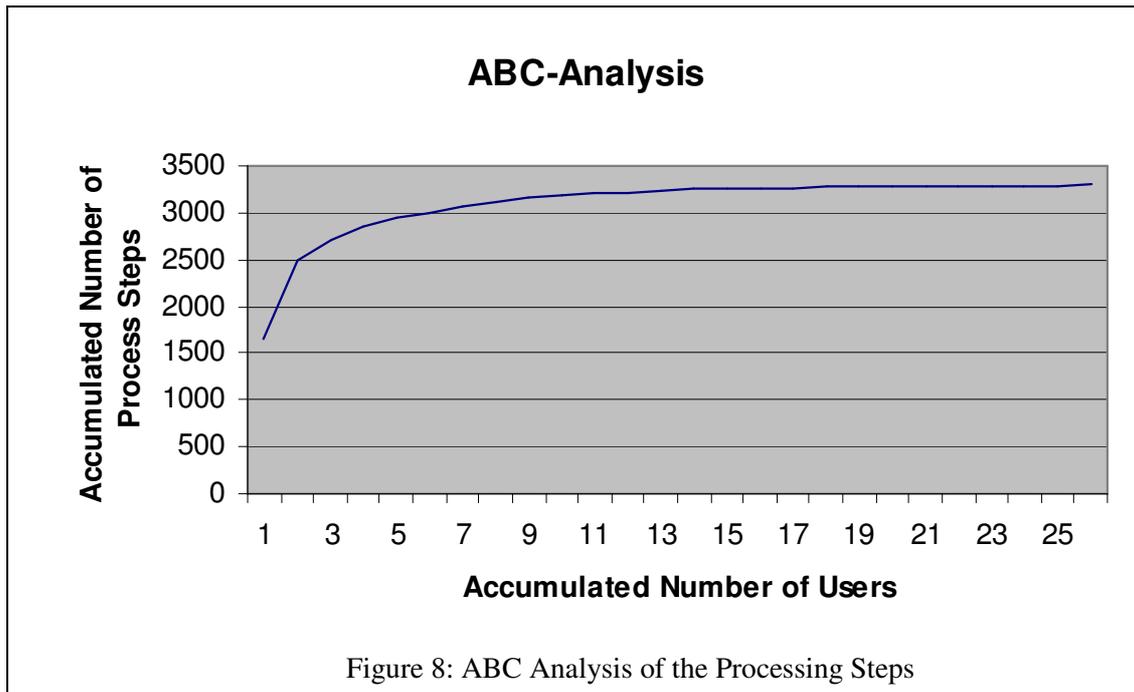
Open Issues – Criticism

When introducing a new IT system, one has to expect criticism. In order to achieve the highest possible level of satisfaction, it is necessary to accept the criticism. This makes it possible identifying the required adjustments and actually implement them. For this reason, the questionnaire for the survey explicitly asked for areas of improvements. This aspect also was covered during small talks. Some of the points that were mentioned in this context allow concluding that finally not all aspects have been sufficiently covered by the training or meanwhile have been forgotten. It was mentioned, for instance, that the structure of the queues is not clear, that it is hard to find tickets again, that statistics for the service level agreements (SLA) would be missing (which actually are in place), and a spellchecking would be missing (which is in place). For this reason, follow-up trainings have been offered at the end of the project.

Besides this type of criticism, the absence of functionalities also was mentioned. This includes the possibility to filter according to specific criteria in some of the ticket overview lists. This requirement needs more analysis, before the implementation is possible. A real bug occurs if a ticket is being forwarded from the ticket system as e-mail. The attachments will not be readable for the receiver. This bug is already known by the developers and a fix is expected soon. Four employees have expressed their demand that they want to have the opportunity to see all notes and mails that belong to a ticket when writing a note. Partly this requirement can be fulfilled by using the middle mouse button to open a new tab in the web-browser for the note and switch back to the original tab for looking into the ticket. In some cases, it is necessary to make changes to the system.

Discussion

The acceptances of the ticket system as new standard system for answering and distributing customer and end-customer requests did not cause any problems at Company A. From this point of view, the general assessment of the employees of Company A has been proven. As an aspect for the success of the project, the acceptance can be regarded as fulfilled. At this place it would be welcomed to be able to conduct a precise analysis on basis of quantitative data according to the processing speed. Regrettably, such data from before the introduction of the ticket system is not available. The previously used e-mail system does not allow such analysis. An assessment of the change of the processing speed therefore has to be made on the basis of the perception of the employees. This is related to the risk that this perception does not necessarily present reality.

The analyses which are available now, allow proving the statement that in general requests are answered within one working day.

Somewhat surprising was the small number of users outside Customer Care. From the analysis of the request types as part of the pre-study (compare Appendix D) the number of requests that would involve other teams than Customer Care was rated to be much higher. From the frequency the different request types were expected, about 50% of the processing steps should have involved other teams than Customer Care. From the statistics that are available now, it is evident that only about 25% of the processing steps in fact are done outside Customer Care. The processing depth was expected to be over 2.0 instead of 1.3. Additionally, some employees do not use the system at all. This extremely uneven distribution of use has an impact on the Knowledge Management component of this project and is discussed in section 7.3.3 in detail.

7.3.3   Acceptance of the Knowledge Base

In this section, the actual use of the integrated Knowledge Base is described and the implications of this use are discussed.

Survey Results

The first important discovery analyzing the actual use of the Knowledge Base is the fact that beside one article about shortcuts (which was used for demonstration purposes) and one article which was written during one of the training session, not a single new article was written during the observation period. The very first question on the Knowledge Management aspect of the survey was looking for the appraisal of the usefulness of the Knowledge Base. Similar to the results of the pre-study, such a system was rated to be useful. Table 14 provides the actual assessment.

Table 14: Rated usefulness of a Knowledge Base

☺☺	☺	☺	☹	☹☹
3	10	1	0	0

The rating whether the implemented system would fulfill the requirements, turned out to be less positive (☺ in average). Five respondents had not yet looked into the Knowledge Base or do not know if it would meet their requirement. Three complained that the Knowledge Base does not contain anything. However, ten out of 13 respondents plan to write Knowledge Base articles in the future, whereas three respondents had no answer to this question. It is unlikely to happen that the Knowledge Base would be used for handing over work for holiday fill-ins, as eleven out of thirteen respondents do not plan to use the system for this purpose. This is in contrast to the appraisal which was captured during the pre-study. Reasons for not having written an article were lack of time (four out of thirteen), not having found appropriate knowledge (four out of thirteen), and not having used the system at all (two out of thirteen).

Discussion

A general disabler for Knowledge Management initiatives, lack of time of the knowledge owners [Will02], [Hair05], [StBa00], also is true for this project. Company A does not make an exception. The time, during which the project was conducted at Company A, was characterized by ambitious and important projects for customers and for the own technology infrastructure. Usually such projects are given higher priority, than creating documentation. This is not only true for Company A [Will02]. According to the observations, this aspect is not going to change: Usually several customer projects and internal projects (e.g. implementation of new IT systems) are running in parallel. Such projects usually only involve the engineers at Company A. For them and for the type of knowledge they own, the Knowledge Base was not meant. The approach that was defined in section 4.4 with respect of risk R7 (section 5.3.4) was focusing on knowledge that is required for processing customer and end-customer requests on the level of Customer Care. The business goal for this Knowledge Management initiative was ensuring the service quality (compare section 5.3.4). The inveterate lack of time of the engineers therefore could not be the reason for Customer Care to leave out any documentation activity. Besides the

lack of time, the project evaluation also discovered the lack of appropriate knowledge for capturing and storing it at the Knowledge Base. This appraisal is reinforced by several observations as well as by usage statistics from the system. The following observation shall explain this: Effective from the 1st of January 2007, the value added tax in Germany was changed (raised from 16% to 19%). This raising needed some special consideration within Billing and Accounting. Despite thorough analysis and planning, invoices that enclosed the change of the years (e.g. 16.12.2006 to 15.01.2007) contained discrepancies. Analyzing discrepancies and processing the incoming requests was done in closest coordination and communication between Customer Care and Billing. Such a situation would have been considered to be appropriate for developing sample solutions how the complaints have to be processed and storing the sample solutions in the Knowledge Base. However, this would not have been possible in advance. The discrepancies were not predictable. The requests relate to a very specific and seldom situation: The value added tax is not very likely to be raised so soon again. This is a typical example of the type of problems that were observable: They have a unique character, need thorough investigation, are not predictable, and most likely will not occur again. To cover something like this in a Knowledge Base for sample solutions does not make any sense. At this place the mistake in the project's premises becomes apparent. It was expected that more teams and employees would be involved in processing and solving incoming requests. The type of requests was expected to be more various, but not unique. The figures above, however, show that most requests are standard requests for which the employees at Customer Care are well prepared and able to process them without any queries to other teams. And then there are the exceptions which turned out to be totally different every time. This was expected to be different. From the interviews at the beginning it seemed as if Customer Care regularly needs the help of other teams for various types of requests. The approach was to start capturing sample solutions to unload the other teams from recurring inquiries by Customer Care.

The conclusion is that the risk R7 (section 4.4) at this place re-occurs in different shape: There is no demand for a Knowledge Base for sample solutions at Company A. For the knowledge owned by the engineers, this is different. Their knowledge however, has been identified being tacit predominantly (compare section 5.3.4) and not appropriate for the codification approach [Hans et al. 99].

However, as described above, several employees have in front to contribute to the Knowledge Base. The fact that it was not possible to recognize this by the end of the project might have several reasons:

1. The announcement contributing to the Knowledge Base was just made to please the researcher or from a basis of a guilty conscience.
2. The Knowledge Base as part of the ticket system has not yet gained enough attention. The ticket system at this stage distracts from the Knowledge Base, so to speak. This relates to 3.
3. The time for observation (four weeks) was to short. Originally, it was planed to have twelve weeks for observation. Risk R3 (not available key personnel) and R4 (not available hardware) have inhibited the observation phase from being longer.

7.4　Aims and Objectives Revisited

Section 4.1.1 has defined the aims and objectives for this case study. At this place, these aims and objectives shall be revisited. The aims are going to be discussed in the sub-sections. The objectives are discussed in the following.

First objective was to assess the original Knowledge Management situation which was to be found at Company A. The results are presented in section 5.3.4. Company A has implemented many aspects of knowledge enabling. This especially includes the communication culture and providing official and unofficial arenas for meetings and knowledge transfer. Company A does not foster the documentation of knowledge. As there are lots of exclusive knowledge owners present, Company A is very dependent on the availability of these knowledge owners.

Second objective was to find out, how the attitudes to knowledge codification and knowledge sharing are developed among the employees of Company A. This point has been answered in section 5.3.4 as well. The employees at Company A wish to document more. At the same time they are willing to help others with their knowledge, i.e., to share their knowledge.

Third objective was to analyze changes to the Knowledge Management practices as result of this project. This objective is missed, as by the end of this study no changes were detectable.

7.4.1   Success Factors

The aim of this research project was to find out which factors influence the success of a Knowledge Management initiative and how the introduction of a ticket system can be utilized for the introduction of Knowledge Management awareness. This includes revisiting some of the risks identified in section 4.4. First, the success factors for introducing the ticket system shall be discussed.

Readiness for Change
The most important success factor was the readiness of the organization and its members for the change the ticket system had caused. Often, problems with change projects are reported and special approaches are suggested to overcome these problems (e.g. [BePl05], [Kara06], [Sche06]). Achieving the readiness for change therefore is a prerequisite for any project that has a change impact on the organization [Smit05]. In this case, common problems like a general resistance or a lacking commitment to use the ticket system (compare section 4.4) did not turn into problems. From the retro perspective, it is hard to assess whether this is an achievement of the taken measures (compare section 4.4) or just that Company A and its employees in general are able and willing to accept and adjust to changes. According to the interview results from the pre-study (compare section 5.3.2), the later is the case.

Identification of power users
A very important aspect for the success of introducing a ticket system was to identify the power users of the new system early and understand their needs by understanding their way of working. This made it necessary, studying the request types and the communication paths intensively. This was one aim and a major contribution of the extensive pre-study. The pre-study indeed did examine more request types and communication paths as the ticket system now is used for.

Using the power users as multipliers
During the system's introduction, first the power users were trained. Their training was expanded compared to the "normal" users. This enabled them to carry forward their knowledge about the system and how to use it. This made it very easy for all other users to find someone who would be able to help with questions or to solve uncertainties according to the proper use of the system. At the same time the power users are opinion leaders. As they use the system the most, their opinion counts. Convincing them by meeting their requirements, helps to convince all others [Laza et al. 44].

Usability comes before completeness of features
The usability is probably the most important requirement to meet. If the users have problems to use a new system, how can they be expected to use it properly and to be committed to use it? During small talk with users who know other ticket systems they made remarks like that the system would be small but smart. The other systems they knew were so full of features one never used, but which made it difficult to use. From this perspective, it is reasonable to leave away functionalities that are doubtful to be used ever or which exceed the standards of common systems of the respective field, in this case ticket systems.

Meet important expectations
With this project, some clear expectations were connected. The system had to increase transparency and traceability as well as to ensure that a prompt processing of incoming requests takes place. Meeting these expectations meant not to disappoint the users. Seeing their fundamental expectations fulfilled, the commitment to use the system is maintained.

Breaking the four points mentioned before down to their real meaning provides the insight that the success factors for the introduction are nothing else but sound requirements engineering. This includes, but is not limited to (compare [KoSo98], [Somm04]):

- Gaining profound domain knowledge
  Most of the required domain knowledge had been in place before the start of the project. The pre-study allowed to fill gaps and gain the necessary company specific knowledge.
- Requirements elicitation
  The pre-study made use of several different techniques for requirements elicitation that have proven to be applicable (interviews [KoSo98], [Somm04], [HiDa03]; ethnography [HiDa03], [Robe01]; diagrams and use cases [Jaco87])
- Requirements documentation and specification as well as
- Requirements analysis and negotiation
  Section 5 and the Appendixes provide a rich description of the requirements and their implications.

Another important and success fostering aspect in the context of requirements engineering is the fact that the whole study was conducted at the "customer-site". That means that the researcher became part of the organization. Only this made it possible for the intense observations – a very important source for requirements [Robe01].

7.4.2   Disablers

For introducing a ticket system, the project delivered some success factors. For the aspect of building Knowledge Management awareness, the project had no chance to assess whether the there was any impact caused by the project. Responsible for this are the following disablers.

Typical project risks
It is sad to notice that a standard risk like late hardware delivery (R4 in section 4.4) is something that keeps spoiling projects again and again. Even though this risk was addressed by a conscious risk management, because of various reasons it was impossible to get the hardware in place in time. This directly influenced the next disabler.

More time for observation necessary
It is not possible to make any justified assessment of whether this project had an impact on the Knowledge Management practices at Company A. It seems that the proposed Knowledge Base is not going to be used. However, this bears the possibility that other approaches are going to be followed as a result of this first initiative. To be able to make a justified assessment of the Knowledge Management impact a longer period of observation would have been necessary. This aspect is expression that another identified risk became a problem: Timeframe and scope of the project (compare R1 in section 4.4) did not match up. Probably, when studying Knowledge Management at an organization, it is necessary to re-visit the organization much later than it was done during this project.

The Knowledge Management aspect remained invisible
As the pre-study elicited (compare section 5.3.4), combining a Knowledge Management initiative with the introduction of the ticket system, only made sense in the opinion about half of the team leaders. That caused that generally the attention being focused on the ticket system and the change initiated by its introduction. Although it has been emphasized that introducing Knowledge Base is an integrated part of the project, usually in every conversation, the project was named as introduction of a ticket system only. This means that the whole project was not regarded being linked to Knowledge Management. When the system finally was in place, the users were only concerned in processing the tickets. The Knowledge Management aspect of the project was missing any visibility.

Number of active users and team size
A general disabler for this specific approach (introducing a Knowledge Base within a ticket system) already has been mentioned above: The number of active users and involved teams has to be bigger. This aspect has been discussed in section 7.3.3.

The concept of building a database for sample solutions and making it accessible for Customer Care employees needs to take the working situation into account. The situation at Company A's Customer Care can be assessed as being very stable: The employees in the Customer Care team are working for the company for quite a while, there is no fluctuation. This also means that there is no current demand for someone adjusting to a new job. Within Company A, Customer Care probably is the team that is prepared best from the Knowledge Management perspective. They have defined overlapping work scopes. One employee being ill or on holiday does not cause bigger troubles as it does in other teams of Company A. It is quite ironic that the approach of introducing a ticket system and an integrated Knowledge Base is affected negatively by this positive circumstance.

Company A prefers sharing knowledge person-to-person

Company A's corporate and communication culture is built on direct and immediate communication. The final appraisal from all the ongoing observation is that in the need of help or knowledge, the usual way is to address the colleagues directly. It constantly happens that someone in need for information, knowledge, or help just appears at the desk of somebody else, calls somebody else by phone, or even makes an instant appointment for a meeting with several colleagues. As this is the culture, probably nobody would start thinking much about putting effort in codification of knowledge. This is contradictory to the findings of the pre-study: During the interviews it was mentioned that documenting more was an important goal for most of the employees and team leaders (compare section 5.3.4). Probably, this aspect of intending doing something and actually doing it is something many people experience. Explaining the reasons for this behavior is out of the scope of this study by far.

Revisiting the six general enablers and disabler for Knowledge Management initiatives, this means that the environment at Company A just does not foster codification (compare 2.5). That does not mean that Knowledge Management at Company A has no chance. Actually, the rich communication culture has fostered an intense Knowledge Management – taking the personalization approach. To use the metaphor of the "seed of knowledge awareness" again, the seed was of the wrong species or the other way round, Company A was not a fertile ground for this type of seeds.

7.5 Summary

The aim of the project evaluation was to assess the success of the introduction of the ticket system with an integrated Knowledge Base as well as to give the answers to the aims and objectives of the study. For this purpose, the project evaluation made use of a survey, qualitative analysis by reading along the tickets, and by querying the database for usage statistics.

An important change was reached by implementing standard responses. This increased processing speed and simplified many processing steps. The system also improved the transparency and traceability of the requests. Company A did not made use of the ticket system as a tool for internal communication or task administration. Instead, the system is only used for communication with customers and end-customers via e-mail. The escalation mechanism increased the discipline and the speed at which responses are provided.

The ticket system is accepted as new standard system for customer and end-customer communication. Important prerequisite for this is the usability of the system which has been assessed as good. The system in total handles the expected number of requests, in average about 130 per working day. In average only 1.3 employees are involved in solving a request. The expectation was that this ratio would be above 2.0. This uneven use at Company A indicates that Customer Care usually solves incoming request on their own and is not depending on the help of other teams often. The cases in which this happens are very special. Therefore, the Knowledge Management approach, capturing sample solutions, did not have an observable effect on the Knowledge Management practices at Company A. However, to be sure about that more time for observation would have been necessary. This was disabled by the late hardware delivery which caused the late introduction of the system. Further disablers for the initiative's approach were invisibility of the Knowledge Management aspect of the project and the preferred way of knowledge sharing at Company A, the person-to-person approach.

8   Conclusions

A very successful aspect of the project was the introduction of the ticket system as tool for processing customer and end-customer requests: The employees of Company A noticed an increased processing speed as well as an improved discipline in giving feedback to inquiries. Especially, the transparency and traceability of requests have increased. For Company A this was the predominant goal. From this point of view, the project can be assessed as successful. However, for generalization purposes this does not provide new insights, as these effects are reported various times, even though not very often within the scope of a case study.

Assessing the success of this study according to other aspects is not easy. The original aim, assessing the impact of the project on the Knowledge Management at Company A, was almost impossible to achieve, as the observation period was to short (due to the late hardware delivery). Additionally, the project's premise that Customer Care would need much more help from other teams proved to be wrong. The expected demand of Customer Care for sample solutions therefore was much less than it was expected. This effect was reinforced by the stable situation to be found at Customer Care (the personnel are employed there for a long time and therefore familiar with the work, there is no fluctuation). Whether the project will take any effect on the Knowledge Management practices later, can not be judged from the point of time the project ended. For this reason a follow-up study is required which has to analyze the ongoing development of the Knowledge Management at Company A. Nevertheless Company A can gain profit from the findings of this study by now. Fundament for this are the substantial analyzes that are built on the basis of the observations and interviews throughout the project. Company A has developed a rich communication culture which creates a knowledge enabling environment. The common disablers for Knowledge Management that relate to frictions in communication therefore are not relevant for Company A. However, despite this positive aspect, the most important insight for Company A is that there is room for improvement. Throughout this study several times problems caused by exclusive knowledge owning were recognized. As soon as one of the exclusive knowledge owners is not available, important processes get stuck. This impression is reinforced by the employees who stated this being a real threat.

It has turned out that there are two fundamentally different ways of working present at Company A. First, there is the clerical work and then there is the development of new solutions. These two different ways of working require two different types of knowledge as well. First there is procedural knowledge, which would be possible to codify (i.e. explicit knowledge), and then there is the knowledge required for creative problem solving, which belongs to the category of tacit knowledge. This differentiated rating was the basis for the valuation that an initiative focusing on sample solutions for Customer Care would be possible. It turned out however, that the demand for this is not developed. Additionally, the communication culture causes that the employees of Company A prefer the direct contact with there colleagues for knowledge transfer and knowledge sharing. This situation also might be responsible for the project not having had any impact, as at Company A the Knowledge Management already was following the personalization approach. Therefore, the conclusion that derives from this is that both approaches, personalization and codification, are not combinable easily [Hans et al. 99].

For Company A the conclusion is that the dependency on the exclusive knowledge owners has to be reduced. From the findings of this study, the best approach for this is to keep up with the personalization approach and to define the areas of responsibilities and competences to overlap. For Customer Care this already is implemented. The personalization approach works best of course, if the employees know each other and know about their respective fields of expertise. That way they are able to immediately decide whom to address when being confronted with a problem. Currently this is the case. It is interesting to observe, how this aspect is going to develop in relation to the planned growth in 2007. The number of employees is planned to rise from currently 28 to 38 persons. For new employees it might be difficult to identify the knowledge owners, as they do not know about the fields of expertise of all

employees. For this reason it might make sense to introduce a knowledge map in shape of an expert locator (compare section 2.3.1).

A generalization from the findings is hardly possible as this study is only one single case study. It is quite possible that in another environment, the approach followed by this study might cause a stronger effect on the Knowledge Management practices.

Other studies have identified Knowledge analysis as an important enabler of Knowledge Management initiatives. This study found out that it is important also to include not only the type of knowledge into the knowledge analysis, but also to include the environment in which the knowledge is used. Judging from this study's findings, this includes the way of working, the employees' qualification for this work, and the overall stability of the working processes, which includes the fluctuation. Basis for this appraisal is that in situations where fluctuation is higher, the request for documented knowledge should increase. In comparable companies of the same domain, especially Customer Care often experiences more fluctuation as often students or temporary workers are employed.

This appraisal shows that the approach is not regarded to have failed in general. In fact from the point of view of this study it is worthwhile to repeat a study with respect of the results of this attempt. This should include looking for a more appropriate environment. However, such a suggestion shows that any Knowledge Management initiative has to be tailored for the respective situation. Other studies made similar findings [Alha et al. 06], [Ghas et al. 04], [Mesa04], [DaPr00], [StBa00]. Therefore, it is reasonable to start with small and inexpensive pilot projects to assess the different possibilities and learn how the organization in question reacts [Bate05], [DaPr00].

8.1   Future Work

This project was focusing on providing necessary knowledge for the service aspect of Customer Relationship Management. Considering that the approach for Customer Knowledge Management is worthwhile, future work needs to find approaches how to capture, how to store and how to present the knowledge relevant for customer service.

Additionally, judging from the situation at Company A, it seems very problematic to follow a mixed approach for Knowledge Management. Combining the codification and personalization strategies in this case seems impossible because of the communication culture. Hansen, Nohria and Tierney especially focus on the type of knowledge (tacit and explicit) and the business model (reuse and expert) [Hans et al. 99] to decide which approach to follow. From their point of view this differentiation makes it necessary to either follow the personalization and the codification strategy. However, there are authors who think that following a mixed approach is possible (e.g. [GaRi05], [ScJo01]). As these authors do not provide evidence for their assessment that a combined approach might work, it has to be found out if combining personalization and codification is possible. As discussed above, the communication culture also has an impact on the success of the chosen approach. This aspect also needs more elaboration: It seems insufficient to base the decision which approach to follow only on the type of knowledge and the business strategy.

Appendix A   Interviews and Questionnaires

A.1   Interview Management (average duration 40 minutes)

Give a short overview on the project. Both parts: the service ticket system and the Knowledge Base.
The interview's transcript will not allow identifying the interviewee.
The interview's transcript will be made accessible to the interviewee for approval before further processing.

A.1.1   Warm-UP

1. Do you have any concerns or fears according to the project right now? And later according to the system? Which?
2. Do you have concerns or fears according to new systems in general? And how about changes to existing systems? Which?

A.1.2   Service Ticket System

3. How important is this system to you (do not want it, I do not care, seems interesting, could be useful, is important)?
4. What do you expect from the project?
5. What are your general expectations to the system?
6. What gets improved in the best case?
7. Do you see any risk for things to worsen by this system?
8. How do you assess the acceptance of your colleagues according the project? And according to the system?
9. Where do you feel the biggest necessity for a ticket system?
10. Which communication processes are getting stuck regularly (not because of organization or persons but because of technology)

A.1.3   Internal Communication

11. For which internal communication do you think a service ticket system can be useful?
12. Should the system support defined workflows (definition of the sequence which team, which person shall work on a ticket)?
13. What do you think about managing the personal tasks with this? And team tasks?
14. Do you use something else for this now? Outlook? Do you think it is likely that project tasks are going to be managed by the system?
15. Do you use a project management tool right now (e.g. MS Project)?
16. Are there any interfaces to other system required (Navision, customer self care, …)
17. Does it make sense that customers and end-customers are able to access there tickets via the internet?
18. Do you need special confidential levels for management or the team leaders?

A.1.4   Knowledge Management

19. Is the open office layout a deliberate choice?
20. What are the advantages of this in your eyes?
21. What are the disadvantages of this in your eyes?
22. Is the place of the kitchen and printer determined by chance?
23. What is your attitude to my undertaking to introduce a Knowledge Base as part of this project?
24. Do you expect the Knowledge Base to be useful?

25. What do you think when two employees are standing in the kitchen chatting while waiting until the coffee is finished? Does this bother you? What do you think they are talking about? How do you estimate the ratio between business and private topics?
26. Are a lot of things recorded by meeting minutes, memoranda, process descriptions, etc.?
27. What is recorded?
28. What do you think about recording things?
29. Do you look up things in those documents? Or do you directly speak to the knowledge owner/ expert?
30. Are there external sources you use? Manuals? Internet? External Experts? Do all of your team members know these sources? Do all have access to these sources?
31. When you speak to a knowledge owner, do you get the help you are looking for?
32. Does the knowledge owner willingly help you?
33. Are you willingly helping others seeking for your help? Why? Why not? What is influencing your attitude to help?
34. Does it happen that you have to ask things a 2nd time? Does this bother you? Does this bother the one you ask?
35. Does it happen that someone asks you a 2nd time? Does this bother you? Does this bother the one asking you?
36. Do the employees trust each other? Within your team? Among the teams?
37. Do you have meetings on a regular basis? On demand? At which level?
38. How is news spread around?
39. How do you stimulate your team members to share knowledge/ to communicate?
40. What could stimulate your team members to share knowledge?
41. Do you include personal attitudes and traits in appraisal interviews?

A.1.5   Cool Down

42. For which traits, skills, and knowledge do you seek for when hiring new employees?
43. Are there characters you avoid to employ?

Thank You!

A.2   Group Interview Teams (average duration 60 minutes)

Give a short overview on the project. Both parts: the service ticket system and the Knowledge Base.
The interview's transcript will not allow identifying the interviewee.
The interview's transcript will be made accessible to the interviewee for approval before further processing.

A.2.1   Warm UP

1. Do you have general concerns regarding new systems?
2. How do you expect this system to change your daily work (improve/ worsen/ just different)
3. Have you used such a system before? What were your experiences with this?

A.2.2   Service Ticket System

4. What does this system change in best case?
5. For which communication processes do you wish assistance through the ticket system?
6. What must not happen as result of the system's implementation?
7. Which communication processes do you feel bad about?
8. Of which communication type are those (call, e-mail, fax, personal)?
9. In general: Do the requests you get affect you or more the organization (is the answer expected from you personally, or from the organization)?
10. How many requests do you process a day/ a week?
11. How long do new requests have to wait before you can get to them?

12. And how long does it take for you to solve them?
13. In the evening, are there still requests left/ open?
14. Do you miss requests?
15. How do colleagues react to this? How do customers/ end-customers react to this?
16. Do responses get lost (via mail)? Do customers/ end-customers have follow up requests, because they miss the original answer?
17. How much time can you afford at the phone to document the contact (e.g. in the Navision chronology)?
18. Do you solve requests by phone immediately? Does it make sense to record those? Are there follow ups to those requests?

A.2.3 Client

19. What do you like with software systems?
20. What do you not like with software systems?
21. Do you like Navision, Outlook, Word, Excel, IE, Firefox, Dialogika, web mailer?
22. Do you come along with web mail clients?
23. Do you have problems to find your way into new systems?
24. Do you prefer normal clients or web clients?
25. (Mini use cases to look for requirements and explain the general way the system works)

A.2.4 Internal Communication

26. For which internal communication do you think a ticket system can be useful?
27. Should the system support defined workflows (definition of the sequence which team, which person shall work on a ticket)?
28. What do you think about managing the personal tasks with this? And team tasks?
29. Do you use something else for this now? Outlook? Do you think it is likely that project tasks are going to be managed by the system?
30. Are there any interfaces to other system required (Navision, customer self care, …)
31. Does it make sense that customers and end-customers are able to access there tickets via the internet?
32. Do you need special confidential levels for the teams?

A.2.5 Sample solutions

(short description of what I mean with sample solution)
33. Do you think you might use such sample solutions?
34. I which way should such sample solutions be presented?
35. Where would you search for them?
36. Do you think you would write sample solutions down yourself?
37. Which tool would you like to use for recording sample solutions (Word, html, screen capture tool, audio, video, …)?
38. Is the structure symptom – problem/ reason – solution reasonable?

A.2.6 Attitude towards KM

39. Are a lot of things recorded by meeting minutes, memoranda, process descriptions, etc.?
40. What is recorded?
41. What do you think about recording things?
42. Do you look up things in those documents? Or do you directly speak to the knowledge owner/ expert?
43. Are there external sources you use? Manuals? Internet? External Experts? Do all of your team members know these sources? Do all have access to these sources?
44. When you speak to a knowledge owner, do you get the help you are looking for?
45. Does the knowledge owner willingly help you?

46. Are you willingly helping others seeking for your help? Why? Why not? What is influencing your attitude to help?
47. Does it happen that you have to ask things a 2nd time? Does this bother you? Does this bother the own you ask?
48. Does it happen that someone asks you a 2nd time? Does this bother you? Does this bother the own asking you?
49. Do the employees trust each other? Within your team? Among the teams?
50. Do you have meetings on a regular basis? On demand? At which level?
51. How are news spread around?

A.2.7 Handovers

52. How do you arrange for holiday replacement?
53. How do you hand over your tasks?
54. How do you memorize the details?
55. Does it happen that you have to disturb your colleague on holiday?
56. What are general problems when you fill in for someone on holiday?
57. Are there many things that pile up when filling in for a colleague?

Thank You!!!

Appendix B Ticket Attributes

Attribute	Description	Remark
ID	Identification attribute	Perhaps special numbering for internal tickets
Sender	Sender's email, phone number, address	
Receiver	Receiver's email address	
Customer number	Customer number from the Navision system	Attribute to record the Navision customer number in case the customer is maintained in Navision
Date	Date when the ticket is created	
Owner	Current ticket owner (agent)	
Queue	Wait list for different type of tickets. The queues steer which ticket is assigned to which teams/ persons	
Subject	Subject, just as for emails	
Text	The content/ description of the problem/ request (just as in emails)	
Attachment	Possibility to attach documents to the ticket	
Status	Current status of the ticket	New, opened, waiting, escalated, locked, closed
Priority	Priority for the processing of the ticket	Very low, low, normal, high, very high
Deadline	Deadline, when the ticket has to be processed latest	
Used time units	Time units needed to process the ticket	
foreign ticket ID	Ticket ID from other systems (from business partners)	
Invoice Number	The invoice number the request relates to	
Phone Number	The phone number the request relates to.	
T-Com customer number	The T-Com customer number the request relates to	
Invoicing period	The invoicing period the request relates to.	

Appendix C   Ticket System Features

C.1   Ticket transactions

Attribute	Description	Remark
Change owner	Handover a ticket to another agent	
Attach document	Attach a document to a ticket or a processing step	Preferably all documents types
Print	Printing of the ticket	
Record new ticket	Capture a new ticket	Automatic receive from email, web interface, manual capturing by agent (from phone call, fax, snail mail, internal (talk)
Re-open	Re-open of an previously closed ticket when the issue is not solved completely	
Change Customer	Change the customer, in case the original mapping was wrong	
Merge	Merge two tickets to one (in case two tickets describe the same case or have been split out of one ticket before)	
Note	Add a processing note.	
Change priority	Change the processing priority of a ticket	
Change queue	Change the queue a ticket is assigned to	
Close	Close the ticket when processing is complete	Closed with success, closed without success
Lock	Ticket owner may lock the ticket to prevent others from processing it	
Split	Splitting a ticket into two. A new ticket with a new ID is created which creates a copy of the original ticket.	
Link	Set a link to another ticket or to a Knowledge Base article	

C.2   Ticket Info

Attribute	Description	Remark
History	Overview on what happened to the ticket	
Show ticket ID and Subject in Navision	The customer chronology in Navision should display at least the Ticket ID, and the subject from tickets that belong to customers maintained in Navision	This is a customising: There is a cross-reference needed from the database of the ticket system to the one of Navision.

C.3 Ticket Search

Attribute	Description	Remark
Search by the ticket attributes	Search for tickets by the different attributes and combinations of them	
Full-text search	Search by all fields (preferably with fuzzy search support)	

C.4 Ticket Reminder

Attribute	Description	Remark
Ticket reminder	Possibility to let a ticket wait up to a specific date	

C.5 Ticket Escalation

Attribute	Description	Remark
Ticket Escalation	In case a ticket is not processed within the required timeframe, the ticket escalates.	
Notification by email	In case a ticket escalates, the ticket owner is notified by email.	
Not possible to open new tickets.	As long a agent has escalated tickets the agent may not process any other tickets	

C.6 Team-Work

Attribute	Description	Remark
Multi agent processing	It shall be possible to process a ticket by several agents in parallel, or in sequence	
Lock	The owner shall be able to lock a ticket.	
Split	It shall be possible to split a ticket into two.	

C.7 Predefined Answers

Attribute	Description	Remark
Salutation	Salutation of the customer and end-customer	„Sehr geehrter Herr", „Sehr geehrte Frau", „Sehr geehrte Damen und Herren"
Message	Predefined standard answers for different issues	
Signature	Standard signatures	

C.8 Statistics

Attribute	Description	Remark
Accounting	It shall be possible to record the time that was necessary to process a	

	ticket	
Reporting	It shall be possible to analyse the tickets according to various criteria	

Appendix D   Request Types

D.1   Invoice Objection

|	
Involved	End-customer
	Customer (Reseller)
	Customer Care
	Billing
Required Data	Customer Number
	Invoice Number
Communication Paths	Email
Involved Systems	Billing System
Tools	None
Trigger	End-Customer contacts the reseller
Pre-Conditions	End-Customer got an invoice with which he is not happy
Post-Conditions/ Result	The invoice objection has been processed and the reseller is informed about the result
Interferences	
Variants	
Volume	1 per day
Description	An end-customer is of the opinion that the invoice he got is wrong. Because of this he contacts the reseller who forwards the request to Company A. The request enters Company A at Customer Care. Customer Care processes the incoming stream and sorts the incoming requests and forwards those with invoice objections to Billing. Billing checks whether the objection is justified and in case it is, corrects the invoice. Billing gives the feedback to Customer Care who informs the reseller about the result.

Diagram
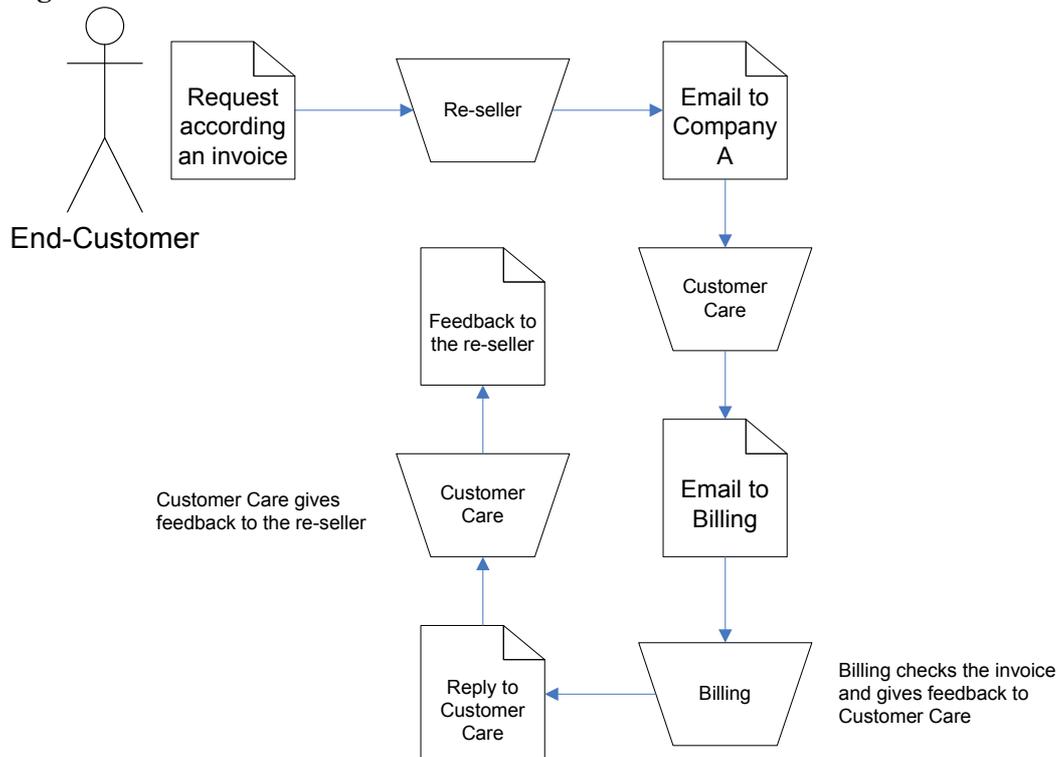
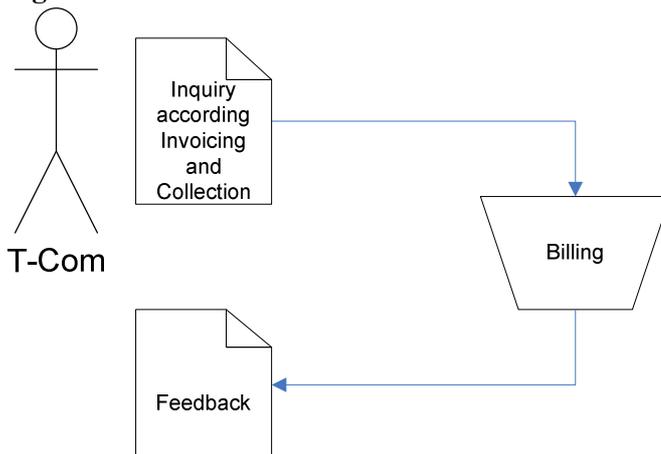|	
Analysis and Assessment	The ticket system is able to fetch the incoming mails and create

tickets for them. It may be possible to automatically assign the tickets to the correct queue (i.e. Billing), in case the reseller uses specific key words in the subject or the body text of the mail. Customer Care is able to monitor the progress of processing the request by Billing and is able to inform the reseller about it. In case the system is opened for this customer through a web interface, the customer itself is able to check the status. Customer Care can directly send the feedback mail to the reseller from the ticket system.

D.2 Inquiry Invoicing and Collection

Involved	Billing
	T-Com
Required Data	
Communication Paths	Email
	Phone
Involved Systems	Billing System
Tools	
Trigger	T-Com
	(Billing)
Pre-Conditions	
Post-Conditions/ Result	The problem is solved, or at least the proceeding is coordinated.
Interferences	
Variants	Several different types of inquiries according to different problems with the data transfer according the Invoicing and Collection process, e.g., rejected files.
	It also may happen that Billing is initiating this process.
Volume	3 per week
Description	When T-Com encounters a problem with the Invoicing and Collection process they contact Billing. Billing checks different aspects likes files, transfers, interfaces, etc. and provides feedback to T-Com.

Diagram
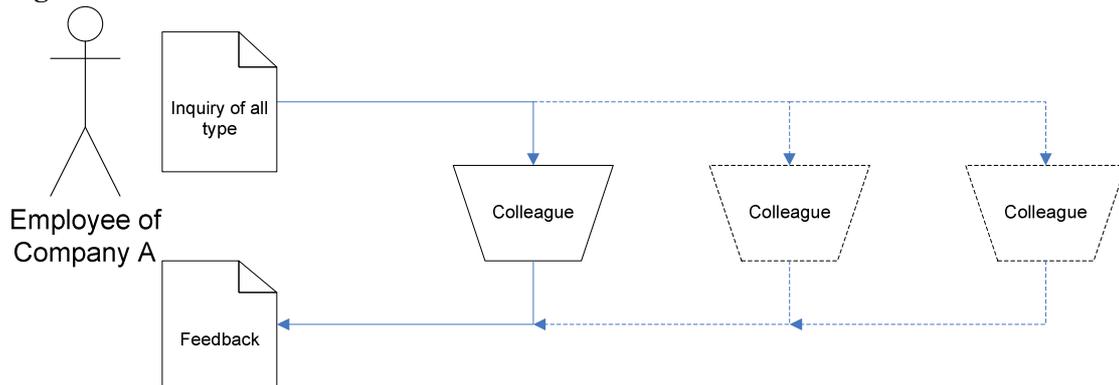

Analysis and Assessment	The ticket system is able to fetch the incoming mails and create tickets for them. It may be possible to automatically assign the tickets to the correct queue (i.e. Billing), in case the T-Com uses specific key words in the subject or the body text of the mail or a specific email address. In case T-Com sends the email to a personal account the team member in Billing could forward the email to the ticket system. Billing can send the answer directly from the ticket system. In case T-Com calls Billing instead of

sending an email, Billing can create a ticket manually. For the variant of this request type, Billing being the initiator, it is possible to create a ticket by sending a mail directly from the ticket system.

D.3 Internal Inquiry

|	
Involved	Employees at Company A
Required Data	
Communication Paths	Email
	Phone
	in person
Involved Systems	Several
Tools	Several
Trigger	An employee at Company A
Pre-Conditions	
Post-Conditions/ Result	Problem solved/ Task fulfilled
Interferences	
Variants	Several
Volume	
Description	A task shall be processed internally at Company A. This may affect only two employees, but may also include more employees or teams.

Diagram

Analysis and Assessment	An employee can create a ticket manually and assign it to a colleague. It is also possible to forward an email to the ticket system and create the ticket that way. The employee is able to monitor the progress.

D.4 Porting (Part I: Customer Care)

Involved	End-customer
	old telecommunication provider of the end-customer
	Reseller
	Customer Care
	Engineering
Required Data	Customer data
Communication Paths	Fax
	Email
	FTP
Involved Systems	Customer Care Systems
	Telecommunication Systems
Tools	

Trigger	End-Customer
Pre-Conditions	End-customer changes his telecommunication provider. End-customer wants to keeps his number, porting order is available
Post-Conditions/ Result	The reseller is informed about the result. Routing for the phone number is activated. Phone number is registered in the Customer Care and Engineering systems.
Interferences	Porting is not possible (through various conditions)
	Customer data are wrong or incomplete
	Fax dose not reach the carrier
Variants	Change of the porting date.
Volume	25 per day
Description	Most portings are handled automated. This only describes the manual portings. Manual portings are necessary in case the automated porting ran into problems.
	An end-customer changes his telecommunication provider to the reseller and wants to keep is old phone number. For this reason he instructs to move the phone number. The reseller transfers the porting order by FTP to Company A. Customer Care processes the porting order and sends it via fax to the old telecommunication provider of the End-Customer. The old telecommunication provider gives feedback on the porting order via fax and remarks whether the porting is ok or if there are problems (error codes). Customer Care processes the feedback and makes the appropriate entry in the systems. The reseller is informed via fax about the result of the porting order. Customer Care hands the porting order over to Engineering. (separate process)

Diagram
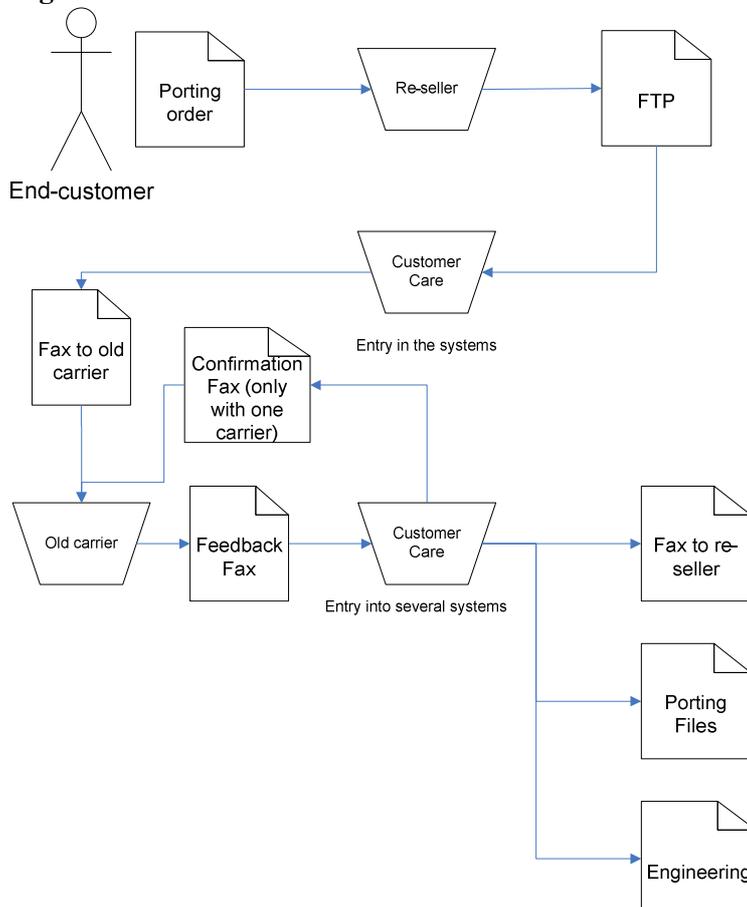
Analysis and Assessment	The support the ticket system may provide is limited very much. This is because the whole process is very much relying on the use of fax. Although there are Fax-to-Email gateways, the system would have to be able to recognize the meaning of the fax in order to attach it to the right transaction. For this, a sophisticated OCR system would be necessary.

D.5   Porting (Part II: Engineering)

|	
Involved	Customer Care
	Engineering
Required Data	Customer data
	Porting order
Communication Paths	
Involved Systems	Telecommunication systems
Tools	
Trigger	Daily process for entering the manual portings.
Pre-Conditions	Customer Care already has processed the porting order and the old carrier has accepted the porting.
Post-Conditions/ Result	Phone number is active.
Interferences	Routing from other carriers is not working properly
Variants	
Volume	25 per day
Description	On daily basis Engineering processes the manual portings. Engineering makes the entries for the switch. The porting orders go back to Customer Care. Customer Care puts the orders to the porting files.

Diagram
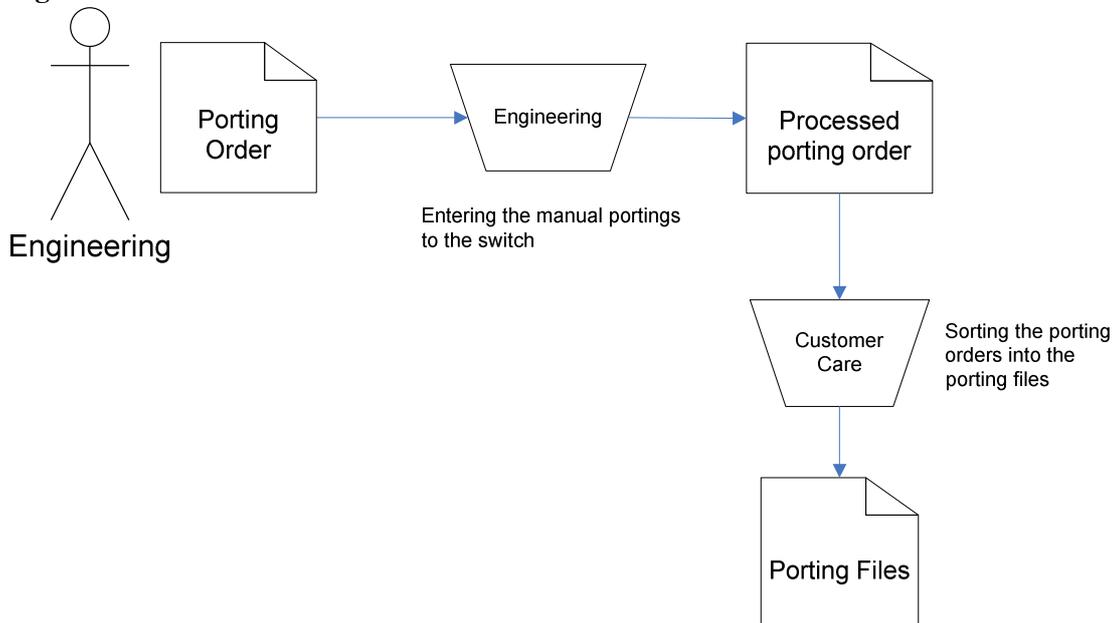
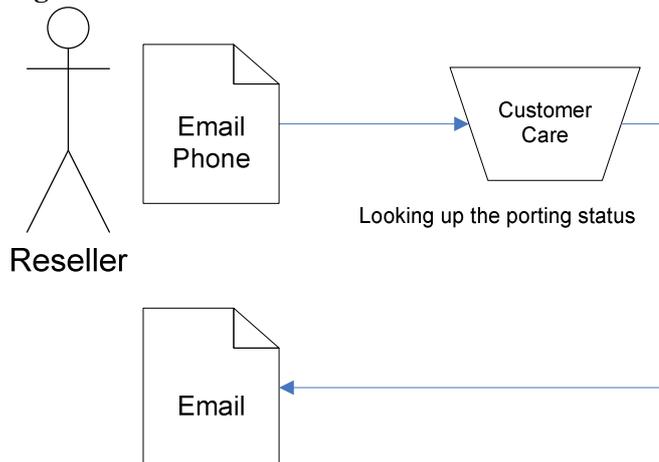|	
Analysis and Assessment	The support the ticket system may provide is limited very much. This is because the whole process is very much relying on the use of fax. Although there are Fax-to-Email gateways, the system would have to be able to recognize the meaning of the fax in order to attach it to the right transaction. For this, a sophisticated OCR system would be necessary.

D.6   Porting Status Inquiry

Involved	Customer Care
	Reseller
Required Data	Customer data
	Phone Number
Communication Paths	Email
	Phone (rarely)
Involved Systems	Customer Care System, Telecommunication System
Tools	
Trigger	The reseller wants to know the status of an ongoing porting.
Pre-Conditions	A reseller's end-customer wants to move his phone number to the reseller.
Post-Conditions/ Result	The reseller is informed about the status.
Interferences	
Variants	
Volume	40 per day
Description	The reseller asks Company A for the status of an ongoing porting process. Customer Care looks up the status and gives the respective feedback to the reseller.

Diagram

Analysis and Assessment	The ticket system is able to fetch the incoming mails and create tickets for them. It may be possible to automatically assign the tickets to the correct queue (i.e. Customer Care), in case the Reseller uses specific key words in the subject or the body text of the mail or a specific email address. The system allows monitoring the incoming requests and ensures that all requests are processed. The answer can directly from the ticket system. This process could use pre-defined answers

D.7   Porting Check-up

|	
Involved	Engineering
Required Data	Newly ported phone numbers
Communication Paths	Phone
	Ticket-System of other carriers
Involved Systems	Switch
Tools	
Trigger	Daily process for checkup of newly ported phone numbers.
Pre-Conditions	Phone number is supposed to be ported
Post-Conditions/ Result	Phone number is routed correctly or there is an error.

Interferences	
Variants	Routing error
Volume	15 per day
Description	On daily basis Engineering checkups whether the phone number that supposed to be ported are routed correctly. In case of an error, Engineering contacts the old carrier and compares the porting data to exclude a mistake at this place. If the porting data is correct, Engineering reports a fault to the old carrier. This may happen by entering it into a ticket system (depending on the old carrier).

Diagram
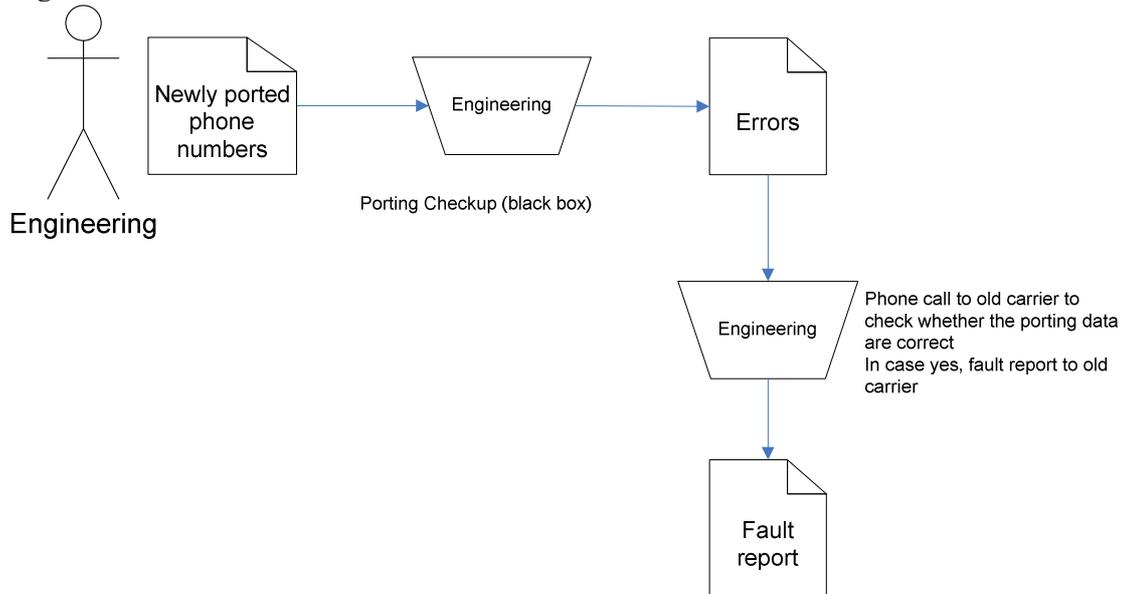
Analysis and Assessment	Engineering can create a ticket for every error (either manually or by import). This will make it easier to monitor whether the other carrier provide feedback in time or not.

D.8   Sales

Involved	Customer
	Law
	Customer Care
	Engineering
	Billing
	IT
	Customer
Required Data	
Communication Paths	Phone
	Letter
	in person
	Fax
	Email
Involved Systems	
Tools	Several
Trigger	Sales
	Customer
Pre-Conditions	Customer is interested in a service
Post-Conditions/ Result	Offer is prepared

Interferences	
Variants	Types of offer vary according to the interest of the customer
Volume	
Description	Starting from sales activity or the customer contacting Company A, it is possible that several points for an offer need to be specified. This may affect different teams, who have to process the questions and give feedback to sales before sales can send out the offer.

Diagram
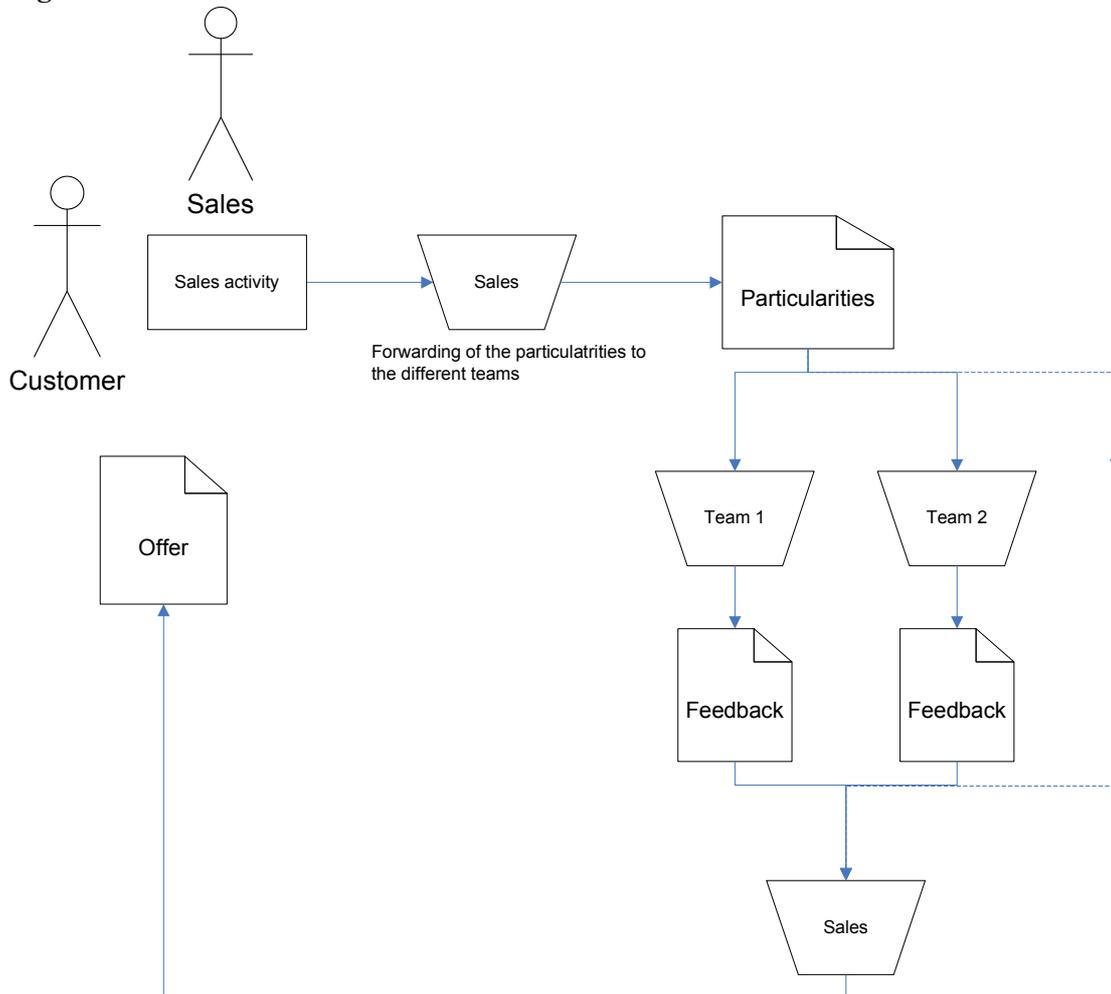
Analysis and Assessment	Sales personnel can create tickets (either by entering them manually or by forwarding an email to the ticket system) for internal coordination according to the development of an offer. This allows to monitor of what happens and what is missing to make the offer complete.

D.9   Dysfunction

Involved	End-customer
	Customer
	Customer Care
	Engineering
Required Data	Customer Data
Communication Paths	Email
Involved Systems	Telecommunication Systems

Tools	
Trigger	End-Customer
Pre-Conditions	
Post-Conditions/ Result	Phone is working again
Interferences	
Variants	The complaint on a dysfunction also may address a not reachable destination in foreign countries.
Volume	
Description	The end-customer has a complaint about his phone access. The reseller checks the own systems (e.g. cable TV network) and forwards the dysfunction notice to Customer Care in case the own systems are operating normal. Customer Care forwards the notice to Engineering. Engineering solves the dysfunction and reports this back to Customer Care who gives the back to the reseller.

Diagram

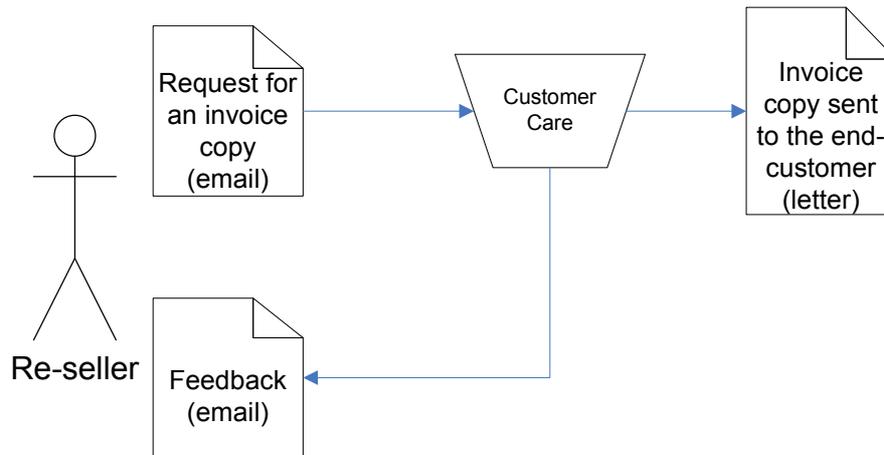|	
Analysis and Assessment	The ticket system is able to fetch the incoming mails and create tickets for them. It may be possible to automatically assign the tickets to the correct queue (i.e. Engineering), in case the reseller uses specific key words in the subject or the body text of the mail or a specific email address. The ticket system gives the opportunity to monitor the progress and enables Customer Care to provide information on the progress to the reseller at any time.

D.10 Invoice Copy

Involved	End-customer
	Customer
	Customer Care
Required Data	Customer Data

Communication Paths	Email
Involved Systems	
Tools	
Trigger	End-Customer
Pre-Conditions	End-customer misses an invoice
Post-Conditions/ Result	End-customer receives an invoice copy by mail.
Interferences	
Variants	
Volume	
Description	The reseller's end-customer informs the reseller that he misses an invoice. The reseller forwards this request to Customer Care by email. Customer Care sends out the invoice copy by mail and informs the reseller about it by email.

Diagram

Analysis and Assessment	The ticket system is able to fetch the incoming mails and create tickets for them. It may be possible to automatically assign the tickets to the correct queue (i.e. Customer Care), in case the reseller uses specific key words in the subject or the body text of the mail or a specific email address. The ticket system gives the opportunity to monitor the progress and enables Customer Care to provide information on the progress to the reseller at any time. The reply can be sent out directly from the ticket system.

D.11 Service Provider Product Change

|	
Involved	Customer (Service Provider)
	Sales
	Billing
	Engineering
Required Data	Customer Data
	Product Information
Communication Paths	Email
	Phone
Involved Systems	Billing System
	Telecommunication systems
Tools	
Trigger	Service Provider
Pre-Conditions	Service Provider wishes to set up a new phone service number or wants to change an existing.
Post-Conditions/ Result	Service number is set up or changed
Interferences	
Variants	New service number, change of existing service number,

dysfunction

Volume

Description A Service Provider contacts Sales at Company A because of a new service number, a change to an existing service number or because of a dysfunction. Sales forwards the request to Engineering and Billing. Engineering and Billing make whatever is necessary and give feedback to Sales. Sales informs the Service Provider.

Diagram
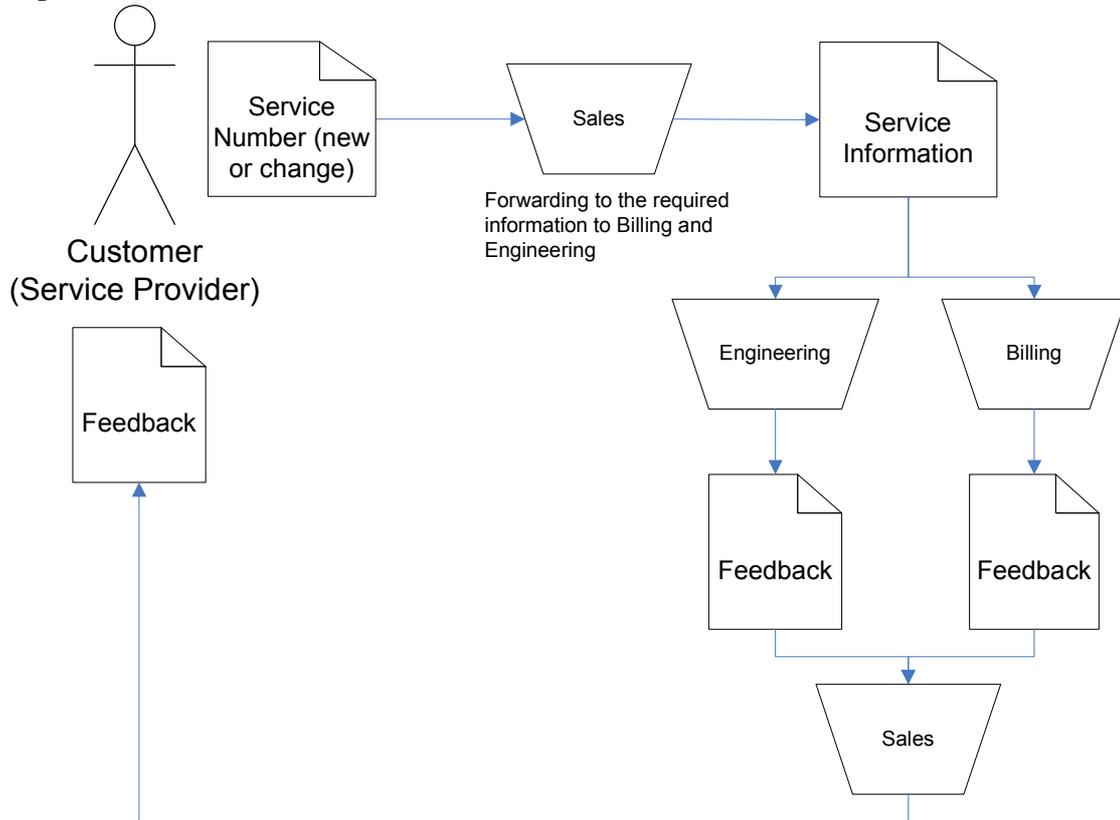
Analysis and Assessment Sales can enter the request manually or by forwarding an email to the ticket system. Sales can monitor the progress.
For this request type a predefined workflow could be useful.

D.12 Service Provider Billing Request

Involved	Customer (Service Provider)
	Billing
Required Data	Customer Data
Communication Paths	Email
	Phone
Involved Systems	Billing System
Tools	
Trigger	Service Provider
Pre-Conditions	Service Provider has a question or a complaint.
Post-Conditions/ Result	Service Provider informed
Interferences	
Variants	New service number, change of existing service number, dysfunction
Volume	

Description	Service Provider directly contacts Billing because of a question according his payoff. Billing processes the request and gives feedback to the Service Provider.

Diagram
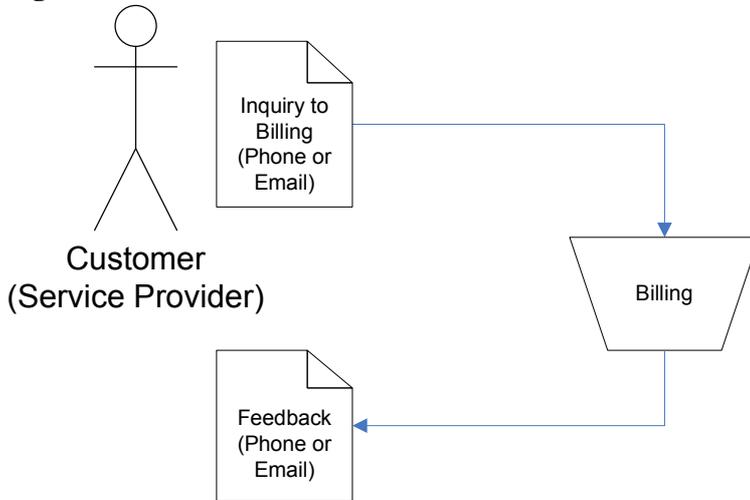
Analysis and Assessment	Billing can enter the request manually or by forwarding an email to the ticket system. The system allows monitoring the status.

D.13 Porting Back

|	
Involved	New Carrier
	Customer Care
	Reseller
Required Data	Customer Data
	Porting Data
Communication Paths	Fax
	Email
Involved Systems	Customer Care Systems
Tools	
Trigger	New Carrier
Pre-Conditions	End-Customer changes the carrier and wants his old phone number to be moved. The new carrier processes the porting order.
Post-Conditions/ Result	Porting order is processed or rejected.
Interferences	
Variants	
Volume	
Description	This is the opposite process to Porting. An End-Customer of a reseller moves his phone access (including the number) to a new carrier. The new carrier send the porting order to Company A. Customer Care pre-checks the porting order and rejects it in case the porting order is wrong or incomplete. Otherwise, Customer Care informs the reseller by email about the porting order. The reseller checks the porting order and sends back a email to Customer Care. Customer Care makes the entries in the Customer Care systems and forwards the original fax with the porting order to the reseller. The reseller finally checks whether the porting order is to accept or reject and informs Customer Care about this. Customer Care sends a fax to the new carrier with the rejection or the acceptance.

Diagram
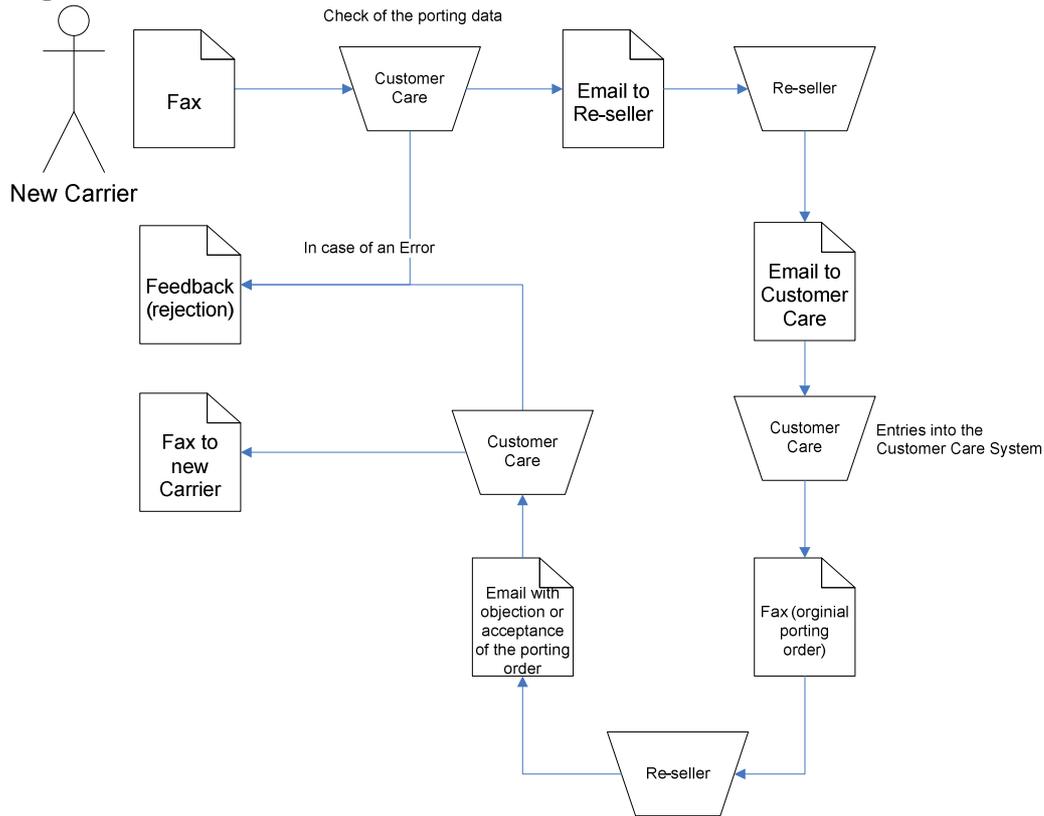
Analysis and Assessment   Similar to the Porting process the intensive use of fax as a media makes the possible assistance through the ticket system very difficult.

D.14 General Request (Customer or End-Customer)

|	
Involved	Customer or End-Customer
	up to all teams at Company A
Required Data	Customer Data or End-Customer Data
Communication Paths	Fax
	Email
	Phone
	Letter
	In person
Involved Systems	
Tools	
Trigger	Customer
	End-Customer
Pre-Conditions	
Post-Conditions/ Result	
Interferences	
Variants	
Volume	
Description	A Customer or End-Customer gets in contact with Company A with any kind of request. Customer Care forwards the request to one or several teams to process the request. The teams provide feedback to Customer Care. Customer Care informs the Customer or End-Customer.
Diagram	
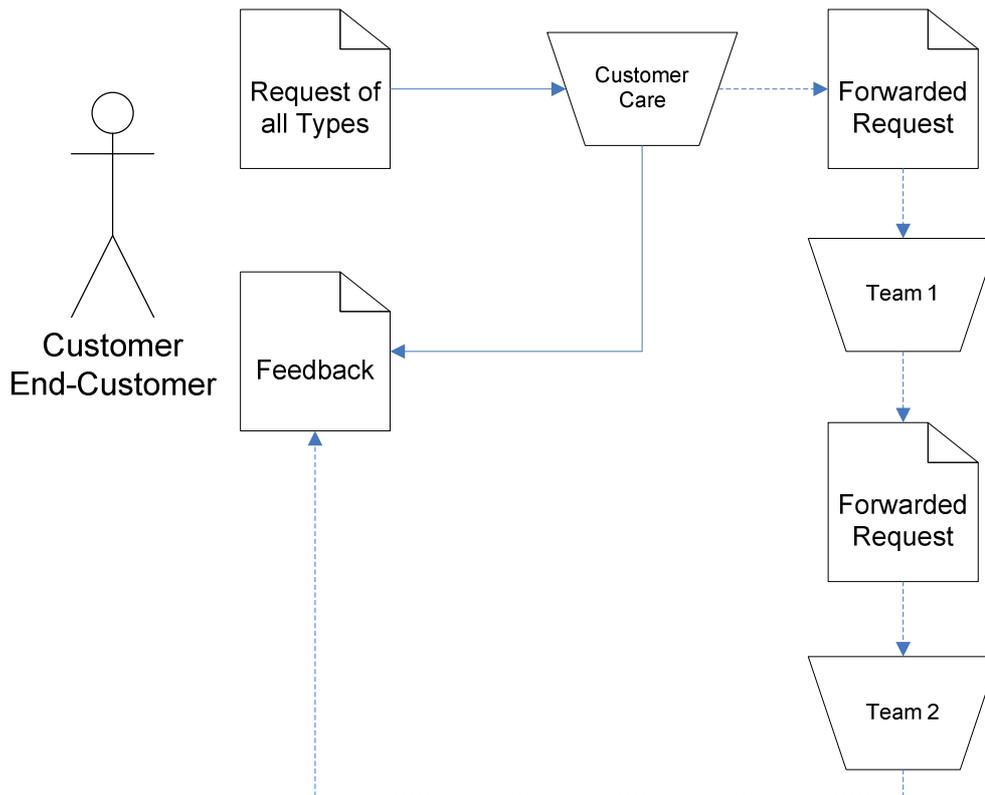
Analysis and Assessment	Customer Care can create a ticket manually or by forwarding an email to the ticket system. Then Customer Care assigns the ticket to the appropriate team. The ticket system enables Customer Care to monitor the progress.

D.15 Provide Call Information

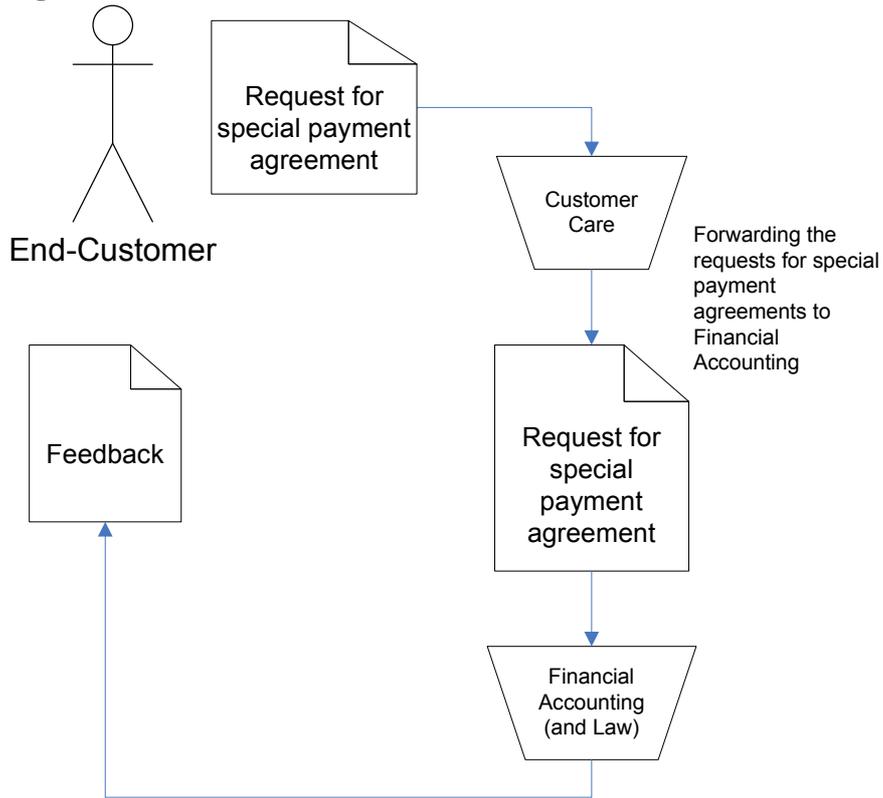|	
Involved	End-Customer
	Customer Care
Required Data	End-Customer Data
	Phone Number
	T-Com Invoice Number
	Invoicing Period
Communication Paths	Fax
	Email
	Phone
	Letter
	Web-interface (forwarded to an email-address)
Involved Systems	Billing System, Customer Care System
Tools	
Trigger	End-Customer
Pre-Conditions	End-Customer has made use of offline-billed services and got an invoice from T-Com with contains them.
Post-Conditions/ Result	End-Customer receives letter with an overview of the calls.
Interferences	End-Customer Data not complete
Variants	
Volume	25 per day
Description	Customer Care receive the request by email, letter, through the web-interface, or by phone and creates the answer letter which is sent out be mail.

Diagram
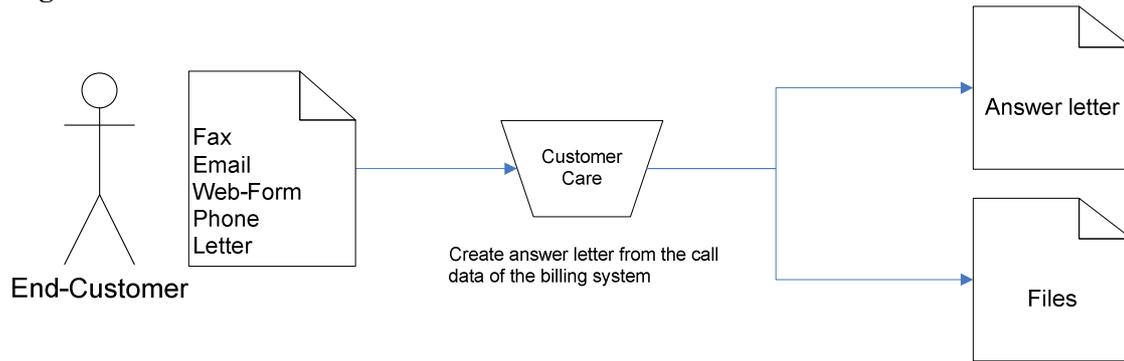
Analysis and Assessment   Requests which are received by email or from the web-form can easily be transformed into a ticket automatically. For the requests which are received by Fax, Phone, or Letter, the ticket would have to be created manually.

D.16 Collection (Variant of 'Provide Call Information')

Involved	End-Customer
	Customer Care
	Law
	Financial Accounting
Required Data	End-Customer Data
	Phone Number
	T-Com Invoice Number
	Invoicing Period
Communication Paths	Fax
	Email
	Phone
	Letter
	Web-interface (forwarded to an email-address)
Involved Systems	Billing System, Customer Care System
Tools	
Trigger	End-Customer
Pre-Conditions	End-Customer has made use of offline-billed services and got an invoice from T-Com which contains them. He is not able to pay.
Post-Conditions/ Result	Company A and the End-Customer have made an agreement according to the payment.
Interferences	End-Customer Data not complete
Variants	
Volume	50 per day
Description	Customer Care receives the request by email, letter, through the web-interface, or by phone. The request is forwarded to Financial Accounting. Financial Accounting processes the request. Law provides help, in case Financial Accounting needs approval or help according to the payment agreement. Financial Accounting sends out the payment agreement to the end-customer.

Diagram

End-Customer

Request for special payment agreement

Customer Care

Forwarding the requests for special payment agreements to Financial Accounting

Request for special payment agreement

Feedback

Financial Accounting (and Law)

Analysis and Assessment   Requests which are received by email or from the web-form can easily be transformed into a ticket automatically. For the requests which are received by Fax, Phone, or Letter, the ticket would have to be created manually.

Appendix E   Suggestion and Reasoning for the Choice of the System

E.1   Aims for the System

- Upholding of the service quality for customers and end-customers despite of a growing number of requests
  For this purpose:
  - Workflow support by an appropriate ticket system
  - Collection of incoming requests of all types
  - Reduced risk for unattended requests
  - Increased transparency for the own employees, customers, and end-customers
  - Monitoring of the processing duration (this includes automated reminding and escalation mechanisms)
  - Integration of an email interface and web interfaces as gateways for customer and end-customer communication
- Improvement of the internal communication for issues which are dependent on feedback. For this purpose the employees may assign tickets to each other to ensure to get feedback and be able to trace the progress.
- Introducing Knowledge Management basics
  - Providing sample solutions and the meaningful knowledge necessary for the processing of incoming requests (in shape of Knowledge Base articles within the ticket system).
  - Reducing the risk for knowledge being exclusively owned by a single person.
  - Making knowledge available more independently from the availability of individuals (especially for cases of holidays, illnesses, employees leaving the company, and new employees).
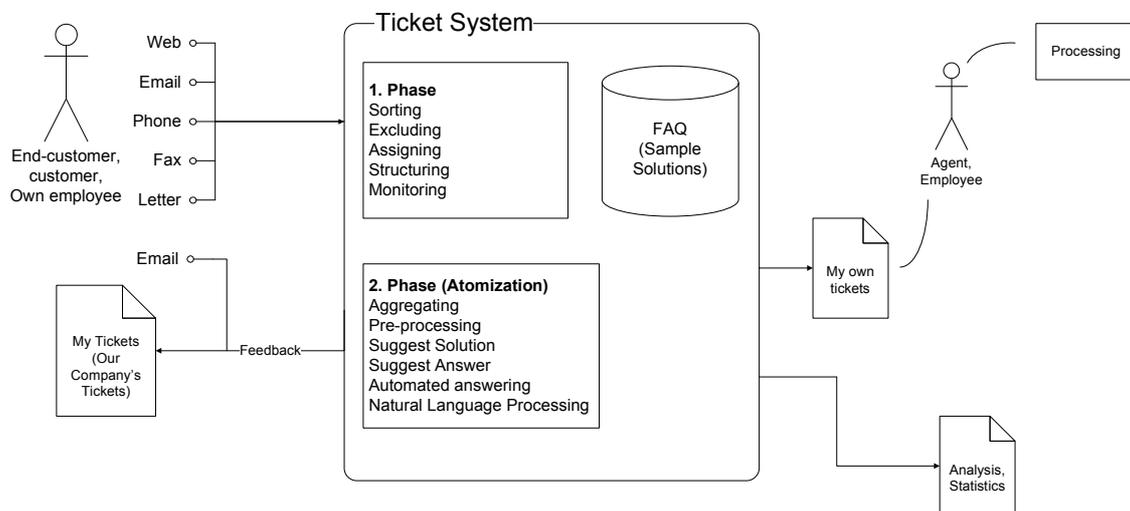
E.2   Requirements

Das target ticket system has to provide the functionality of a standard ticket system. This especially includes the standard lifecycle for processing a request (compare Figure 4 on page 15).

Attributes   A ticket is described by a set of attributes. Some of those attributes are similar to those of an email: ID, sender, receiver, date, subject, text, attachments, priority, state, accounted time. It has to be possible to add additional attributes as customizing

	(e.g. customer number, T-COM customer number, phone number, reminder number, invoicing period)
Transactions	Ticket transactions are the assignment and the change of the ticket owner, attachment of documents, printing, capture new tickets, reopen tickets, split tickets, merge tickets, change priority of a ticket, change the queue of a ticket, close tickets, and lock tickets.
Search	Complete search functionality for tickets
Ticket History	Documentation of the activities referring to a ticket.
Escalation Mechanism	Monitoring of the processing duration and the progress of the tickets in a system and escalation in case of too long processing duration.
Predefined Answers	Preparation of standard answers.
Automated Answers	e.g. automated replies
Statistics/ Analysis	Possibility for statistics and analysis.
Queues	Structuring of the tickets in the system by queues
Email Interface	Collecting mails from several email boxes. The system has to be able to collect emails from several different mail boxes and must be able to automatically convert the emails into tickets and assign them automatically to the different queues, depending on selectable criteria (e.g., sender email address, sent-to email address, key words in subject or text)
Workflows	It shall be possible to define workflows which prescribe the steps a ticket takes through the organization. This means that a ticket is processed by different teams or employees in a predefined sequence.

E.3   Areas of Development

Connection to other systems of Company A (e.g., Microsoft Dynamics Nav, Fax gateway). Atomization, Natural Language Processing.

E.4   Additional Criterion

System environment: MS Windows (i.e., no Linux, Unix, or Novell)

E.5   System Evaluation

Because of the additional criterion (limitation on systems that are operable on MS Windows) many systems are not a possible option as they are only available for Linux, Unix, or Novell. Many more systems used to be individual solutions for large companies or for specific branches and the vendor decided to extend the product for the mass market later. Many of those systems lack standard features and often the vendor is the only one being able to do the customization as the system's architecture is very poor. Therefore, from about 50 systems only the following were assessed in detail after a first screening:

System	Short description	Advantages	Disadvantages	Web links/ evaluation systems
OTRS	Standard ticket system as open source development with professional support through the OTRS GmbH	Complete fulfillment of the functionality. Very dynamic development (reference system after only three years of development). Coordinated development by OTRS GmbH. Very responsive community. Very stable and well performing application. No license fees for server or client licenses. Customizing and administration fairly easy. Platform independent	Only web client	www.otrs.de www.otrs.org test system on the laptop

		(free choice of operation system, database system, and web server). Free choice of the web browser (Internet Explorer, Mozilla Firefox,, Opera) Powerful statistic module		
Omnitracker	Standard ticket system	Complete fulfillment of the required functionality. MS Outlook look & feel	Customizing only possible from the vendor. Client application difficult to understand, therefore reduced usability. Too many not required functions. Strong focus on IT helpdesk (Malfunctions of hard and software systems). Price	www.omninet.de test system on the laptop
Ticketxpert Enterprise Edition	Standard ticket system	Complete fulfillment of the required functionality. Very good ergonomics. Integration in MS Outlook. Newest :NET architecture	Important modules have to be purchased extra. Customer user require single licenses. Price: € 20.000	www.ticketxpert.net Online access: administrator / password dev.ticketxpert.net
i-net HelpDeks 6.5	Standard ticket system	Cheap	Browser requires Java-VM, poor ergonomics, poor look & feel, only web client	www.inetsoftware.de
infrafox	Complaint management tool	Template for covering letters. Freely definable process chains, management of written opinions (requesting written opinions via email), includes focus to internal customers, easy customizing	Not a classical ticket system, probably not without complex customizing usable as ticket system. No Knowledge Base	www.inworks.de
Microsoft CRM	Customer Relationship Management (Marketing, Sales, Service) Solution for CRM on a very high level	Perfect integration in the system environment (MS Windows, Outlook, Office). Development perspective for Customer Relationship Management	Service module not designed for big volumes (only little automatisation). Many ticket system standard features not available (email gateway, escalation). This would cause an enormous. MS CRM is not a ticket system. Client was not stable during the tests (crashes!) Price (without customizing) € 10.000	www.microsoft.com/dynamics/crm test environment PC and Laptop

E.6   System Suggestion

OTRS (Open Ticket Request System) on MS Windows 2003 Server with MySQL and Apache web server (alternative with MS SQL and Internet Information Service; this configuration means more effort and less support through the community, as it is not so often in use by now). OTRS is an inexpensive and at the same time complete and professional solution. Customizing and administration are easy to be done without external consulting and therefore inexpensive

An alternative could be the TicketXpert Enterprise Edition on MS Windows 2003 Server with MS SQL and IIS. This system would provide a better integration in the MS Windows environment. The vendor is able to deliver integration for MS CRM 3.0 which would make it easy to adapt MS CRM later, when a complete Customer Relationship Management system is required. Of course, it would be possible to start with MS CRM 3.0 and TicketXpert right away. This would cause a major investment (> € 50.000). On the other hand, it is possible to change the ticket system later as well, especially as with OTRS the investment would not be very big, so there is no investment to protect.

Appendix F   Survey Project Evaluation

Questions – Ticket System

1. What was your first impression according to the usability of the system right after the training session?

☺☺	☺	☺	☹	☹☹

Comments:

2. How do you assess the usability now?

☺☺	☺	☺	☹	☹☹

Comments:

3. Did the training cover all aspects that are important to you (yes / no)?
    What was missing:

4. How often du you use the ticket system now?
    Number of tickets you process per day:
    Number of ticket you additionally take a look at:

5. Did the ticket system change your way of working (yes / no)?
    In case yes (improved / worsened)?

6. Does the ticket system have influence on your processing speed (yes / no)?
    In case yes (faster / slower)?

7. Does the ticket system have any influence on the processing speed of your colleagues (yes / no)?
    In case yes. Do you get feedback (faster / slower)?

8. Has the transparency according to the request processing changed (yes / no)?
    In case yes (improved / worsened)?

9. Which feature do you miss within the ticket system?

10. What do you not like about the ticket system?

11. What do you like about the ticket system?

12. Additional comments:

Question – Knowledge Base

1. Do you asses a Knowledge Base to be useful?

☺☺	☺	☺	☹	☹☹

Comments:

2. Does the implemented Knowledge Base fulfill your requirements?

☺☺	☺	☺	☹	☹☹

Comments:

3. Have you already written a Knowledge Base article (yes / no)?
   In case not, why not?

4. Do you plan to write articles for the Knowledge Base (yes / no)?
   In case not, why not?

5. Do you plan to use the Knowledge Base for the next hand over (holiday replacement) (yes / no)?

6. Have you had a look what articles are available (yes / no)?

7. Have you rated any present article (yes / no)?

8. Additional remarks:

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