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Knowledge Management in an IT-Help Desk environment

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Submitted by Gunnar Ingi Ómarsson to the University of Skövde as a final year project towards the degree of B.Sc. in the School of Humanities and Informatics. The project has been supervised by Mikael Berndtsson.

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I hereby certify that all material in this final year project which is not my own work has been identified and that no work is included for which a degree has already been conferred on me.

Signature: _____

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Abstract

The help desk serves as the first support level for solving IT problems but sometimes they have their own problems. These problems can be linked to the lack of access to the right knowledge which could be solved by implementing knowledge management so that agents have all the knowledge they need available to them when they need it. There is statistical data available to confirm that, by implementing this knowledge management-centric approach, there is a significant improvement in throughput and reduced times spent on calls. Yet there seems to be that there is no research available to show us the cultural, process, resource and responsibility impact of knowledge management in this environment. This is the focus of this project and by creating a special knowledge management system prototype, for a working help desk, these aspects are analyzed. The results show a minimal culture barrier, more structured processes, better access to resources and increased responsibilities.

Keywords: Knowledge management, Knowledge management systems, Help Desk

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1 Introduction

In a perfect world, as customers, we could call a help desk; the agent would greet us as our close friend and solve our problem quickly and efficiently. But unfortunately we do not live in a perfect world so we seldom experience this scenario. Instead we have problems with these agents, such as:

- Waiting for long periods of time while the agent finds the right solution for our problem
- Waiting while the agent consults a colleague
- Waiting while the agent finds information about us or our company
- Get greeted with a standardized greeting where the agent wants to get rid of us as soon as possible
- Get stuck with an agent that has no knowledge of your company or your problem
- Being sent to a 2nd level service agent and not understanding this agent due to overuse of technical terms
- And waiting for an agent to become available.

The root of these problems can be found in a lack of knowledge. More and more problems are becoming solvable by 1st level support (IT – Help Desk). This means that there is more and more knowledge that these 1st level support agents need to have. A dedicated, and ambitious, employee, in an IT-Help Desk department, would want to be able to assist his customers with as many problems as he can, as quickly and efficiently as possible. But how is this done? Knowledge management (KM) is a very good tool to achieve this goal. KM is providing the right knowledge, at the right time to the employee that needs it to perform a specific task (Aggestam, 2008). This is the abstract view of knowledge management. Knowledge is just one factor in all of this. The need for a learning culture within the organization is also quite significant. If members of an organization are not willing to be a part of a knowledge management system (KMS), it can be hard to implement. But what are the significant issues and changes that occur when implementing a KMS in this environment?

Current work is very limited, articles like “*Knowledge management-centric help desk: specification and performance evaluation*” by Gonzales, Giachetti and Ramirez (2005) focuses mostly on statistical data and “*Knowledge management for call centers*” by James Robertson (2002) covers how to implement a KMS in the help desk environment. There are still questions that need answering regarding how KM impacts the help desk environment, i.e. “What are the changes in the process flow?”, “Is there a cultural change among the agents?” and “How important is staff involvement in decision changes?” Another problem can be found in the levels of support, as clear boundaries between these levels are getting more blurry. This brings up the question “What does the help desk do?” With the help of an IT-solution provider, and personal experience, these questions will be addressed and studied within this project.

The Icelandic IT-solution provider Þekking hf. is a company that has a working help desk and is familiar with its problems and practices. This company showed great interest in being a case environment for this project. The author is an employee of the company, for over two and half years, and has extensive knowledge on the structure

and inner workings of their help desk. This company will thus act as a testing environment for the project.

The aim of this project is to study the impact that a knowledge management system has on the help desk environment

1.1 Objectives

In order to reach my aim I have broken the work down into three objectives. In the following sections I will cover them in more detail.

Analyze current processes and system in department: Performing an analysis on current processes, workflow, resources, structure, culture, etc., within the company's help desk, should aid to find problematic issues in regards to KM in the environment. This will also be the comparison template for how things are currently done.

Conceptually design a KMS: Using related work, and KM theory, a new KMS is conceptually designed. This KMS will hold steps that the help desk needs to take in order to be an efficient knowledge sharing unit.

Use the new KMS and analyze changes: With the aid of the company the new KMS is used and results analyzed. This should produce a working view of how to use the KMS and its elements. Analysis will be focused on the changes within the environment before and after the proposed changes within the help desk.

2 Methods

Different methods are used in order to reach the aforementioned objectives. These methods are explained in this chapter.

2.1 Analyze current processes and system in department

As an employee of the company's help desk for over two and half year, and over six years of experience in customer service in the IT sector, analysis is done on the help desk based on the author's knowledge. To get an even better understanding, however, of the working help desk environment, which consists of 4 agents, a questionnaire will be sent to the agents. This questionnaire will give their perspective of the current processes, resources available as well as a little insight into the sharing mindset of the environment. Another questionnaire is sent to the department manager for a more managerial view.

2.2 Conceptually design a KMS

A KMS is designed using related work and KM theory. To satisfactorily fit the environment the KMS will use applicable or modified procedures. The core of this KMS is based on the work from "*Knowledge management for call centres*" by James Robertson and further validated or developed using research on KM.

2.3 Use the new KMS and analyze changes

Finally the designed system will be used, in close collaboration with the department manager, in a way that proposed changes to the help desk in question will be formulated and a prototype is created. This is then compared to previous analysis and examined giving a detailed change of event and impact. Proposed changes and prototype will be sent to the agents for their review. They will then answer questionnaires to engage their reactions in order to better analyze the cultural and procedural effect.

These are the chosen methods in order to reach each of the objectives. They in turn will contribute to the main goal of achieving the aim of the project. The primary data is compiled from author's working experience in the environment and the answers to the questionnaires, which the author provided for the help desk employees, is complimentary data to back up author's knowledge.

3 Background

It is easy to throw around words like knowledge management, knowledge management system and help desk, but that is not very useful if the reader has little information about these topics. This chapter aims to better explain the main concepts of this project as well as comprise information about the company that is working with the author and the author himself.

3.1 Knowledge management

In this chapter a closer look is taken at KM; firstly what it is, then a few basic concepts within the field, followed by why we should be using KM and lastly explain KMS.

3.1.1 What is KM?

Unfortunately there is no universal definition for KM. Although it is now a concept that is over 20 years old there seems to be no consensus for a unified definition. A few of these definitions are detailed below.

Aggestam (2008) talks about knowledge management being the work that should provide the right knowledge, both tacit and explicit, to the organization's members that need it, so that they can do their work tasks better. In other words it is the practice of gathering knowledge, documenting it and then making it available for those in need. Meso and Smith (2002) describe KM as being the process of capturing an organization's expertise and intelligence in order to cultivate innovation through continued organizational learning. Wiig (1995) names four very important factors in managing knowledge: (1) find, create and exploit knowledge that is competitively important in order for the organization to obtain a leadership position; (2) managing the knowledge daily in an intelligent way – cost efficiently without sacrificing quality; (3) build knowledge from assets within the organization; (4) make sure that knowledge is up-to-date and relevant.

The common thread in these definitions is that KM is the process of capturing knowledge and disseminating it to the members of an organization. The result, of KM implementation, can differ, doing every day work processes more efficiently, finding new ways to solve every day problems or working faster due to more accessible knowledge.

With multiple definitions of the concept within the field of KM it can become quite confusing for the reader. This project takes the position that it is the practice of capturing, codifying and disseminating knowledge to the right user for the right situation. This is the most abstract view of the process as there are multiple aspects that are included within this definition, i.e. making sure knowledge is relevant, accurate and up-to-date which would fall under the capturing process.

3.1.2 Why use KM?

A businesses' ability to stay competitive in its market is one of the most important aspects in order to stay in business. A competitive advantage largely results from innovation. Innovation often occurs when new knowledge is created and new knowledge is created in the organizational learning process (Meso and Smith, 2002). As mentioned before, the acquisition of new knowledge is among one of the processes of KM is therefore and thus KM is an important part of having a competitive edge.

3.1.3 Important concepts in KM

Here we will take a look at a few concepts within the KM field of study. Among those concepts are the clarification of knowledge, the SECI model, cultural issues like the learning organization and knowledge management systems.

3.1.3.1 Knowledge

Nonaka & Takeuchi (1995) categorized knowledge into two sets, tacit and explicit; these are then defined into another two categories, internal and external. A better clarification is as follows.

- Tacit knowledge is considered something that you know, something that is not documented in any way and often considered hard to explain. Internal tacit knowledge is often referred to as “know how”, things like looking left and right before crossing the street and checking the water temperature in the bathtub before going into it. External tacit knowledge, on the other hand, is like saving your work regularly and signing letters with your name.
- Explicit knowledge is the knowledge that has been documented, whether it is written on paper or stored on an electrical database. Internal explicit knowledge is the knowledge that has been documented but you know it without having to read it, can be something that someone else has told you, like the biblical Ten Commandments. External explicit knowledge is the documented knowledge that you have to acquire, like reading the instructions for your new electrical appliance.

The individual knowledge is crucial for developing the organizational knowledge, but this organizational knowledge is not merely the sum of the individual knowledge (Bhatt, 2000). It is in fact a sum of multiple relationships between organization, its members, techniques and technologies it uses (Bhatt, 2000).

3.1.3.2 SECI Model

Nonaka and Takeuchi's (1995) SECI model is the process of making one member's tacit knowledge to another member's tacit knowledge by making it explicit first (see figure 3-1). It stands for Socialization, Externalization, Combination and Internalization. Travaille & Hendriks (2010) explain the concepts as follows:

- **Socialization:** Involving two or more individuals blending their mostly implicit insight to create new tacit knowledge.
- **Externalization:** Covers documenting this tacit knowledge to make it explicit. Can be done by creating analogies and metaphors.
- **Combination:** Combining the new explicit knowledge by adding, sorting, categorizing it into the existing knowledge base.
- **Internalization:** The act of making the codified explicit knowledge into new tacit knowledge. This can be achieved by learning-by-doing, goal-based training, etc.

The SECI model is often referred to as the SECI learning spiral. This is due to it being continual and at each revolution of the spiral the total knowledge of the organization increases.

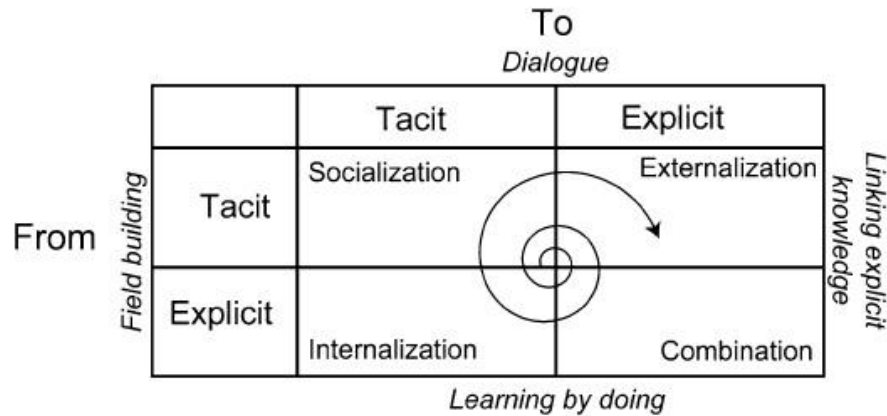


Figure 3-1: Travaille and Hendrik's (2010) view of the SECI model.

3.1.3.3 Learning organization

"... organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to learn together." (Senge, 1990, p.3)

Peter Senge, the author of *The Fifth Discipline*, is one of the leading figures when it comes to the concept of the learning organization. This definition at the beginning of his book explains how learning organizations never stop trying to evolve their knowledge. That leaves one thing to consider. Is the concept of a learning organization a part of KM or is it the other way around? Aggestam (2008) actually devised a model of stages for achieving maturity as a learning organization (see figure 3-2). This model describes KM as a stage of the maturity process in becoming a learning organization, thus being a tool to use in this process. Organizational learning is the other step in this process, where organizational learning is when the learning of the individuals changes the organizational knowledge. She further defines that a learning organization is not an end-state; it is in fact an endless loop of this maturity process. One way to look at it is like picturing a waterslide. The goal is to reach the top, becoming a learning organization, but in order to do that you have to walk the steps all the way to the top, where the steps are KM and the act of walking is organizational learning. When you reach the top you slide down the waterslide and start it all over again. The basis for all of this is that the organization has a learning culture. The members of the organization have to have this sharing mindset, teaching and learning, and preferably be self motivated to have this mindset.

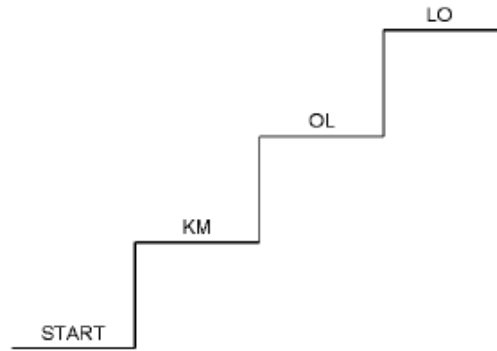


Figure 3-2 : Aggestam's (2008) model of Learning organization stages

3.1.4 Knowledge Management System

Knowledge management systems (KMS) share a problem with KM, there is no universal definition. Some say that there is no distinct difference between a KMS and an information system (IS) while others argue that these two concepts are completely unrelated. If we start by breaking down these two concepts, down to the core of their meaning, knowledge and information. What are the differences between knowledge and information? Bhatt (2001) proposes that knowledge and information are differentiated on the basis of interpretation. *"Without meaning, knowledge is information or data"* (Bhatt, 2001, p.2). Through certain actions such as combination and interpretation data becomes knowledge. These actions would be, data is collected and combined thus becoming information which gets interpreted into knowledge. Now taking another look at KMS and IS, Meso & Smith (2000) define an organizational KMS as *"... a system that provides for the creation of new knowledge, the use of existing knowledge, and the finding of knowledge from internal and external sources."* A KMS must then be a system that uses KM tools to achieve its specific goal of capturing, codifying and disseminating knowledge. This implies that a KMS can be designed without the use of information technology (IT), this is further supported by what Holsapple (2005) calls the exclusive view. The Wikipedia entry for IS states that it is any combination of IT and people's actions using these technologies to maintain operations, management and decision making. This implies that IT is always present in ISs. The problem here is the lack of unified definitions for these concepts. Researchers have to decide what their view is and define their work accordingly.

3.2 Support levels

Support levels represent the levels in a technical support domain. These levels are usually defined by a company's needs or wants but according to the Technical support entry on Wikipedia there are usually three to four levels of support. These levels being as follows:

- **Level 1:** Initial support. Takes information from customer. Solves simple and straightforward problems and *"...possibly using some knowledge management tool..."* (Windley, 2001, p.4). Meant to handle 70% - 80% of user problems. Responsible for escalating unsolved problems to next level and, rarely, to level 3.
- **Level 2:** Handles escalations from level 1. More technically specialized personnel. Helps level 1 with solutions of problems. May handle, but not

limited to onsite repairs or replacement of different kinds of hardware components, use remote control tools to take over user's machine to perform troubleshooting or applying problem solution. Escalates remaining problems to next level.

- **Level 3:** The highest level in the three-tiered support model. Consist of experts in their respective fields. Handle the most complex of problems that the first two levels cannot solve. Usually have the same responsibilities as the level 2 technicians.
- **Level 4:** This is not a universally used level. This level often implies escalations to the point of involving hardware or software vendors outside the organization.

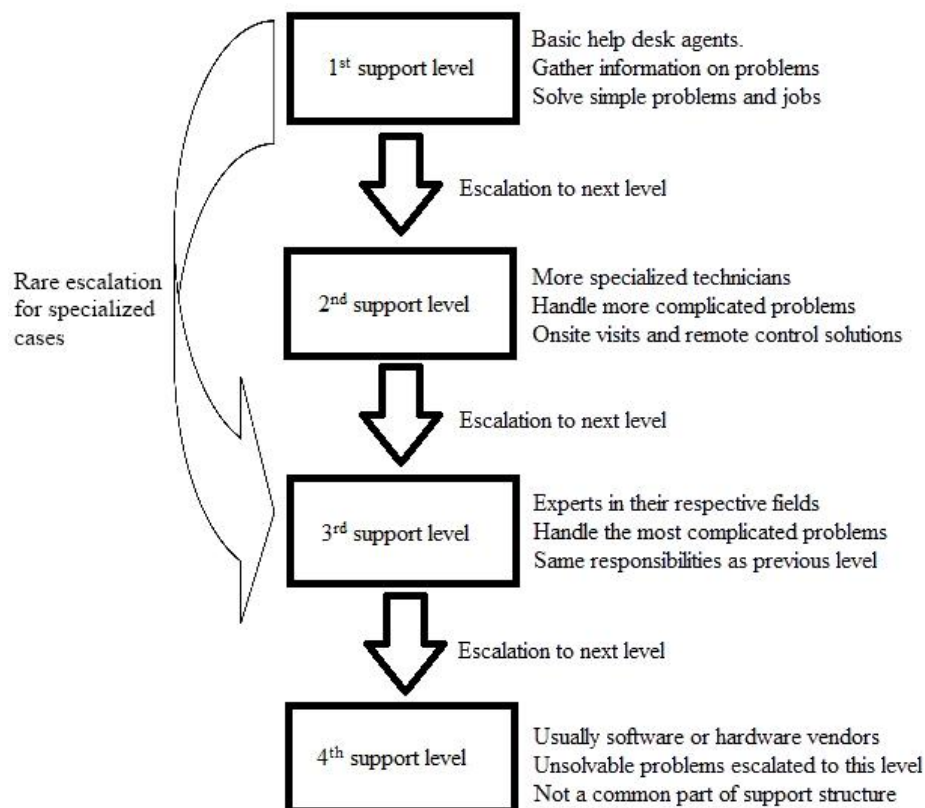


Figure 3-3 : Support Levels

The definition of this project for this 1st support level is a mixture of the first two defined earlier. It proposes that the help desk does most of the remote work done by 2nd support level. It also proposes that the support levels connect through Omni-directional work flow (see figure 3-4) so work can be delegated back to lower tiers if the solution can be implemented by the help desk, thus being able to further grow the knowledge base and use the help desk to its full potential.

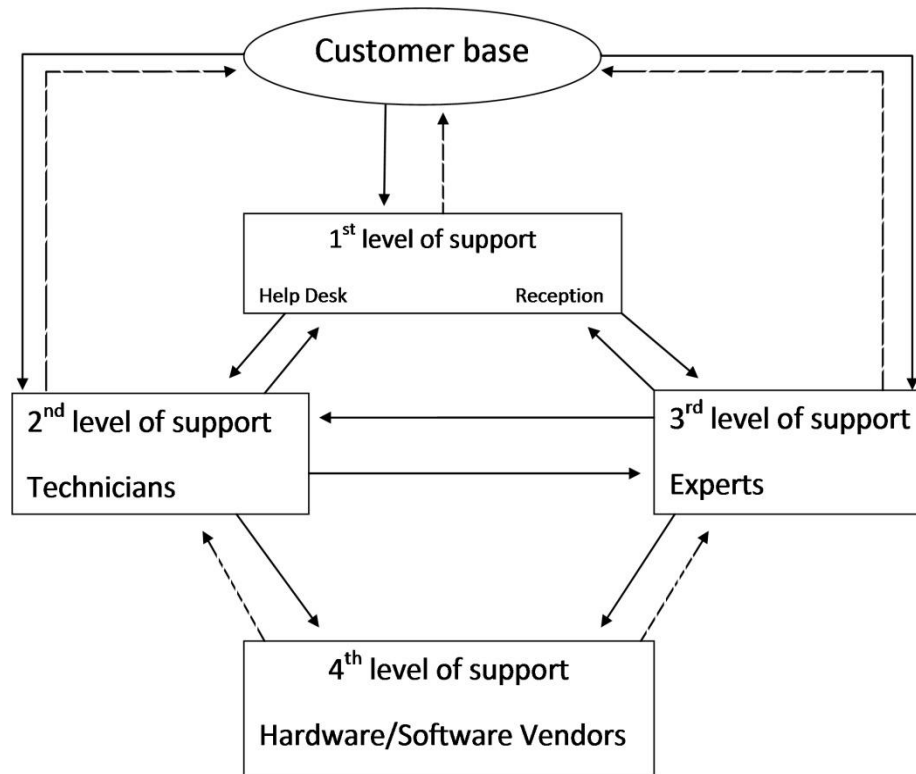


Figure 3-4 : Communication channels. Dotted lines represent rare communications.

3.2.1 Call centre vs. help Desk

To begin with let us look at the call centre phenomenon. According to the Wikipedia entry a call centre is: “*a centralised office used for the purpose of receiving and transmitting a large volume of requests by telephone.*” The call centre handles both incoming calls as well as outgoing calls. Incoming calls are types of calls that are initiated by the customer, often to solve problems with a product. Outbound calls, on the other hand, are calls initiated by the agent where he is selling a product or conducting surveys, arrange meetings, distribute information and other things along those lines. Another concept in this field is the contact center. It has a broader definition that covers handling of e-mails, faxes, live chat, letters, telephony, etc. etc. The help desk environment this project focuses on is somewhat a mixture of those two, though help desks are usually considered to be a version of a call centre. The project’s help desk only handles technical problems that customers have, software and hardware. The only outbound calls to these customers are to inform them that a problem has occurred and the problem is being dealt with or that a problem has been fixed which the customer has reported. It also handles requests sent in by other mediums, which is mostly e-mail.

As is with all customer support the help desk has to have capable agents that also possess people skills, have good sense of problem solving and realize that they are quite often the standard by which the company is judged. Speed, efficiency, quality and good interaction are the key ingredients to the customer being served, well.

3.2.2 The job ticket

The job ticket is a service request that is entered into a system in order to document its progress. This allows for managers and employees to follow up on requests made, both in-house and customer initiated requests. In this day and age there are numerous software solutions to handle this and these software solutions allow for better control of these job tickets. Job tickets can be categorized and prioritized in many ways and this is usually designed by the company according to their standards, needs or wants. Gonzales et al. (2005) mentions four categories that a fortune 500 company uses. These are a good example of how these job tickets can be categorized, they are as following:

- **Critical severity:** A system or a major system component is down or unavailable to a substantial portion of the user community, or the user cannot conduct critical business operations that will result in a significant loss of revenue, profit, or productivity.
- **High severity:** A problem that causes a partial or potential system or application outage.
- **Medium severity:** A problem that must be resolved but does not impact the service level commitments of the information technology organization. The problem does not severely impede the user's ability to conduct business and/or it can be circumvented.
- **Low severity:** A low impact problem that does not require immediate resolution, as it does not directly affect the user's productivity, system or application availability.

3.3 Related work

As was previously mentioned there has not been much work done on KM in the help desk environment. Although there is some work on the building and evolution of FAQ (Frequently Asked Questions) in the help desk environment, like "*Behind the Help Desk: Evolution of a Knowledge Management System in a Large Organization*" by Halverson, Erickson and Ackerman (2004), which is not applicable to this project. FAQ is not applicable for this project as the help desks view this project takes is that the help desk is meant to assist clients directly and not by showing where they can find instructions to fix the problems themselves. Though this is the case at least two articles were found on the project's subject, each focusing on different aspects. The first one is an article written by James Robertson, who is a managing director for a KM consultancy company, the second one is written by Gonz  les et al. for the Department of Industrial and System Engineering, Florida International University. The following are reviews of these articles.

3.3.1 Knowledge Management for Call Centres

The author, James Robertson, specializes in establishing knowledge management systems, information design, usability and XML development. With his article he talks about the key issues when implementing KM for Call centres. He breaks it down into two parts, the first one being how you manage your knowledge and the other being how to develop the KMS.

Regarding managing your knowledge he writes about four processes and what they involve:

- **Identifying required information**, with the help of employees, customers and outside sources.
- **Structuring the knowledge**, up to a third of the time in a KM project should be spent on design and testing. This will reduce risks in developing a solution that doesn't meet standards.
- **Information accuracy and making sure that it is up-to-date**, by allowing users to comment or critique will allow for better accuracy.
- **Making sure that staff is trained in the use of KMSs**, thus making sure they fully comprehend the full extent of the system.

Regarding the KMS development there are more processes to cover, these processes are as follows:

- **Build a call centre intranet**, therefore easing communication between all departments and keeping the call centre up-to-date by introducing multiple types of information, i.e. training material, policies and procedures, help desk resources, etc.
- **Knowledge repository**, an online information storage that is available to all members, well-structured, easy and efficient to use, comprehensive and correctly maintained.
- **Develop online solutions**, allows for better integration into a single seamless solution. Also allows for "thin client" technology.
- **Effective searching and browsing** will shorten time that staff needs to find correct material.
- **Analyze staff usage**, can help with finding missing information and locating frequently asked questions. Basically what is and what is not valuable.
- **Feedback**, thus making available a single point of contact where staff can comment on the KMS, what is missing, what is good, etc. Staff reacts better when listened to and that motivates them to keep information up-to-date.
- **Develop custom KM solutions**, little applets that help with the day-to-day work.
- **Integrate CRM and KMS**, connecting information from both to be integrated. This would be like connecting escalation in the CRM system with the KM processes and grouping KMS information according to the CRM grouping.
- **Integrate help desk and KMS**, involves that most help desks use call logging to track status of reported problems and issues. This information can then be used to create solution for the KMS.
- **Integrate IVR and KMS**, Interactive Voice Response (IVR) systems are often used to front the help desk. By using the information from this system and information from the KMS it is possible to ensure consistency between the two. Also the IVR gives data that can be analyzed further to improve the KMS.
- **Customer-facing resources**, covers the fact that call centres now handle online queries and thus need to manage an additional workload. By publishing

FAQs for customers, making sure online information is correct and developing standard responses for a range of e-mail or website queries, this workload can be managed better. This should all be based on the same information that is used by call centre staff.

The author then gives his conclusions which are that by using KM tools and approaches it is possible to get the information to call centre staff more quickly. Making sure that knowledge is accurate, up-to-date, easy to use and comprehensive is also very important.

This article is very helpful as it covers a lot of the points that are necessary when creating a KMS. He covers each point with a practical idea so that the reader understands better what it involves. There are a few problems with this article. Firstly he switches between call centre and help desk quite frequently, never explaining properly if they are the same thing or if there is a difference. In this article the KMS and IT system come across as the same thing, which is not the case as mentioned in the KMS chapter. The culture part of the KM area is always quite relevant and he touches on the subject of staff involvement in this regards.

3.3.2 Knowledge management-centric help desk: Specifications and performance evaluation

This article is more quantitative, than the previous one, and aims to show the benefits of using knowledge management-centric help desk over using the agent-centric help desk by using statistical data gathered from a simulation study.

Agent-centric help desk: The general idea here is that all knowledge resides in each agent of the help desk. This can be personal instruction stored electronically, as tacit knowledge, printed documentation and access to the Internet. No knowledge is shared and different agents solving the same kind of problems often have to spend the same amount researching a solution to a problem even though someone has already searched and found the solution. Therefore the responsibility of finding the correct information or knowledge is on each agent.

Knowledge management-centric help desk: This approach entails sharing knowledge between agents in order to achieve faster and more efficient work processes. It proposes using a KMS as an intermediary between the help desk agents and all information, data and knowledge sources. With the KMS as an intermediary it would aid in the knowledge acquisition and work as a single uniform interface. The interface is the bridge that connects all sources, both internal and outside, allowing for a speedier way to locate relevant knowledge no matter how it is organized at its location.

The KMS that the authors use is designed to support both tacit and explicit knowledge by integrating several technologies including group-ware, information retrieval and document management. An important element of this KMS is how knowledge access is organized. In this case it is organized according to a context-specific to the help desk and how its agents perceive the problem domain. The prototype illustrates a split view where the search criteria are on the left hand side of the window and the knowledge sources are on the right hand side. The knowledge management-centric approach can aid with achieving organizational learning. Problems are a part of the organizational memory and thus available to all other agents.

The article goes on further to describe an agent-centric help desk in a fortune 500 company that goes from a single agent to a multi agent department. The company aids the evolution of the help desk by implementing a computer telephony software package, called Remedy™, in order to better track job tickets and provide better service. The article also covers a basic flow of problems through the help desk and how they are escalated in the system and given priority according to a defined criterion.

Data was collected, using the Remedy™ software that the company used, for the agent-centric help desk approach. Interviewing management and the help desk agents gave them their key performance indicators, which were:

- Number of calls received versus number of calls abandoned
- Number of calls resolved at first contact
- Average time to resolve a problem at each level.

These points were then used as building blocks for the simulation model. This simulation model is used for the data acquisition for the knowledge management-centric approach. The simulation model was run with different replication numbers in order to verify that it worked under different conditions. After that a statistical testing was used to validate the model.

The results were clear cut. They showed a significant advantage of the knowledge management-centric approach. For low priority calls in the system, times were improved by almost 60%, medium priority almost 65% and high priority close to 52%. The system also showed a 19% higher throughput (total number of calls resolved within a certain time period). This indicates a possible cost benefits as more calls can be resolved at the 1st support level, which usually has staff that are at a lower salary level than higher support level staff. This approach also results in quicker problem solving, which is very important in a business unit.

The article finally concludes that they have given a specification of the knowledge-centric system for the help desk. A system that incorporates different aspects of other available systems, it is centralized, integrated into the help desk process and therefore avoids the use of specialized personnel to update the knowledge base. Because all knowledge goes through the system it becomes available to all help desk agents and because all the knowledge is captured by the organization and by the individuals it promotes organizational learning. It also concludes that there are issues that they do not cover as they cannot be addressed in a computer simulated scenario, such as cultural issues.

This article gives a very good perspective with regards to the different approaches of help desk management and how the knowledge management-centric one is clearly the better of the two discussed. It helps with in facets of selling the idea to organizations, with figures, even though it is simulated data. The authors also recognize that they could not account for the culture variable in their research and that it is a significant aspect. There is a lot of data and tables to illustrate the results, which in turn require a little bit of knowledge of statistics. The practical illustration of the company allows for the reader to get a better understanding of the research. This article underlines certain problems with current practices, like case based systems, and aims to create a solution so that these problems can be avoided. The proposed problems and solutions comply with this project's issues.

3.4 The Company

Pekking (Thekking) was originally the IT department (started in 1974) of a retail and wholesale company (KEA). In November of 1999 this department was made into an IT service company in Akureyri. In May 2001 it merged with a company called Tristan ehf. and their base of operation became the headquarters in the capital city area. Together these companies formed one company under the name Pekking ehf. and now provide service for IT solutions for the entire country (Iceland). The name Pekking means knowledge and just underlines that knowledge is very important in the company's policy. Pekking is one of the leading local players in the industry.

The company has about 50 employees in 5 departments and is based at two locations, Akureyri (in the north) and Kópavogur (in the south). The customer service is one of the most important facets of the company. It has 3 levels of support, the first being the help desk where companies, that have a certain support contract, can call in, agents will try to solve their problems and if that is not possible they will make sure that the problem goes to the next level. The second level is the technical agents. These agents solve problems that the help desk cannot solve along with doing the onsite work. The third level is then the specialized department which handles more complex issues such as programming, network issues, database problems etc.

3.5 Author reflective bias

I want to give you a better view of my background and that will hopefully allow you to understand better my views on this project and its scope. I have been working at the Pekking help desk for over two years now. Currently I am on a one year leave, due to my studies, but intend to go back when my studies are finished. I have a multitude of duties there which range from taking calls, assessing severity of problems, attempting to fix the problems, finding the correct technician to solve the problems and producing a "job ticket" for higher level of service. This includes problems with both software and hardware. Before working at Pekking I worked at a computer retailer as a salesman, customer service agent and technician, for over two and a half years. I have handled customers in every aspect of the job. I have also been working privately as a computer technician, helping the everyday man with his PC related problems. With over six years of experience in customer service, on both ends of the table, I have felt that there is often a lack of knowledge when dealing with problems. As a customer I often feel that solutions take too long, and considering I know what they have to go through to find the solution I usually give them more than enough time. Sometimes I get agents that have no idea what I am talking about or have very little knowledge about the kind of problems they should be able to solve. As an agent myself I sometimes feel that the environment I work in can be rather unorganized, looking through multiple documents to find the right solution is often too time consuming.

The KM field of study is something that intrigues me quite a bit. It can be implemented in so many ways to help each and every situation. I understand that I will be looking at it from the Help Desk Agent point of view and that there might be some ideas that need to be looked at even after I have dismissed them and that is why I will try to engage outside opinions to help with the adaption of the system. I also want to see what happens when KM is implemented in this environment. Statistical data is helpful for the justification for management but, as a help desk agent, I want to see how this affects me and my work environment.

4 Working environment

Imagine that you are a customer with the best support contract available and that you sell furniture. You have a problem with your retail software and you are unable to make a receipt for your customer. You call the help desk, first they take your information, then they access the client database to find your branch and the ip address for your computer in order to connect through remote control software, next they try to find a documented solution to your problem, given they do not know it by heart, and finally they attempt to fix your problem. One of two things happens next, either they solve the problem or they escalate the problem to the appropriate department by creating a job ticket. If the severity of the problem is high they will follow up on the job ticket to make sure it is addressed in the correct time frame. This is an example the working environment (see figure 4-1 for workflow). This project focuses on the help desk aspect

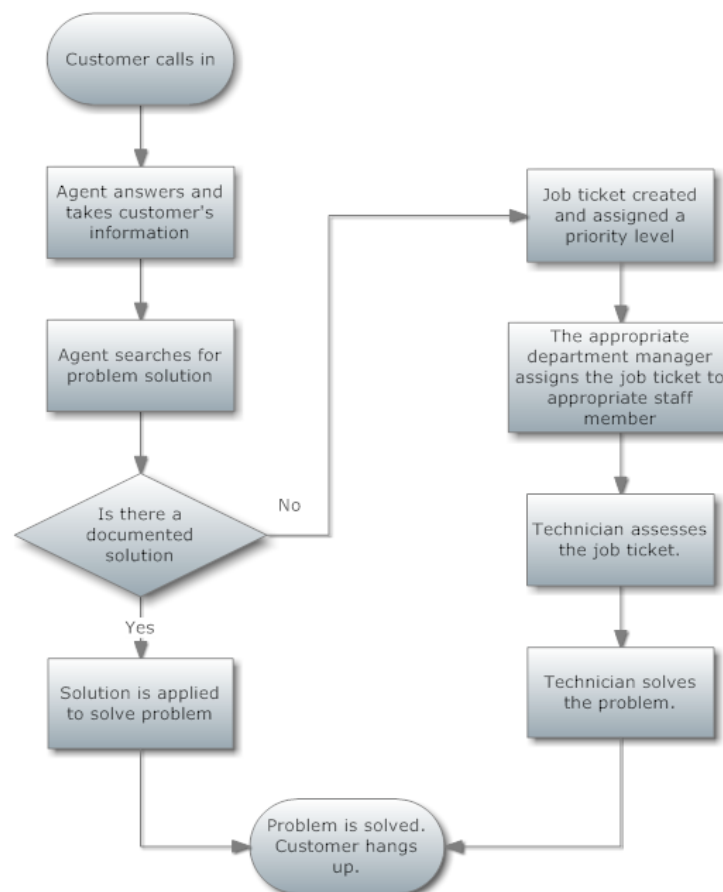


Figure 4-1: Current work flow

The help desk, which is used in this project, consists of four agents and one department manager, who is a normal agent but also does more specialized work. The agents also keep a watchful eye on monitoring systems and take appropriate actions if something fails. These systems are meant to catch errors in a number of IT solutions provided by the company, i.e. hardware, inventory, ordering and sales reports. The reception also falls under this department; receptionists answer calls to the main

phone number and the overflow trying to reach the direct number. Receptionists only take down basic information and/or forward callers to the appropriate department. Because some of the company's customers are "rivals" the help desk is divided into groups when it comes to these customers, this is hereafter referred to as rivalry. If an agent is assigned to a certain customer he can only do very basic work for certain other customers, their rivals, due to the rivalry.

4.1 Data

The analysis of the help desk is primarily based on the author's knowledge of the environment. In order to confirm that this knowledge was correct, and things had not changed significantly, two questionnaires were sent to the help desk, one for the manager and the other for the agents. The questions for the agents and the reason for them were:

- **Describe your work flow, starting from answering a call until you hang up. Describe for both problems you can solve and those that you cannot.**
 - This question was meant to insure that the procedures had not changed. It is also the base for the workflow image (see figure 4-1)
- **Do you find it important that other agents share problem solutions?**
 - This question was to engage the culture in the department. To see if there the sharing mentality was present and what agent's expected of each other.
- **Do you feel you lose your specialty if you share your knowledge?**
 - This question was also to engage the culture in the department. This was more focused on whether they thought they could weaken their position within the company if they shared their knowledge.
- **Do you think the help desk could solve more problems if they had access to the right knowledge?**
 - This was used to engage the potential of the department, the agents' point of view.
- **How many different programs do you use on a daily basis?**
 - To get a better overview of what kind of programs they used and thus seeing what they used them for.
- **Do you think something could be done to make it simpler?**
 - Engage the agents view if the current resources could be simpler, easier to use and such.
- **If you could change one thing what would that be?**
 - Engage what is the most significant aspect of their job they would like to change and if that view was the same as the author's view.

The other questionnaire was sent to the department manager, his questions and the reasons behind them were:

- **What resources do agents have access to in their day-to-day work?**
 - Get an overview of the resource available to the agents.
- **What are the agents' responsibilities?**
 - Compare the managerial view of the agents' responsibilities to what they actually do.
- **Do you feel that the help desk can solve more problems if they have access to the right knowledge?**
 - This question was to engage his view of the help desk's potential.
- **Describe the department's atmosphere/culture.**
 - As a manager he keeps an eye on how the agents interact and thus has a good overview of the culture and atmosphere.
- **Are changes in the department discussed with the staff before being implemented?**
 - Checking his personal philosophy towards staff influence in decision making.

Other issues were discussed in e-mail correspondence or phone calls. (Answers from questionnaire see Appendix A).

4.2 Analysis

The "job ticket" software, CRM base and part of the knowledge base, is all in Lotus Notes. Agents use Microsoft Word, Microsoft OneNote and/or pen and paper to document their work. The instruction, or problem solution, knowledge base consists of Microsoft Word files stored on a file server and organized by a predefined document key system. Each company has its own folder; this folder has subfolders containing relevant information for sales department, support and contacts, each folder is then accessible only to those that need the information. This information is linked in Lotus Notes to a certain degree. When the work day is done, each staff member is supposed to record his/her work into a time journal system. This system is used to bill customers and to track work hours of staff for salary purposes. Most work, at this help desk, is done through remote control software.

Agents are encouraged to record solution to problems they encounter so that other agents can use the information should they encounter the same problem. The processes of recording these problem solutions is; typing them up in Microsoft Word, placing them in the appropriate folder, linking them into Lotus Notes and inform the agents. This is a process that today is outside the normal day-to-day routine and therein lays the problem. There is a good sharing culture within this help desk as agents are not afraid of losing their specialties if they share their knowledge and actively try to share their knowledge. Agents actually want the company to do well and realize that in order for that to happen every agent has to be able to solve as many problems as possible. Agents are all in agreement that the help desk can solve more problems than it does now. But for that to happen the technicians need to share more of their knowledge, which is currently limited due to a high workload. There is

definite potential for the agents to solve more than they do today. The challenge is how to capture the knowledge of the technicians and system admins. When there are going to be changes in the help desk department the manager actively discusses them with the agents before implementing as he feels that it works better to get their feedback.

González et al. (2005) define two different approaches to the help desk environment the agent-centric help desk and the KM-centric help desk. The agent-centric approach is where all knowledge resides with the agent, in documented form and/or personal experience. On the other hand the KM-centric approach is where knowledge resides in a knowledge repository and all knowledge sources are accessible through a single interface. The current approach in our environment does not fit into either approach but instead is somewhat a mixture of these two approaches and will be referred to as a sharing-centric help desk. This sharing-centric approach entails that the knowledge is both tacit and explicit; it resides in a repository of a sort and as personal documents. There is a sharing mindset within the organization and members realize that their specialties do not rely on them having to hoard their knowledge but as being assigned to service certain clients in greater detail than other agents.

4.3 Problems

Problems with the current environment are largely related to the knowledge base. First of all it takes too long to search for solutions, browsing through folders or using the somewhat flawed search function in Windows. There are even some solutions that agents only have in their possession and are not on the server. The tacit knowledge is plentiful and communication between agents is good, yet it can become frustrating when people ask the same questions often. Another point is that this knowledge is less accessible when the agent, which has the knowledge, is on vacation, sick or even leaves the company. If this knowledge could be codified and placed in a database it would both increase efficiency and ease frustrations. The available solutions also need reviewing; some are rarely used and might not still be applicable while others have very confusing titles. There are also some solutions that apply to multiple clients and these are placed in different folders, a sort of “applies to all” section. The sheer number of different kinds of software that agents have to use every day is also a little hindering. If they have to locate information about something they have done in the past it requires too much manual searching and it takes time switching between different software solutions to do a job. There is also the fact that agents do not have access to the work descriptions from other agents, aside from the job tickets which are not always created. All this was confirmed when agents were asked what they would change if they could change one thing, they were unanimously in agreement that the knowledge base needs a overhaul. They want to be able to have a more accessible knowledge base, which covers everything from problem solutions to customer information. There also needs to be a process for the knowledge base and a sort of content quality control. Current statistical data available covers answered calls (%), missed calls (%), average waiting time of client and an efficiency rating. Although this is helpful information it is very limited and does not provide management with many helpful selling points for prospective clients.

5 The Knowledge Management System

The KMS is broken down into three categories, knowledge base, activities and technology. Knowledge base covers multiple aspects of the stored knowledge, like structure. Activities focus on how agents' tacit knowledge can be captured and disseminated as well as agents' participation in maintaining the knowledge base. Technology focuses on how to build a system that takes into account both aforementioned categories as well as every day work processes, access to knowledge base and electronic interaction between agents, to name a few. The core categories of this KMS are based on "Knowledge management for call centres" by James Roberts and each category is then further developed using research papers, adjusted to fit the environment. Each of the categories will be covered more extensively in this chapter. Finally we will cover a few issues that also need attention to facilitate the success of the project.

5.1 Knowledge base

Constructing the knowledge base is a key element in the process of implementing a KM project, without a knowledge base there is no project. User involvement is important to make the outcome usable (Levy, 2009). Engaging help desk agents in the development of the knowledge base helps to make sure that it fulfills requirements. These are the people that will be using the knowledge base on a day-to-day basis; they know best what should populate it and how it should be accessible. These aspects are based on Robertson (2002) paper and validated by Kiczo's (2001) work.

- **Identify the required knowledge:** Interview help desk agents, technicians, system admins, experts, etc. Evaluate what knowledge already exists and what is missing.
- **Structure knowledge base:** Make a knowledge map. Make prototypes and assess what fits the requirements best.
- **Make sure knowledge is up-to-date:** Put quality control into the hands of the agents. Assign knowledge managers that have a responsibility to maintain the content.
- **Staff training:** Make sure agents know how the system works. Make sure that instructions to the system are available to agents even after a "training period" is over, i.e. manual and/or videos.

5.2 Activities

Tacit knowledge is something that is often neglected as it is by its nature hard to document (Desouza & Vance, 2003). Therefore there is a need to have activities that facilitate the transformation of tacit knowledge into explicit knowledge. These activities are inspired by Nonaka&Takeuchi's (1995) SECI model. Another facet to keep in mind is to maintain the learning culture of the group. This could be achieved with statistical data, encouragement and by setting goals, which if met can be awarded (Zhang et al, 2010; Chen&Xu, 2010).

- Have a meeting once a month, or every other week, to discuss the current status of the help desk, discuss knowledge base issues (adding, updating and managing), review statistics and set goals.

- Have meetings with a customer's system admin to discuss progress and other issues.
- Develop an intranet forum so that agents can address problems or air their ideas on a day-to-day basis.
- Regular reviews on old and little used knowledge.

5.3 Technology

In this day and age technology has become a very big part of our life and even a bigger part of our work. It can be tricky to choose the right software to suit your needs. Information technology is a very powerful tool for KM and can be a make-or-break issue. A delicate balance regarding technology reliance is important as over reliance can result in project failure (Chua&Lam, 2005). There are multiple issues that need to be kept in mind whilst selecting the appropriate software solution. These issues are, but not limited to:

- **Maintainability:** Is the software complete or are there still issues that are being addressed by its vendor? Is it easy to update, upgrade and sustain?
- **Cost:** How much does it cost? Is it a onetime payment or are there future costs? Does it require new hardware?
- **Service:** Does the vendor supply good service? Do you have staff that is familiar with the software?
- **Usability:** Is it user friendly, easily understood and does it fulfill the requirements?
- **Development:** Is this a final version or is it under constant development? Can it be developed further in-house?

Setting requirements for these issues is a good start for a checklist to use on software candidates. The system needs more requirements though. Keep in mind that previous categories require that you can structure your own database, have access to an intranet, are able to gather statistical data on the system's usage and it should also allow users to provide feedback on the knowledge. Yet another issue is to integrate the CRM into the system, so that agents have access to more detailed knowledge. The main goal should be to try and find a centralized solution, one interface that connects to all required knowledge sources. Get staff feedback on possible candidates; they are the users that have to use it every day.

5.4 Lessons learned

Since emphasizing so much on having a learning culture it would be sensible to consider lessons learned on other KM projects. Although the material researched usually covers KM projects that are implemented throughout the entire organizations, and not just a single department, there are things that project leaders should keep in mind. One element is a dedicated management. If management does not fully support the project it can easily be derailed (Chua&Lam, 2005). Culture is also very important and things like politics, sharing knowledge and user's perceived image need to be monitored (Chua&Lam, 2005). This includes making sure that people want to share their knowledge, that it isn't a bad thing to access the knowledge base to get knowledge on an issue and that the success of a certain department is not bad for

others. Chua&Lam (2005) also identified failure factors in project management, things like:

- **User involvement:** Members of the organization do not participate in the project and their knowledge needs are not identified.
- **Technical and business expertise:** Not enough staff with the technical and business expertise to maintain the project.
- **Conflict management:** Conflict between members is not handled or not handled correctly.
- **Rollout strategy:** Lack of a rollout strategy. No specific way of testing or initiating the project.
- **Project cost:** Costs exceed the original estimates.
- **Project evaluation:** Progress of the project isn't documented and therefore no way to point out successes or failures.
- **Involvement of external consultants:** Over reliance on external consultant and/or involving too many of them resulting in confusion.

Not all these factors are applicable to every situation; you need to be sure to account for the correct ones. These lessons learned are issues that project leaders need to keep in mind as they do not directly make their way into the software itself.

6 KMS results and the prototype

The KMS above was sent to the help desk department manager for review and study. The author and department manager went through the system to work out requirements and produce a prototype. This prototype was then presented to the agents for their review and study along with other changes. This chapter will cover how each facet of the system was used and what was the result.

6.1 The knowledge base

The help desk has a very good database of instructions regarding problem solutions. There is some knowledge that could be added to the database but that will require participation from the technicians. This database is already structured and it was agreed that this structure suited quite well as a base and only needed to be slightly modified. As mentioned before, in chapter 4, the structure of the database is based on a predefined document key system. The core of the structure is based on each client/customer and then all material for the help desk is in a sub category called “instructions.” The change would entail that each piece of knowledge would be associated with client, branch and problem type. This would make it easier to find the appropriate knowledge by narrowing down each parameter in the system and allow for knowledge to be associated to multiple clients without being copied, placed in multiple locations or placed in a certain “applies to all” category.

Agents are assigned to groups which have full access to certain clients and basic access to their rivals. This serves as the base when it comes to assigning agents as knowledge supervisors to clients. Clients will be assigned at least two supervisors where one is a help desk agent and the other is a technician or the client’s system admin. This results in an “author and reviewer” relationship, allowing for increased quality control.

The knowledge base will also hold instructions on how the system itself works; this will include both an online manual and video instructions. The purpose of this is to aid with training of the staff, providing both better and faster training, and easing workload on other agents. Like other material this will need to evolve as the system does and when new features become available within the system they should be accompanied with instructions to be placed in this knowledge base.

6.2 Activities

The help desk department already has a monthly department meeting. These meetings cover overview of answered calls and missed calls, feedback from clients, things that need improving and acknowledgement of good work. These meetings will now undergo a few changes to accommodate issues regarding the knowledge base and system in general. To be added are short reports from knowledge supervisors, more statistical data from the system, important issues raised on the forums and the setting of goals for the coming month.

Meetings with a client’s system admin are scheduled two to three times a year, depending on the size of the client’s company. The knowledge supervisor and help desk manager attend these meetings with the system admin. This will serve to aid and/or increase communication regarding the problems that occur and the things that work well.

The company has been developing Microsoft SharePoint as their intranet. This allows for forums, which are being used but could be put to more use especially with regard to knowledge issues. Encouraging discussion both on the forums and just in general, like on coffee breaks, will allow for tacit knowledge to surface. Agents will then have to recognize that this is knowledge that needs to be documented. Technicians are given a special place within this forum to get feedback on whether certain problems can be solved by the help desk, given that the agents have access to the right knowledge.

Counters are placed on the instructions to keep tabs on their age and how long it has been since it was last implemented. If an instruction is not used for six months its supervisor is sent an alarm/a message so it gets reviewed and when an instruction reaches the age of two and a half review process is also instigated. These reviews will determine if the instructions are still applicable, if they need to be updated or if it can be removed from the database. If it is not removed the counter is reset and the alarm/message will trigger next after one year, or six months if they have not reached the age of two and a half years.

6.3 Technology

One of the key factors when it came to choosing the software solution was trying to minimize the number of concurrently used software. The idea was having a solution that could provide the agent with as many features as possible, within a single interface, when agents are working on a call/job. Another quite important factor was flexibility, the ability to change or develop further without too extravagant costs. Due to such specific requirements and preferences it was decided to build the system as a website. It will allow for great flexibility, in-house development and close collaboration with users. The company has programmers familiar with website development and there is also a plethora of website developers that could be contracted to build parts of or the system entirely. This will also allow for a connection to the intranet forum, RSS feeds and have a centralized interface. In-house development and usability were considered the most important factors. The reason behind that was that it was foreseen that the system needs to evolve quickly as requirements change and with good usability the system's usage is will be higher. The system will only be accessible on the local network to ensure security. The idea here is that this system can grow and evolve as requirements will change, much like other KM solutions (Levy, 2009).

6.4 The prototype system

The proposed system is made up of 7 views, a homepage, call page, reports, knowledge base, client page, stats page and how to/help page. This system also records its usage for statistical purposes. As it is web based it can be integrated into the Share-Point system. Detailed description of each page is covered in the following subchapters.

6.4.1 Home page

The "home page" will hold important messages for the agents, i.e. dates of staff meetings, upcoming holidays, latest topics on forums, messages from management, etc. The flow of the system will always bring the agent back to this page when finished working in the other views. From this home page the agent will navigate to the subpages depending on what he wants to do.

Calls	Reports	Knowledge base	Clients	Stats	How to/Help
-------	---------	----------------	---------	-------	-------------

<p>Upcoming events:</p> <p>Next saturday shift : Mike</p> <p>Staff meeting 07.06.10</p> <p>Department meeting 08.06.10</p> <p>Next holiday 17.06.10</p>	<p>Most recent forum topics:</p> <p>Microsoft Outlook does not update inbox.</p> <p>New Windows XP update results in BSOD</p> <p>New worm going around, how to remove.</p> <p>A few important points on MS Dynamics C5</p>	<p>Messages from other dept:</p> <p>All work for Hot Dogs inc. suspended until further noted</p> <p>Clothes R You inc. undergoing hardware renewals. Further information due in the next few days.</p> <p>New primary technician assigned to Jim's Garage</p> <p>New client : Cool and the Gang ice cream parlour</p>
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Figure 6-1 : Home page view

6.4.2 Call page

This view will be the primary focus of the system. This page is used to record information about a client, provide the agent with knowledge from the knowledge base based on the information and record the agents work. The view is split into 5 boxes.

The agent starts by setting the time the phone call started, and then chooses the appropriate client, branch and problem type. This will allow him to choose from available problem solutions. If there is no solution available for the particular problem he checks the appropriate box or he checks another box if the solution available does not work.

When a certain problem solution is selected it appears in the adjacent box and the problem solution's counter is reset when the submit button is pressed. In a box below, the solution text, the last work done for the client regarding the problem type appears. Displaying known solutions and the last thing done allows for a comparison to make sure that information provided is correct. Then there is one box for displaying information about the particular branch, things like store manager, system admin, primary technician, ip addresses for workstations and other hardware. All this allows for a mixture of case based solutions, specially codified solutions, equipment and CRM.

Finally there is a box where the agent writes down the problems description and his work. When the agent presses the submit button all the information accumulated is committed to the database and will serve as the "last work done" for the next time a similar or same problem occurs. Ultimately, the necessary information would be pushed into the time journal system automatically when submitted.

Set start time
Set end time
Reset Form
Submit call

Phone call starts: 08:00
Phone call ends: 08:30

Customer: Company inc.
Branch: King's Square
Problem type: Retail software

Available solutions:

- Unable to create new receipt.
- Error on retrieving customer history
- Unable to create new customer
- Missing column in sales screen
- "Cannot connect to server"

☐ Solution out of date
☐ Solution not available

Information on customer and branch:
System admin: John Smith Phone: 123-1234
Primary technician: John Doe Phone: 123-4567
Store manager: Jane Doe Phone: 123-7890
Hardware:
Manager station: 1.1.1.10
Workstation 1: 1.1.1.11
Workstation 2: 1.1.1.12
Workstation 3: 1.1.1.13
Workstation 4: 1.1.1.14
Workstation 5: 1.1.1.15

Unable to create new receipt.
Instructions to solve problem of not being able to create a new receipt.

Most recent work done for customer:

enter text...

Figure 6-2 : Call page view

6.4.3 Reports page

The “reports page” will allow agents to retrieve reports on their work. The agent will specify a certain time period and the system will display a report showing date, time, type, client, branch and description. This page will also allow for a narrower search in case agents want to see what they have done for a specific company and even a specific branch of that company. The report can also be printed out as soon as it has been generated. The agents can use the reports to fill in their time journal, compare them to information in the time journal system or review to see if there is anything missing.

Today
Clear
Generate
Print
Home

From: 15.05.10
To: 15.05.10
Client: All
Branch: All
Time: 08:00 to 16:00

Report

Date	Time	Type	Client	Branch	Description
15.05.10	08:00	JCS	Cool 'N the Gang	Queen Street	Unable to start sales station 3. Everything plugged in. Escalated to tech
15.05.10	08:30	JCS	The Burger joint	Main Street	Mail server down
15.05.10	09:30	JCT	Clothes R You	Queen Street	Find lost document on sales manager's workstation
15.05.10	11:00	JCS	Hot Dogs inc	Travel Street	Check for yesterday's sales reports
15.05.10	11:30	JCS	Jim's Garage	Industry Street	Set up Microsoft Office 2007 on workstation
15.05.10	12:30	JCS	Cool 'N the Gang	High Street	Unable to connect to server. Station restarted. Solved.
15.05.10	13:00	JCS	We Build inc.	Industry Street	Error in inventory software. Solution found and applied.
15.05.10	13:30	JCS	We Build inc.	Industry Street	Manager unable to access internet. Advised to restart computer. Solved
15.05.10	14:00	JCS	Town Municipality	Main Street	Create shortcuts to server folders
15.05.10	14:30	JCS	Town Municipality	Main Street	Unable to open scheduling software. Preferences adjusted. Solved.
15.05.10	15:00	JCS	The Burger joint	Main Street	Sales workstation unable to process orders. Advised to restart.
15.05.10	15:30	JCS	Jim's Garage	Industry Street	Set up mail account on workstation.

Figure 6-3 : Reports page view

6.4.4 Knowledge base page

The “knowledge base page” is the access point, for agents, to the knowledge base. Here they record new, update or delete problem solutions. Agents will have some options here. If there is a problem solution that applies to all clients they only need to select the problem type. Also if the solution works for all branches of the company they only need to select the company and problem type. Finally if the problem only applies to a specific branch of a specific company they select from all drop down menus.

When agents select from the drop down menus it populates the list of available solutions. In order to avoid accidental editing or deleting the agent has to check the “change/update” box to have the possibility to select a specific solution. When a solution is updated, its “last time used” counter is reset. At any time the user can clear the form and/or navigate to the home page.

The screenshot shows a web application interface for a knowledge base. At the top, there is a navigation bar with buttons: "Add/update", "Delete", "Clear", and "Home". Below this, the main content area is divided into two sections. On the left, there are three dropdown menus: "Customer:" with "Company inc." selected, "Branch:" with "King's Square" selected, and "Problem type:" with "Retail software" selected. Below these is a checkbox labeled "Change/update" which is currently unchecked. Under the checkbox is a list box containing five items: "Unable to create new receipt", "Error on retrieving customer history", "Unable to create new customer", "Missing column in sales screen", and "Cannot connect to server". On the right side of the interface, there is a "Title:" label followed by a text input field containing "enter text...". Below the title field is a large text area, also labeled "enter text...", with a vertical scrollbar on its right side.

Figure 6-4 : Knowledge base view

6.4.5 Clients page

The “clients page” is a part of the knowledge base as well as part of the CRM. This page will hold information about the company and its branches. The view is split up into three columns. The first column contains general information on the company, things like name, company number (social security or ID), system admin, primary technician and address. The mid column holds information on the company’s branches, things like address, phone number, manager’s phone number, name of the store manager and e-mail. Below there is a list of these branches where the agent can choose to edit or delete each one. The third and final column holds information on the selected branch, things like name and ip address of all hardware. Each column has a checkbox that is used to indicate that the information is new and should be added to the database, not updated.

Home																						
Company: <input type="text"/> <input type="checkbox"/> New Name: <input type="text"/> Company ID: <input type="text"/> Address: <input type="text"/> System admin: <input type="text"/> Primary technician: <input type="text"/> <input type="button" value="Add/Update"/> <input type="button" value="Delete"/>	Branch : <input type="checkbox"/> New Name: <input type="text"/> Address: <input type="text"/> Phone number: <input type="text"/> Manager: <input type="text"/> Store Manager: <input type="text"/> E-mail: <input type="text"/> <input type="button" value="Add/Update"/> <input type="button" value="Delete"/>	<div>Info</div> <input type="checkbox"/> New Machine Name: <input type="text"/> IP Address: <input type="text"/> Phone number: <input type="text"/> <input type="button" value="Add/Update"/> <input type="button" value="Delete"/>																				
	<table border="1"> <thead> <tr> <th>Name</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>Town Center Branch</td> <td>Edit Delete</td> </tr> <tr> <td>Main Street Branch</td> <td>Edit Delete</td> </tr> <tr> <td>Old Town Branch</td> <td>Edit Delete</td> </tr> </tbody> </table>	Name	Action	Town Center Branch	Edit Delete	Main Street Branch	Edit Delete	Old Town Branch	Edit Delete	<table border="1"> <thead> <tr> <th>Name</th> <th>IP Address</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>Workstation 1</td> <td>001.001.001.001</td> <td>Edit Delete</td> </tr> <tr> <td>Workstation 2</td> <td>001.001.001.002</td> <td>Edit Delete</td> </tr> <tr> <td>Workstation 3</td> <td>001.001.001.003</td> <td>Edit Delete</td> </tr> </tbody> </table>	Name	IP Address	Action	Workstation 1	001.001.001.001	Edit Delete	Workstation 2	001.001.001.002	Edit Delete	Workstation 3	001.001.001.003	Edit Delete
Name	Action																					
Town Center Branch	Edit Delete																					
Main Street Branch	Edit Delete																					
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Workstation 1	001.001.001.001	Edit Delete																				
Workstation 2	001.001.001.002	Edit Delete																				
Workstation 3	001.001.001.003	Edit Delete																				

Figure 6-5 : Clients page view

6.4.6 Stats page

As mentioned before the system record its usage for statistical purposes and therefore a stats page was a logical step. The stats page is primarily used for retrieving statistical data for department meetings. The possibility of displaying simple statistics about the user that requests this statistical data could also be developed. By selecting certain criteria, from a user specified range of dates, a statistical report can be generated. This functionality is mainly conceived for the management.

Clear		Generate		Home		Print	
From:	<input type="text" value="01.01.10"/>	To:	<input type="text" value="31.01.10"/>				
<input checked="" type="checkbox"/> Number of calls	<input checked="" type="checkbox"/> Number of escalations						
<input type="checkbox"/> Average length of call	<input type="checkbox"/> Most used instruction						
<input checked="" type="checkbox"/> Most answered calls	<input type="checkbox"/> Criteria 1						
<input type="checkbox"/> Criteria 2	<input type="checkbox"/> Criteria 3						
<input type="checkbox"/> Criteria 4	<input type="checkbox"/> Criteria 5						
<input type="checkbox"/> Criteria 6							
Report:				Number of call: 1053 Number of escalations: 769 Most answered calls: Mike - 296 Joe - 263 Danielle - 249 Elisabeth - 245			

Figure 6-6 : Stats page view

6.4.7 How to/Help page

The how to/help page is primarily conceived as a training page. This page will hold all the training information on how to use the system itself. All the material will be broken down into categories so that it could also be used by agents that just need a reminder of how a certain feature works or to learn how new features/functions work. The idea is to have both text and instruction videos.

7 From the Old to the New

After all the work done so far, what are the changes? Imagine again that you are the customer with the best possible support contract and you sell furniture. Same situation again, you have a problem making a receipt for your customer. You call the help desk, they take your information, input it into the new system, they get available solutions immediately and all information about your particular branch, then they access your computer and try the available solutions. Again one of two things happens, either they have a workable solution and fix your problem or they escalate the problem to a technician by making a job ticket. If the critical level is high the agent will follow up on the job ticket to make sure it is completed within the correct time frame. So what is the difference between this scenario and the one before? First of all, instead of having to search through a folder database after taking your information, the agent is getting possible solutions whilst recording your information into the system. Secondly this is all being recorded to make sure that if this problem is solvable by a help desk agent he will be able to solve it should it reoccur and thus will not have to escalate it to the technician (see figure 7-1 for workflow).

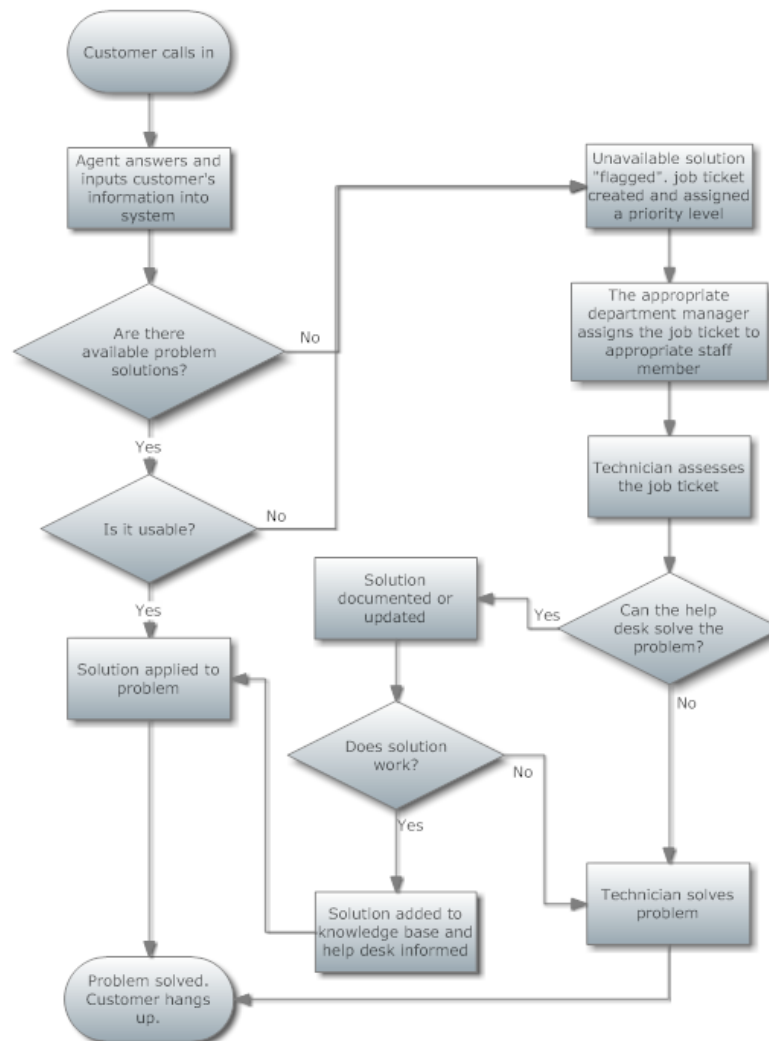


Figure 7-1 : New workflow

7.1 Data

Analysis is primarily based on comparing the current activities as discussed in chapter 4 and the changes illustrated in chapter 6. In order to engage the agents' view on the changes they received a questionnaire after they were presented the prototype, and other changes. The manager received two extra questions, other than that the questionnaires were alike. The questions asked and the reasoning for them was:

- **What do you think is the advantage with these changes?**
 - This question is intended to confirm that the requirements were met and that the prototype addresses the correct issues.
- **Do you think the system will track instructions better in order to keep them up-to-date?**
 - One of the issues was that there was no process to monitor instructions. This question is to check if that was achieved.
- **Do you feel this will provide you with increased knowledge?**
 - The system is supposed to increase the knowledge base and this question is to confirm that.
- **Do you think the system will provide better and/or quicker access to the knowledge?**
 - One problem was the time it took to search for solutions. The prototype was designed to address that issue and by asking this question it will either confirm or reject it.
- **Do you feel it is important that you had a hand in how the system was developed?**
 - Engage the agents' view on the importance of their involvement.
- **Do you think that these changes will encourage more knowledge sharing from agents?**
 - Answers from this question will show us if the culture or mindset has changed.
- **Has your attitude, with regard to sharing your knowledge, changed?**
 - Same reasoning for this question as the one before.

The two extra questions sent to the department manager were:

- **How important do you think that increased statistical data is?**
 - This question is intended to confirm or reject the importance of statistical data, from managerial view.
- **How much do you think these changes would change the department's atmosphere/culture?**
 - Engage if there are any cultural changes and if they coincide with author's and agents' view.

These questionnaires were meant to engage the agents' reactions to the proposed changes and that there were no aspects missing. As further questions arose they were

discussed either in phone calls or e-mail. (Answers from questionnaire see Appendix B)

7.2 Analysis

Previous structure of resources had problems regarding time taken to search for appropriate solutions. This is solved in the new system. When the agent inputs information about the client, which the agent should be doing as he receives it, the possible solutions are made available in real time. This significantly cuts down the time taken to search for solutions. This also solves the problem of having to know that certain instructions are not filed under the client's folder because it applies to all the other clients as well. Those instructions are specifically marked as applying to all clients and will always appear when their specific problem type is selected.

The agents are unable to see what other agents have done unless it has been recorded as a job ticket and sometimes agents do not even record their work into the job ticket. This is something that the new system fixes. Now agents are able to see what was done for the client the last time he had this particular problem. So if the problem solution has not been updated, i.e. when an agent is still working on it but has not updated it yet, the system provides more information by displaying the last case.

There is no official process of reviewing or identifying problem solutions. This has been addressed by assigning knowledge supervisors to each client and placing the review features in the prototype. These knowledge supervisors are at least two and from at least one other department than the help desk department. The idea for behind this is to form an "author and reviewer" redundancy system and therefore make sure that the instructions are relevant. The old way of recording problem solutions was too tedious, according to agents, due to the complexity of the process. The prototype makes it a part of the system, thus it becomes effortless and less time consuming. To keep the instructions up-to-date the system will monitor their usage and age and send messages to the supervisors at appropriate time intervals. Quality control is thus in the hands of both the system and the knowledge supervisors.

Activities have been put in place to solve the access to tacit knowledge and encourage the sharing culture. Agents have ample tacit knowledge and are glad to share that knowledge but it can be frustrating being asked the same question numerous times, which can happen if this knowledge is not documented. It can also become disruptive when agents are talking to each other with the customer waiting on the line. Being able to document the tacit knowledge, and thus making it explicit, it should minimize the need for this kind of communication as well as minimize the risk of absent knowledge when the agent is not available. This is addressed in another way using staff meetings, review meetings and an intranet forum. Once a month staff meetings address goals, projects, stats, feedback from clients, changes and important issues that have been brought up on the intranet forums. There was little statistical data available to encourage the sharing mindset. This is addressed by the system as it records its usage and provides for an interface to retrieve these statistics. This statistical data can also be used by the sales department as selling points, for management to calculate their ROI and even by management to justify staffing and resource needs (Orlikowski, 1995).

The new prototype system also aims to provide a single interface and software solution for most of the agent's need. Instead of using anywhere from 5-10 different programs the new system would be able to cut that number down. The single interface

also limits the time and resources needed when having to navigate between one or more programs. Agents were in agreement that this single interface would make them quicker and more efficient. This system would also be able to run on a thin client with just basic remote control software installed.

The differences between the 1st support level and the 2nd support level, as described in chapter 3.2, are changing. This is apparent in the initial analysis of the environment and goes a step further with the proposed changes. With increased collaboration from the technicians and system admins the help desk aims to have the capacity to solve more and more problems. This is achieved by readily making knowledge available, provided by the technicians and system admins, to help agents with the problems they encounter. As the knowledge base increases and agents start to solve more problems the technicians and system admins have more time to work on more complex problems and situations that require their full focus.

The cultural impact was one of the things that this project wanted to study, changing from the current approach to the KM-centric approach. One question in that regard is if there is a cultural barrier, when it comes to sharing knowledge. The help desk did not fall under the agent-centric approach or the KM-centric approach and thus a new approach had to be defined for it, the sharing-centric approach. Due to the sharing mindset of this approach, it is much closer to the KM-centric approach than the agent-centric one and that is likely the reason why there does not seem to be a cultural barrier. As McDermott & O'Dell (2001) discuss, it is important to design the KM approach according to the present sharing culture, even if you intend to implement changes. This view is taken in the prototype design, which received high acceptance among the agents. Another point is that the technical nature of the environment minimizes the chances of new technology being rejected.

8 Conclusion

When we contact help desks we can have unfortunate experiences which are related to lack of knowledge. Fortunately there are ways for companies, which want to increase their help desk's efficiency, to make it the best it can be. González et al. (2005) have already shown, with a simulation study, that the KM-centric approach is better than an agent-centric approach with regards to decreased time to solve problems and increased throughput in the help desk environment. This project's aim was to study the impact that a KMS had on the help desk environment, the impact being cultural, process, resource and responsibility changes. The results from this project are meant to fill in some of the gaps in the available research.

First regarding the cultural aspect, an initial analysis resulted in that the project's help desk did not fall under the agent-centric view so a new specification, sharing-centric, was coined. The result was that due to the sharing culture of the sharing-centric approach there is not a significant cultural barrier when changing the approach to a KM-centric one.

Next regarding process changes, the initial analysis lead to the assumption that they were over-complicated and according to agents they were also tedious. The proposed changes took this into account by making these processes a part of the system and therefore simplifying them.

Thirdly regarding the resources, the initial analysis resulted in that they were not well structured and were not maintained. The proposed changes improve the resource structure, allow for faster and better access and implement a review policy.

Finally regarding responsibilities, was that this project also discovered that the differences between the 1st support level (the help desk) and the 2nd support level (the technicians) is, like most things in IT, evolving rapidly and numerous responsibilities are moving from the 2nd level to the 1st level. This is partly due to increased knowledge sharing between the support levels. The goal for the help desk is to handle as many of the problems as is possible without having to send a technician onsite and therefore problems are resolved quicker and expenses are lower.

8.1 Future work

Due to the small size of the project's help desk, limited time and resources there were issues that could not be addressed. Future work could address these issues as a straight continuation of this project or as independent research. Some ideas of this future work are:

- **Developing cultural measurements:** To get a quantitative result, a cultural measurement scale could be developed. Thus having data to perform statistical analysis, on the cultural aspect, before and after the implementation of a KM project in the help desk environment. This scale could also be used to analyze a help desk's viability for a KM project.
- **Larger analysis:** Use help desks that are larger, more agents, and/or use different approaches, there might even be approaches there that have not been studied, analyze changes when implementing the KM-centric approach and thus analyze the cultural barrier for each of the different

approaches. Therefore answering questions like if the size of the help desks is an issue when implementing the KM-centric approach.

- **Implementing the system:** Implement the system in the help desk department, then develop it further for use in the entire organization and study how it impacts each department differently.

8.2 Author's final thoughts

As I did this analysis I learned a lot and discovered aspects of the environment that I had not seen before. Things like the actual culture of the help desk and how the agents actually perceived it. It also confirmed my current views and gave me a sense that I was on the right path. I also tried to do my work as unbiased as I could and I feel I was able to achieve that. As for the material it gave me a new perspectives and a greater understanding of KM. Things like how important it is to keep and nurture a learning culture, how it can in a sense never stops. It reminds me of the words of Newton D. Baker, "*The man who graduates today and stops learning tomorrow is uneducated the day after.*" I find that KM is still evolving and with new technology comes new methods, like Distributed Knowledge Management Systems, and it will be exciting to follow these changes.

The fun thing about working with theoretical work is finding everyday examples to explain the concepts. In this project I talked about the learning organization as going on a waterslide and there were numerous other examples that came to life during a presentation. There is one quote that I always have in my mind and it reflects on innovation "*Make it idiot-proof, and someone will make a better idiot*" unfortunately the author is unknown.

Unfortunately I was unable to get 100% participation for the questionnaires and I think if I had been in direct contact to the help desk agents I might have been able achieve it. Also it would have allowed me to better present my prototype and proposed changes. Human interaction is very powerful when it comes to presenting new things and being to answer questions directly could have had an effect as well.

Finally I want to thank my supervisor, examiner and the computer science department for their flexibility with this project, my proofreaders for their indispensable work in correcting my grammar and typos and of course Pekking hf. for their invaluable contributions and participation.

9 References

- Aggestam, L. 2008. *IT-supported Knowledge Repositories: Increasing their Usefulness by Supporting Knowledge Capture*. Stockholm: Universitetsservice US-AB
- Bhatt, Ganesh D., 2001. *Knowledge management in organizations: examining the interaction between technologies, techniques, and people*. Journal of Knowledge Management, Vol. 5, No.1, pp. 68-75.
- Chen, Z. & Xu, X., 2010 *Study on Construction of Knowledge Management System Based on Enhancing Core Competence of Industrial Clusters*. International Journal of Business and Management, Vol. 5, No. 3.
- Chua, A. & Wing, L., 2005 *Why KM projects fail: a multi-case analysis*. Journal of Knowledge Management, Vol. 9, No. 3, pp. 6-17.
- Davenport, T.H. & Prusak, L. 1998. *Working knowledge: how organizations manage what they know*. Boston: Harvard Business School Press
- Desouza, K.C. & Vance, E., 2003. *Facilitating TACIT KNOWLEDGE Exchange*. Communication of the ACM, Vol. 46, No. 6, pp. 85-89.
- González, L.M. Giachetti, R.E. & Ramirez, G., 2005. *Knowledge management-centric help desk: Specification and performance evaluation*. Decision Support Systems, 40 (2), pp. 389-405.
- Halverson, C.A. Erickson, T. & Ackerman, M.S., 2004. *Behind the Help Desk: Evolution of a Knowledge Management System in a Large Organization*. CSCW'04, Chicago.
- Kucza, Timo., 2001. *Knowledge Management Process Model*. Espoo: Technical Research Centre of Finland, VTT Publications 455.
- Levy, M., 2009. *WEB 2.0 implications on knowledge management*. Journal of Knowledge Management, Vol. 13, No. 1, pp. 120-134.
- McDermott, R. & O'Dell, R., 2001. *Overcoming cultural barriers to sharing knowledge*. Journal of Knowledge Management, Vol. 5, No. 1, pp. 76-85.
- Meso, P. & Smith, R., 2000. *A resource-based view of organizational knowledge management systems*. Journal of Knowledge Management, Vol. 4, No. 3, pp. 224-234.
- Nonaka, I & Takeuchi, H., 1995. *The knowledge-creating company : How Japanese companies create the dynamics of innovation*. New York: Oxford University Press
- Orlikowski, W.J., 1996. *Improvising organizational transformation over time: A situated change perspective*. Information Systems Research, Vol. 7, No. 1, pp. 63-93.
- Robertson, J., 2002. Knowledge management for call centres. *KM Column*, [online]. Available at: http://www.steptwo.com.au/papers/kmc_callcentre/index.html (as of March 2. 2010, 15:34 GMT)
- Senge, P., 1990. *The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organization*. New York: Double Day
- Traivaille, A.M. & Hendriks, P.H.J., 2010. *What keeps science spiraling? Unraveling the critical success factors or knowledge creation in university research*. Higher Education, Vol. 59, No. 4, pp. 423-439.

Wiig, K.M., 1995. *Knowledge Management Methods: Practical Approaches to Managing Knowledge*. Arlington: Schema Press, Ltd.

Wikipedia, *Call centre*, http://en.wikipedia.org/wiki/Call_centre (as of March 21, 2010, 11:37 GMT).

Wikipedia, *Help desk*, http://en.wikipedia.org/wiki/Help_desk (as of March 21, 2010, 11:13 GMT)

Wikipedia, *Information System*, http://en.wikipedia.org/wiki/Information_system (as of April 6, 2010, 18:13 GMT)

Wikipedia, *Technical support*, http://en.wikipedia.org/wiki/Technical_support (as of April 6, 2010 18:22 GMT)

Windley, Philip J., 2001. Delivering High Availability Services Using a Multi-Tiered Support Model. *Utah dot gov*, [online]. Available at: <http://www.windley.com/docs/Tiered%20Support.pdf> (as of April 7, 2010, 10:22 GMT)

Zhang, X. et al., 2010. Knowledge-Sharing Reward Dynamics in Knowledge Management Systems: Game Theory–Based Empirical Validation. *Human Factors and Ergonomics in Manufacturing & Service Industries*, [Online]. 20/2, 103-122. Available at: <http://www3.interscience.wiley.com/cgi-bin/fulltext/123268466/PDFSTART> [Accessed 15 May 2010].

Þekking, *English* / *Þekking hf*, *Rekstur tölvukerfa og hýsing*, <http://www.thekking.is/page/english> (as of March 22, 2010, 13:30 GMT)

Appendix A

Here is the list of questions and answers that were in the first questionnaire, which were sent to the help desk agents.

Describe your work flow, starting from answering a call until you hang up. Describe for both problems you can solve and those that you cannot.

- Answer 1: Listen to the client and analyze the problem. If I solve a problem it is done either by accessing the machine remotely or instructing the client through the phone. I can also log into a retail software system and fix error, i.e. sales and stock reports. If I cannot solve a problem I send the call to a technician or make a job ticket.
- Answer 2: Analyze the problem, sometimes it is enough to instruct the client through the phone but more often it requires accessing the machine remotely and fix. The problems that they aren't fixed are sent to a technician, who fixes it immediately, or a job ticket is made.
- Answer 3: Answer the phone. Record information, business, name, number and ask about the problem. If it is a problem I solve regularly I solve it right away, may have to find or ask of an ip number in order to access a machine. Record, preferably as I go, what I do for the time journal system. Say goodbye and hang up.

Answer the phone. Record information, business, name, number and ask about the problem. If it is something that I can't fix, even after an extensive search through material and problem solutions, I usually make a job ticket where I describe the problem. If time is an issue I contact the technician and inform him about the fact. Sometimes the technician gives me instructions so I can solve the problem, otherwise he solves it himself.

Do you find it important that other agents share problem solutions?

- Answer 1: Yes I do. It would be best if the problem solution could be recorded centrally so that everybody can access it. It would increase the speed in which these problems are solved when they occur later and that will probably result in happier clients.
- Answer 2: Yes because it improves the service provided to the clients if everybody in the help desk department know the problems that occur and are able to solve them.
- Answer 3: Yes, especially regarding common problem. Not necessarily regarding issues that occur seldom or involve specific systems that an employee has specialized in.

Do you feel you lose your specialty if you share your knowledge?

- Answer 1: No I do not feel so. One tries to share as much as possible but some things you are responsible for and always do by yourself.
- Answer 2: No, the purpose of the help desk is that everybody is pretty much equally adapted to fix the problem that they face. If there is a specialty it is in that way that agents are in different client groups

(service certain clients) which other agents don't have access to and that is usually by requests from the clients.

- Answer 3: No I cannot say that.

Do you think the help desk could solve more problems if they had access to the right knowledge?

- Answer 1: Yes, the help desk can certainly solve more problems than it does today.
- Answer 2: Yes. Some clients often call technicians to solve problems that the help desk can, and really should, solve and solves for other clients. There are also many small problems that the help desk should solve if the technicians would provide the help desk with the appropriate knowledge.
- Answer 3: Yes without a doubt. But it would be beneficial to first analyze what problems the technicians are solving regularly and teach the agents how to fix. As agents do not have extensive knowledge of these systems we tend to forget more complex solutions that only happen like only once a year or something like that.

How many different programs do you use on a daily basis?

- Answer 1: Ca 4, Lotus Notes, Share Point, shared server drive, navision. Then I use OneNote to record my work, which is then recorded into a time journal system.
- Answer 2: Toda I use around 5-6 different programs to search for information but new information are recorded in one single place.
- Answer 3: OneNote is used to record phone calls, Navision to record work (time journal system), Lotus to find problem solutions and GoPro to record job tickets, Office Communication Service for electronic in-house communication, Share-point to see recorded employee's vacation days, search the T-drive for some information (i.e. problem solutions that have not been linked to the Lotus IP-well), visionapp to collect some terminal servers that one uses frequently and then there is some information in Outlook communications. So according to this it is about 9 programs.

Do you think something could be done to make it simpler?

- Answer 1: It would be much more comfortable to have all the information and problem solutions in one place, like Share-Point is supposed to be.
- Answer 2: It is possible to simplify by moving all old information to a single location. And that is in progress by moving older information and problem solutions to Share-Point.
- Answer 3: It would be brilliant it was enough to record everything into one system, then those issues that one does not solve are place into a job ticket (usually you have recorded all the pertinent information into OneNote) in one motion and then it would be in the time journal system which one would only at most have to assign the appropriate time done on the job. Also the ip-well could be better maintained, regularly go

over information about those clients that call in the most and delete out-of-date information and add new information. Share-Point is supposed to succeed the ip-well but as of now I still feel it is quicker to search the ip-well and it gives me the best overview.

If you could change one thing what would that be?

- Answer 1: One system to maintain the problem solutions and information, recording into the time journal system.
- Answer 2: Simpler access to information and problem solutions.
- Answer 3: Better access to problem solutions and information on clients that we service.

This is a list of questions and answers in the questionnaire, which was sent to the department manager.

What resources do agents have access to in their day-to-day work?

- Answer: Information on clients are kept in so called IP-well in Lotus Notes, pretty good problem solutions but maybe not quite up-to-date. Then there are problem solutions on a shared server drive organized by clients and now work has been started to put this information into Share-Point which is planned to be the knowledge base for the future. These systems are all quite accessible but it would be better to have everything in one system, which is the plan.

What are the agents' responsibilities?

- Answer: Answer phone calls, solve 1st level problems for clients, record job tickets, keep an eye on monitoring systems and react if problems arise.

Do you feel that the help desk can solve more problems if they have access to the right knowledge?

- Answer: Yes I do, we have very capable people here that can tackle most cases if the information exists. The issue is that in some cases people tend to keep their information and are not very eager to let other people know.

Describe the department's atmosphere/culture.

- Answer: We have a very good atmosphere and a very lighthearted bunch of people. People exchange information and help each other to solve problems, very good cooperation.

Are changes in the department discussed with the staff before being implemented?

- Answer: Yes I have tried to do that, it works better that way.

Appendix B

The questionnaire sent to the help desk after the prototype and proposed changes were sent to them for review.

What do you think is the advantage with these changes?

- Answer 1: It looks to me like it will be less busy work on each phone call. Today one has to start by looking for problem solutions in the ip-well, if they are not there one has to check the T-drive but it looks like you could have all the information in the system. So all problem solutions and important document will be accessible via the system. And of course the time journal system, that will be revolutionary!! Stop the twice and thrice recordings. First recording notes, second recording time journal and sometimes the third recording which is the job ticket.
- Answer 2: Much easier access to all information, i.e. workflow, running projects and more in that area. Also, all information appears straight away on the client and you can write into the time journal system straight away instead of having it in different programs like it is today.
- Answer 3: Having everything in one program and having to surf between different programs to find information or record it.

Do you think the system will track instructions better in order to keep them up-to-date?

- Answer 1: Yeah definitely, it couldn't be much worse than it is today. I imagine it will probably lead to more regular deletion of out-of-date solutions and information on clients that are no longer in our service. Then there is the question how active people will be at correcting and improving problem solutions even though they are reminded. But it should encourage rather than discourage.
- Answer 2: Yes, if there is reminder on the problem solutions then it would be easier to monitor and delete old out-of-date problem solutions or update them according to the values that are valid at the time.
- Answer 3: I do believe so. By reminding that problem solutions have not been used in a long while.

Do you feel this will provide you with increased knowledge?

- Answer 1: Yes I think so. If we are active in saving new solutions in the system and it will be easy to search in then it will increase our knowledge.
- Answer 2: Yes, increased and easier access to information will increase our knowledge as it will be easier to get this information. If information is not recorded in this system they probably are not recorded anywhere else.
- Answer 3: Yes, though people will have to be active in information gathering. Depends on each individual.

Do you think the system will provide better and/or quicker access to the knowledge?

- Answer 1: Yes, definitely quicker access.
- Answer 2: There will be quicker access to problem solutions and information on clients as it will all be in the same place, fewer mouse clicks the better.
- Answer 3: Yes I believe so if the system is simple to use and fast.

Do you feel it is important that you had a hand in how the system was developed?

- Answer 1: Yes, at least it is good to be able to change things that are not working or if one sees that one could be faster to do something with minor changes. But we are used to all kinds of things so if this is better than the existing system it would not be hard to adopt.
- Answer 2: Yes, those that do most the work in a system should always have something to say about how it work and get to make suggestion about its structure and more in that category and to be able to test-drive it.
- Answer 3: Yes of course, we are the ones that will be working in it and therefore we should have part in how it is designed and built. We have different ways of working than others and therefore it has to be designed to our needs.

Do you think that these changes will encourage more knowledge sharing from agents?

- Answer 1: Yes it has to. As I have understood it, it is not more work to make problem solutions, it is all in the same system and you can use information that you have written down somewhere else. You don't have to open word and type down everything and then find the appropriate place on the T-drive to save it on and then link it to the right place in the IP-well. So people must be more diligent in that regard.
- Answer 2: It will always be up to each individual as it always needs some manual information recording to begin with and that applies to any system that is used, people are and will be variably diligent but some will probably use this more and better than the existing system.
- Answer 3: It is hard to say, it is up to each individual, one hopes that as time passes and the people realize that it the best for everybody.

Has your attitude, with regard to sharing your knowledge, changed? (Not sent to manager)

- Answer 1: I have never been against sharing my knowledge, but if the system makes it simpler to share it I probably will be more diligent about it.
- Answer 2: I do believe that I share my knowledge right away or very quickly after I receive it by writing problem solutions and sending e-mails to those that it regards. It will be much quicker in this new system as it does not require one to start by writing a Word document, save it and then link it to the IP-Well like it is done today.

The two extra questions sent to the department manager were:

How important do you think that increased statistical data is?

- Answer: It is very important. But what I like the most about the system is that problem solutions and information are available whenever they are needed and you do not have to find an individual that has knowledge on a certain issue, should be encouraging for people to document their knowledge in computerized form so they are not being bothered time and time again with phone calls outside of work hours. Also this information is not lost and is still available even if there are staff changes in the company.

How much do you think these changes would change the department's atmosphere/culture?

- Answer: It should be a relaxed and good atmosphere as people are not shouting questions and answers out loud between each other, with a client on the phone, would minimize stress regarding not solving a problem in an acceptable time and be more professional.