Haaga-Helia
University of Applied Sciences

Developing Knowledge Management and Knowledge Support at an Airline Operations Control Centre

Minna Majander

Master's Thesis
Degree Programme in Aviation and Tourism Business
2021

Haaga-Helia
University of Applied Sciences

Abstract

Author(s)
Minna Majander

Degree programme
Master's Degree Programme in Aviation and Tourism Business

Report/thesis title	**Number of pages and appendix pages**
Developing Knowledge Management and Knowledge Support at an Airline Operations Control Centre.	**88 + 2**

In today's world many functions depend on accessing the right knowledge and information at the right time. This is reality in both people's private lives and work lives, but the handling of information and knowledge at workplaces has often not kept up. The huge amount of information, and the rapidly changing situations require resilience, but also new more efficient ways to handle information and knowledge so that it is efficiently shared and easily available. Technology has an important role in this, but it cannot solve the problems alone. Information and knowledge management needs to be considered more comprehensively to be able to gather, analyze, store, and share information, ideas, experience, and know-how to enable efficient high-quality performance.

This qualitative case study takes a look at these most critical points of knowledge management and knowledge support at an Airline Operations Control Centre, with the aim to improve knowledge management and knowledge support so that it would effectively support the employees in their everyday work. This study concentrates especially on the availability, findability, and sharing of knowledge, as those are considered the most challenging aspects at the target organization.

The theory used in this study addresses the general concept of knowledge management and clarifies the main aspects of both knowledge management and knowledge support, while also explaining how these concepts can be implemented in practice. The research data is collected by the means of document analysis, focus group discussion and interviewing. Methodological triangulation has been used to get a more comprehensive view of the studied subject, to provide confirmation of the findings, and to increase the credibility of the study.

The findings of this study reveal the underlying reasons that are causing the knowledge management and knowledge support issues at the target organization. The findings imply that there is a comprehensive amount of knowledge management and knowledge support tools available, but as they are not targeted, and as the work processes, task, and the related knowledge and communication needs are not clearly defined, the tools are often providing unstructured and inconsistent support. Furthermore, the findings reveal that undefined general knowledge management processes, seem to hinder sharing, capturing, and processing of knowledge. The findings additionally provide some insight to possible cultural problems that imply knowledge is not given the appreciation and consideration it would be worth of. Concrete development ideas include clear process- and task descriptions, new tools with better usability and different actions that promote and bolster the knowledge culture and enhance the importance of knowledge. In general, the findings give a good base for applicable conclusions regarding the most critical points that the development of knowledge management and support should begin with.

Keywords
knowledge management; knowledge support; information availability; information findability; knowledge sharing; knowledge capturing; knowledge processing

Table of contents

1 Introduction 1
1.1 Background and introduction of Airline X OCC 2
1.2 Research problem and research questions 5
1.3 Objective and scope 5
1.4 Structure 6
2 Knowledge management and support 8
2.1 The concept of knowledge 8
2.2 Knowledge management 12
2.2.1 The knowledge management process 17
2.2.2 Knowledge management in practice 20
2.3 Knowledge support 25
2.3.1 The main features of knowledge support 27
2.3.2 Creating and developing knowledge support in practice 29
3 The research process 32
3.1 Approach and methods 32
3.2 Data collection 33
3.2.1 Document analysis 34
3.2.2 Focus group discussion 36
3.2.3 Interviewing 37
4 Data analysis and findings 40
4.1 Document analysis 40
4.1.1 Processes 41
4.1.2 Communication 46
4.1.3 Knowledge sources, repositories, and distribution channels 48
4.2 Focus group discussion 55
4.3 Interviews 58
4.3.1 Sharing of knowledge 60
4.3.2 Capturing of knowledge 66
4.3.3 Processing of knowledge 69
4.4 Summary of the findings 72
5 Discussion and recommendations 75
5.1 Conclusions and development ideas 75
5.2 Reflections on the research process and the credibility of the study 79
References 82
Attachments 89
Attachment 1. 89

1 Introduction

Terms like information flood, information overload, and information anxiety are without doubt familiar phrases to many of us, and no wonder. The amount of information is enormous in today's society. Modern life very often includes and depends on use of technology and accessing the right piece of information. On the other hand, people have also become used to having information at their fingertips at all times. This is reality in people's private lives, but at the same time when also more and more jobs have become knowledge intensive it has become evident that it can be widely different at work. So also in the target company of this research. How information and knowledge is handled, and how it is supported, has not kept up. This requires changes in the ways we work. As the amount of information has increased, the need to manage it more effectively has become imminent. The huge amount of information sets its challenges to the handling of it, and the relevant information is easily lost in the information flood, or simply disregarded due to information overload, which means it never becomes knowledge that is now a days a very critical factor of success. Technology has of course developed along with the information society; however, it cannot solve the problems alone. Information management needs to be considered more comprehensively as knowledge management, that is an entity including gathering, analyzing, storing, and sharing of information, ideas, and experiences to be able to make them easily available to support efficient and high-quality performance. This is also why this research takes a look at the whole knowledge management infrastructure while trying to solve problems with information handling.

This research is done for a Finnish regional airline that is in this research report referred to as Airline X. The company operates 24 aircrafts and employs at the moment about 800 persons. The study concentrates on the airline's Operations Control Centre department, later referred to as the OCC department. The Airline X OCC is supervising the operations of the aircrafts and the nearly 500 employees, pilots and cabin crew operating the flights. The OCC is the command, coordination and control center performing operational monitoring and control for the airline. The OCC plans and controls the operations to ensure optimal flight traffic performance according to the schedule, and to minimize the impacts of irregularities and unforeseeable traffic disturbances like delays, cancellations and other deviations from schedule caused by resource lacks and other organizational problems, technical defects, weather conditions and so on. In other words, the OCC indicates a suitable reaction in case of malfunctions or failures to regain a normal process flow. To do this the OCC needs to gather, process, generate and disseminate a lot of information related to the flights, and the work at the OCC includes communication, planning, real-time

management, decision making and initiation of action in constantly changing situations and often under harsh time pressure. The OCC has therefore a big impact on the punctuality, reliability, and service quality of the airline's operations.

The key to this kind of "conflict management" that the OCC does is the usage of expert knowledge about the process and its problems, and it is utmost important that the decision makers have reliable information and knowledge available for support. To be able to gather, provide, and utilize this kind of knowledge, that is usually not explicitly available, it is not enough to just have good information handling systems. When the needed knowledge consists of a lot more than just explicit information, the organization would need to have knowledge management systems with effective knowledge acquisition and knowledge sharing functions that take into account experiences, skills and know-how and helps to create, collect, and share all these types of knowledge.

At the moment this is though something that is not working in an optimal way at Airline X OCC. Storing, distribution and application of knowledge causes some confusion at the department, and it seems that the available information and knowledge is not supporting the work in the best possible way. There seems to be some kind of an information and knowledge disorder that makes it challenging to utilize the available knowledge in the daily operations. Yet there is a common understanding that handling this more adequately by improving knowledge management could lead to more efficient, knowledge-based decision making, and more consistent, high-quality work performance that would also enhance work engagement. Therefore, this study aims to start the development of the knowledge management and knowledge support structures by analyzing the current situation and by providing development ideas for better information and knowledge handling. The goal is to find ways to make, not just information, but all kinds of knowledge better available so that it would improve the departments overall performance, and also contribute to employee satisfaction.

1.1 Background and introduction of Airline X OCC

The Airline X OCC is part of the Operations Planning and Control department (OPAC), which in addition to the OCC also includes the planning department. The operational part of the department, the OCC, that this study concentrates on, consists at Airline X of two main executing functions, the operations control and the crew control, that are both supported by an operations control assistant function. At Airline X the operations controller position corresponds to that of the flight operations assistant (FOA) in International Air

Transport Association (IATA) terms. Job rotation is common, and a major part of the employees work with both of the main functions, operations- and crew control. All the employees also work in the assisting position. The OCC department employs altogether 12 persons that work in shifts 24/7/365 supervising the airlines daily operations. In addition, there is an OCC duty manager function that supervises the other functions and takes care of the departments follow-up, development, and training. This function is handled by three duty managers working mainly office hours. The department is led by an administrative manager and the head of the department, that is assisted by an operations planning analyst.

In big airlines the work at an OCC is distributed to several positions with different areas of expertise, but at smaller airlines like Airline X, a lot of the OCC functions are concentrated and handled by one or two persons, the operations controller and the crew controller. The operations controller at Airline X oversees the daily operations overall and the job includes aspects from flight planning and flight preparation, aircraft allocation, rotation control, delay monitoring, flight tracking, slot management, initiation of emergency procedures and different kinds of reporting to operational crew resource management, crew briefing and irregularity handling. The operations controller on duty also supervises the daily operation of the OCC during the shift. The crew controller is in charge of the crew operations and manages the operational crew resources. The crew controller oversees the crew competence validity and the compliance with flight duty regulations, which are based on collective labor agreements (CLA) and European Union Aviation Safety Agency (EASA) directives. The crew controller is also responsible of all changes on the flight crew´s public rosters, and all operational disruptions regarding the flight crew. When crew control is not available, usually at nighttime, the crew control function is handled by the operations controller. Many of the tasks, in both the operations control and crew control function, are highly authority regulated. Furthermore, the duty managers, that are senior operations controllers, are in charge of the OCC's operational environment as a whole. The knowledge management and knowledge support processes are not directly assigned to them, but part of their job is to provide help and support to the controllers working with the operative tasks. The three duty managers are also assigned main responsibility of some of the Airline X OCC processes, so that each of them has their own appointed processes.

Due to the broad job descriptions, and multifunctioning, the knowledge base needed for the functions is extensive, and due to the hectic nature of the job, the need for information is most often urgent. Irregular situations and different kind of disruptions are common, and they often need complex customized solutions. The general criteria for decision making are safety, maximal passenger comfort and satisfaction, punctuality, smoothness of traffic

flow, and economic criteria like optimal use of resources and other aspects to minimize costs. The decisions are therefore made based on comprehensive information gathering in a rather short time. Additionally, the decision making often requires expert knowledge and fuzzy rules of if-then type. As the problems are often complex and variable, many of the processes are based on heuristics that are part of tacit knowledge within the experienced employees. When the personnel resources are small and the situations change rapidly and constantly, the number of needed heuristics sometimes become overwhelming. Therefore, it would be important to have well-organized supporting information and knowledge available to be able to make accurate decisions and manage the operations efficiently, safely, and as cost effectively as possible. This would in addition to the already available comprehensive training, require a working knowledge management system that would ensures that the right kind of knowledge is acquired, stored, kept up-to-date and made available and easily accessible during the work performance.

This is however the thing that is considered problematic at the moment. The current situation at Airline X OCC is that the incomplete knowledge management and knowledge support causes some confusion, frustration, inconsistency, and fluctuations in quality in the rapidly changing environment. The initial training for the operations controllers, which is regulated by International Civil Aviation Organization (ICAO) directives and IATA Operational Safety Audit (IOSA) standards, is very extensive, thorough, and based on a clearly defined training syllabus. Also, the yearly recurrent trainings, as well as the yearly competence checks provide an excellent knowledge base for the employees, but the information available for support in the everyday work situations is scattered, and to some point also outdated. Updates to working instructions are at times lost in the information feeds, information is available in various sometimes illogical locations, and best practices and new work methods are not always documented, and therefore used from memory and shared only by word of mouth. Consequently, there is also a lot of tacit knowledge stored only in the employee's minds. The crew controller training is less extensive than the operations controller training and the job is to a larger extent taught by providing on the job training in the operative environment. The crew control training is though also based on an extensive and clearly defined training syllabus according to the directives of the Operations Control Manual. The crew control function is less knowledge intensive than the operations control function, but the job is yet very controlled by some frequently changing directives, regulations, and interpretations of the collective labor agreements (CLA). The instructions for crew control are somewhat more concentrated, but the changing situations often cause temporary interpretations and exceptions that are not always updated, and therefore hard to keep track of. In general crew control faces a lot of the same problems than the operations controller regarding unorganized information.

The set of tools for knowledge management and support at the department is comprehensive, but as the information is scattered and sometimes also inconsistent, it occasionally seems to confuse rather than support the decision making. The problem has been acknowledged and actual for a while, but as no one has been specifically in charge of the knowledge management process, it has so far been left with less than needed attention. Problems in knowledge support are often sporadically dealt with afterwards by creating instructions in different repositories and distribution channels, but an overall perception of how knowledge is systematically managed and supported, and how it should be developed to serve the organization better as a whole is missing.

1.2 Research problem and research questions

The research problem of this study is based on the issues mentioned above, and consists of identifying the parts in knowledge management and knowledge support causing these issues, and generating improvement of the knowledge management process and the knowledge support activities at Airline X OCC. To solve the problem the research problem is transformed into research questions that will help to find solutions to the problem. Therefore, this research will try to find answers to the following research question and the related assisting questions;

- How can knowledge management and knowledge support be improved at Airline X OCC?
    - How is knowledge currently managed and supported at Airline X OCC?
    - What parts of the knowledge management and the knowledge support processes are the most critical ones at Airline X OCC?
    - How could knowledge management be improved so that it would effectively support the employees in their everyday work, and provoke efficient and consistent, high quality performance?
    - How could knowledge support be improved so that knowledge would be better available, easier to find and more efficiently shared?

1.3 Objective and scope

The objective of this study is to improve knowledge support and to give suggestions for development of the knowledge management process at Airline X OCC department so that it would effectively support the employees in their everyday work, and provoke efficient and consistent, high quality performance. The aim is to analyze the current knowledge

management and knowledge support infrastructures and to examine what parts of the processes are the most critical ones. Additionally, the goal is to identify the problems, to find out the reasons behind them, and to provide ideas and tools for the development of them.

The currently occurring problems at Airline X OCC indicate a need for improvement of knowledge support, and therefore that is emphasized. This study concentrates especially on the availability, findability, and sharing of knowledge, but the whole knowledge management process is considered, to be able to understand the underlying reasons. Knowledge management is as a whole though such a broad concept that the scope of this study is narrowed down to knowledge and information in the operative environment. The change management, as well as the training and learning aspects are disregarded, as the encountered problems are not directly linked with these. This study also focuses only on the knowledge management and support for the operative work and leaves out knowledge management for the planning work, even though these jobs are under the same OPAC-department at Airline X. The basic nature of the operative controller job and the planning work differ from each other considerably, and therefore the knowledge and support needs are rather different, and hard to consider in the same study. Furthermore, this study also concentrates mainly on the employees' view of the situation, as it is considered most essential when the aim is to improve the system so it would support the daily work in the best possible way.

1.4 Structure

According to Saaranen-Kauppinen & Puusniekka (2006) a research report is usually divided into three main parts, the beginning, the body (the main text) and the end. Consequently, also this research follows this general structure. The beginning contains the name of the study, the abstract and the table of contents, after that comes the body, and then the end part with appendices. The body of this study consists of altogether five chapters, the introduction, the theory, the research process, the analysis, and the discussion.

The first chapter of this study is the introduction, which presents the subject, provides an introduction of the target organization and the background for the study, and clarifies the objective and scope of the study. Also, the research question and research problem are introduced in this part. After the introduction comes the theory part. This part, chapter two, presents first the concept of knowledge and goes then on with explaining the knowledge management concept, while also displaying how knowledge management can be applied in practice. This chapter takes furthermore a closer look at the knowledge support concept and how that should be developed. After this theory part comes chapter 3, that introduces

the research process. This chapter explains the course of the research, presents the research approach and methods, and clarifies the data collection processes. Chapter four is the data analysis chapter that presents and summarizes the findings, and finally, chapter five is the discussion part, which consists of development ideas and conclusions made based on the results. Also, reflections on the research process and the credibility of the research are included in this final chapter.

2 Knowledge management and support

Both academic and business communities seem to agree that organizations can create and sustain competitive advantage by leveraging knowledge, but to be able to fully exploit the potential that can be realized from the knowledge capital, it needs to be managed appropriately. As the amount of information and the importance of knowledge has increased, so has the importance of knowledge management. It is crucial for company success to get the right information to the right people at the right time. This is also true in the target organization of this study where knowledge is essential for both competitiveness and effectiveness, but where knowledge has so far not been given the attention it deserves.

2.1 The concept of knowledge

In today's world the amount of information has exploded, and the endless amount of information is available for everyone. We talk about big data and information society and how knowledge is an important asset for organizations, but actually the terms are not very clear. To be able to think about how the information and knowledge could be manage more effectively in the target organization, we first need to define what knowledge is, and explain how the different terms used are linked to each other and to this study.

The nature of knowledge can be seen in many ways, depending on the purpose and function of the knowledge. There is probably no single universally applicable definition for knowledge, but when it comes to knowledge management and this study, the most applicable view is probably the social constructivism view that strongly combines knowledge with skills, competence, and people. In today's rapidly changing work environments it is also important that we don't look at knowledge the traditional western way as absolute or static, but instead see knowledge as changing and situational, as a dynamic process. In organizations knowledge is not a true belief but rather something that is materialized as performance. Knowledge can in this context be described to be a combination of structured information, experiences, values, principles, and ideas that allows people to evaluate new information and experiences and helps them to resolve problems and to make decisions. Knowledge is a storage, but it is also a process within people. (Jalonen 2015, 4; Kasvi, Vartiainen & Pulkkis 2000a, 34; Suurla 2001, 33-34; Sydänmaanlakka 2012, 189; Virtainlahti 2009, 52.)

To understand knowledge better it can be categorized in different ways. For example, Poikela (2001, 104) classifies knowledge into theory-, practice-, and experience-based knowledge. Theory-based knowledge is objective information including concepts and sym-

bols, practice-based knowledge is more concrete actions and observations, but still objective, while the experience-based knowledge is know-how and skills shaped by these two. Experience-based knowledge is composed by the individual and therefore subjective. (Virtainlahti 2009, 35.) Another widespread classification of knowledge within organizational science is made by Gorman (2002, 228) who divides knowledge into four categories: information (what you know), skills (how to do it), judgement (when to use it), and wisdom (why to use it).

Sometimes the term knowledge is distinguished from the term information, but as can be seen from the different definitions above, in the organizational and knowledge management context, knowledge is most often used as a common umbrella term that covers a wide range of different phrases belonging to the same category. Also, in this study the term knowledge is used like in the presented definitions, as a general term for the whole concept, covering among others information, ideas, skills, experience, and expertise.

Within the concept of knowledge, the different types are sometimes organized by the hierarchy of knowledge that takes into account refining of knowledge. The hierarchy of knowledge is illustrated in Figure 1 below. The higher up we go on the hierarchy the more it includes processing, evaluating and human thinking, and the harder it is to produce or handle as technical random material. The hierarchy of knowledge starts with data and information which is turned with human processing into knowledge and then through understanding into intelligence and wisdom. (Kaario & Peltola 2008, 6-7; Kasvi & al. 2000a, 33; Suurla 2001, 31-32; Sydänmaanlakka 2012, 187-192.)

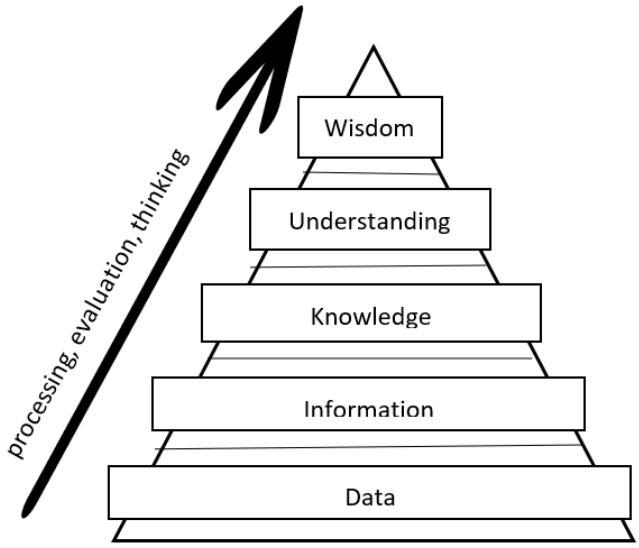

Figure 1. Hierarchy of Knowledge (adapted from Sydänmaanlakka 2012, 188)

Marakas (1999, in Bhatt 2001, 70) summarizes the knowledge hierarchy accurately by defining knowledge based on it as meaning made by the mind, and states that “knowledge is an organized combination of data, assimilated with the set of rules, procedures, and operations learnt through experience and practice”. In general, it could be reasonable to say that knowledge really becomes an organizational asset only on the higher levels of the hierarchy when it is processed and therefore hard to replicate, but for this study the essential thing is to realize that those levels cannot be achieved if the lover levels are not in order.

In addition to the already presented categorizations, another very common and highly relevant way to structure knowledge in the knowledge management context is to divide it into implicit (tacit) and explicit (declarative) knowledge. This categorization of knowledge was presented by Michael Polanyi already in the 1950’s but was made famous by Nonaka & Takeuschi in the 1990’s, around the same time when knowledge management started to become a renowned domain. (Girard & Girard 2015, 1; Suurla 2001, 35; Sydänmaanlakka 2012, 192.) For this study it essential to recognize the difference of these types of knowledge, and to understand how they interact with each other. The problem in the target organization for this study is the unstructured explicit knowledge, but as the job itself is based on a lot of tacit knowledge, the development needs to consider the conversion of knowledge from tacit into explicit and vice versa, to be able to produce functioning and reliable solutions.

Explicit or declarative knowledge is formal, precise, and objective and in addition defined and articulated and therefore detectable. It is available in documents and databases and it is easy to transfer to others. Implicit, or tacit knowledge is more abstract, personal, experience based, and context bound knowledge that is hard to explain or express formally. Tacit knowledge is about mental models, and it is heuristics and skills that have become automated, but also include reactions, personal judgement, intuition, instinctive behavior, and premonition. Our everyday activity, as well as workmanship and expertise, are widely based on tacit knowledge. Tacit knowledge is sometimes even used as a synonym for know-how. Tacit knowledge can be further divided into different subcategories like technical knowledge (know-how) and cognitive knowledge (values, beliefs mental models), but the most relevant aspect regarding knowledge management is that some part of the tacit knowledge is almost impossible to express, while some of it can be made visible through conscious reasoning and active reflection. (Gorman 2002, 221; Kasvi & al. 2000a, 44-45, 47; Suurla 2001, 35-36; Sydänmaanlakka 2012, 192; Virtainlahti 2009, 39-47.)

Based on the explicit and implicit structure of knowledge Nonaka & Takeuchi (1995) have made a SECI model about how knowledge is transformed and refined. The adapted version of this model is illustrated in Figure 2 below. It is broadly used in the field of knowledge management to describe how tacit knowledge can be turned into more manageable explicit knowledge, and how explicit knowledge can then again be turned back into tacit knowledge, which is an important part of professionalism. The name SECI comes from the words Socialization, Externalization, Combination, and Internalization, which are according to the model the four main processes of the knowledge conversion. (Kasvi & al. 2000a, 45-47; Suurla 2001, 40-44; Sydänmaanlakka 2012, 192-195.)

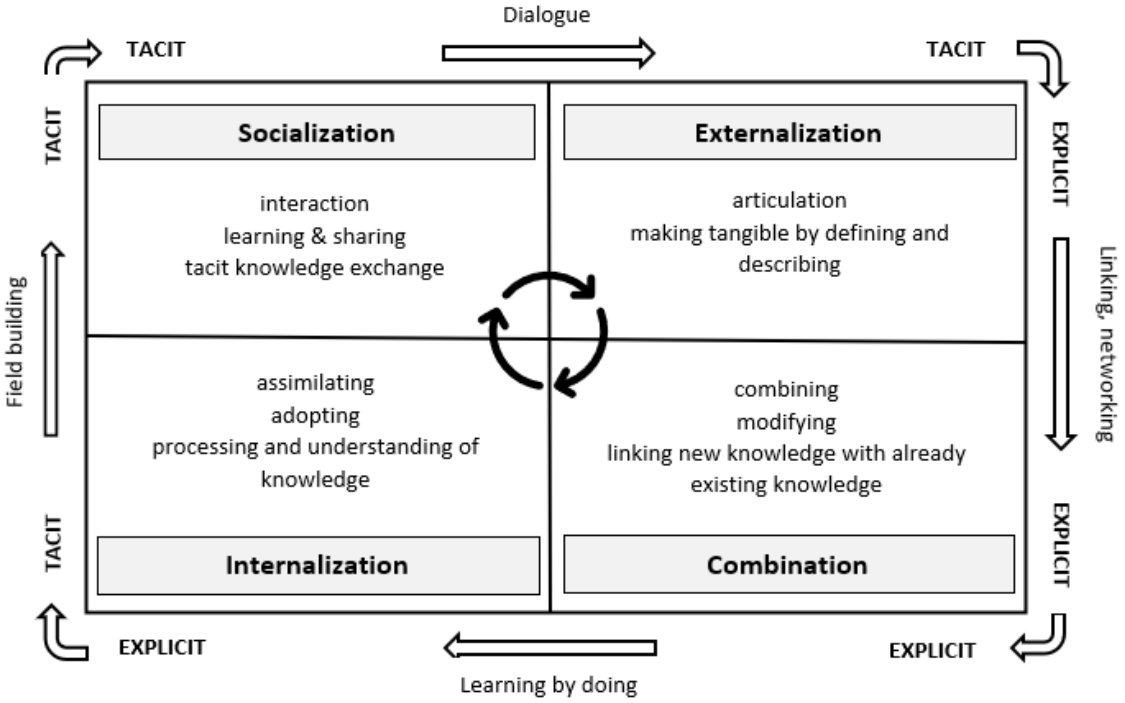

Figure 2. SECI model illustrating the knowledge conversion (adapted from Nonaka & Takeuchi 1995, 71)

Socialization is about transforming tacit knowledge between people. In socialization individuals exchange experiences and learn skills and procedures, but also norms and standards, from each other by observing, monitoring, and imitating, by being and doing together. One person's tacit knowledge becomes tacit knowledge also for the others. For example, the traditional apprenticeship, where a freshman learns from a master, or a more common on the job training, relies heavily on this kind of socialization. (Kasvi & al. 2000a, 46; Suurla 2001, 41-43; Sydänmaanlakka 2012, 193.)

In externalization the tacit knowledge is transformed into explicit knowledge. The tacit knowledge is formulated and made tangible by defining, describing, and articulating it as

concretely as possible, often with the help of frameworks and symbols. Externalization often requires discussion and cooperation so that the tacit knowledge can be expressed in a way that is reasonable and easy for others to understand. Unique, personal knowledge is translated into generally applicable concepts so that it can be distributed effectively. (Kasvi & al. 2000a, 46; Suurla 2001, 42-43; Sydänmaanlakka 2012, 193.)

In the combination phase new explicit knowledge is combined with the already existing explicit knowledge. Explicit knowledge is exchanged, added, combined, revised, modified, grouped, and categorized to better suit the organizational needs. In combination different contexts are for example linked to create larger entities. (Kasvi & al. 2000a, 46; Suurla 2001, 42; Sydänmaanlakka 2012, 194.)

In the final phase, internalization, explicit knowledge is transformed back to tacit knowledge. Internalization is creating new tacit knowledge through learning. When individuals assimilate and understand the general and shared knowledge, they define it again in their own way and adopt it into their actions. The knowledge starts to steer their actions subconsciously, creating routines and generating skills which then become tacit professionalism and know how. (Kasvi & al. 2000a, 47; Suurla 2001, 43-44; Sydänmaanlakka 2012, 194.)

2.2 Knowledge management

Like knowledge, also knowledge management is a very large entity, and in addition also very diverse. Knowledge management that evolved as a field of study in the early 1990's has today become an essential component of organizational life, but it is still a very ambiguous domain. The elements of knowledge management are mostly intangible and therefore hard to understand and implement, especially when many of the terms used are very unsettled and vague. What often makes it even more confusing is that the nuance differences in the terms are not always directly translatable and therefore there is also slightly different terms in different languages. Knowledge management can for example be translated to Finnish as "tietojohtaminen", "tiedolla johtaminen", "tietämyksen johtaminen", "tiedonhallinta" or sometimes even as "osaamisen johtaminen". The different terms and nuances within knowledge management that are considered essential in this study, and the linkage between them, are illustrated in
Figure 3 below. Basically, the intention of knowledge management is though to reduce the uncertainty caused by lack of information and to control the ambiguity caused by the multitude of information and complex situations and circumstances. Knowledge management can therefore be seen as solution to knowledge problems, that are according to Zack

(2001, in Jalonen 2015, 9) uncertainty, complexity, ambiguity and equivocality. Uncertainty arises from lack of information and facts, complexity from information overload caused by adherence and inseparable connections of situations and phenomenon, ambiguity from difficulties in interpretation and equivocality from overload of contradictory interpretations. (Bhatt 2001, 68; Girard & Girard 2015,1; Jalonen 2015, 1; Kaario & Peltola 2008, 8; Kulha 2015, 11; Laihonen & al. 2013, 6; Sydänmaanlakka 2012, 8,175; Virtainlahti 2009, 67–68.)

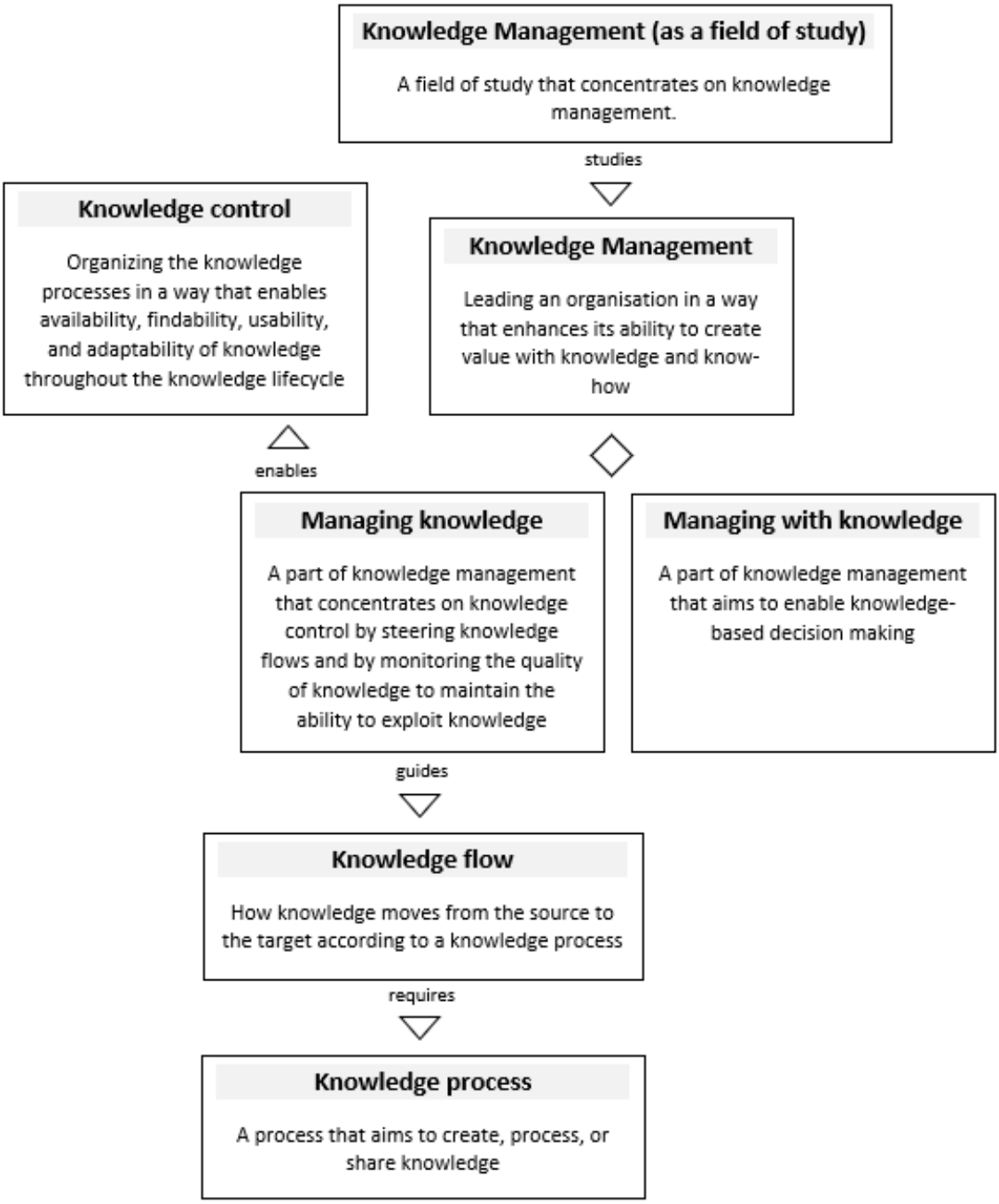

Figure 3. Terms and definitions that are linked to knowledge management and central to this study (adapted from Finto 2018)

Depending on the point of view, knowledge management can be defined in slightly different ways, but generally it includes the thought of creating, storing, using, sharing, and managing the knowledge and information of an organization (Girard & Girard 2015, 14). According to Sydänmaanlakka (2012, s 78-79, 176, 180) knowledge management aims to create, acquire, store, share and apply knowledge so that it can effectively be utilized in decision making in the organizations. According to Davenport & Prusak (1998, in Girard & Girard 2015, 2) knowledge management is based on other already existing resources like good information systems management, organizational change management, and human resources management practices. Khedhaouria & Jamal (2015, in Mazorodze & Buckley 2019, 2) also point out that knowledge management takes advantage of existing expertise and experiences and makes it possible to utilize them better.

Virtainlahti (2009, 67- 68) divides knowledge management into managing know-how/knowing (in Finnish osaamisen johtaminen, tietämyksen johtaminen) and managing knowledge (in Finnish tiedon johtaminen, tiedolla johtaminen), and states that in general managing know-how/knowing is a larger entity than just managing knowledge. Managing knowledge concentrates on theories about knowledge itself, while managing know-how/knowing is more broadly based on learning theories. Sydänmaanlakka (2012, 77- 79) uses the same categorization, but adds managing performance (in Finnish suorituksen johtaminen) to it. Managing performance is based on the tasks in the organization, and means that everyone knows their tasks, their goals and what is expected from them. Furthermore, also guidance, support and feedback are part of it. Even though Sydänmaanlakka (2012, 17, 77-79, 56) presents this categorization, he considers though that these different managing processes can be separate, but on the other hand, in fact also integrated into each other. Either way, he sees them as essential for wise organizations, and argues that performance management, know-how/knowing management and knowledge management are all fundamental processes that endorse a far-reaching learning organization that is effective but also wellbeing. What is good to note is that even though managing know-how/knowing (osaamisen johtaminen, tietämyksen johtaminen) is an essential part of knowledge management, and important for a learning organization, in this study it is not within the scope as the learning and training aspects are not considered to be central to the problem. The term know-how is though closely linked also with tacit knowledge, and therefore used in that sense also in this study.

Hansen, Nohria & Tierney (1999) state that companies usually use one of two very different knowledge management strategies, the codification strategy, or the personalization strategy, where codification is strongly linked with explicit knowledge and technology, and

personalization with tacit knowledge and people. Jalonen (2015, 6) points though out that these strategies do not rule out each other, and usually they are mixed and used together. Sydänmaanlakka (2012, s 78-79) and Virtainlahti (2009, 71), as well many other researchers such as Song (2007, in Mazorodze & Buckley 2019, 2) state that technology plays an important part in the execution of knowledge management, but that it is essential to understand that it alone cannot be the solution. Often the most important aspects are people and change. Mazorodze & Buckley (2019, 4) point out that the knowledge management process is often more people-oriented, and less technology-oriented than most practitioners think. Bhatt (2001, 68) argues though that if knowledge management is defined too narrowly through technological or social systems alone it easily leads to overemphasizing one aspect over the other, when actually both technology and people are equally important. The best results are therefore often gained through optimization of these two. Technology is definitely the most efficient way to handled data and information and to store and systematically reuse information, but also to support and enable communication and networking, while people are essential for the conversion of information into knowledge and skills, and to pass on this know-how by interacting. Also, Suurla (2001, 26-27) highlights the diversity of knowledge management, and states that knowledge management is about more than just managing knowledge. It is also about managing skills, know-how, learning, communication, networks, technology etc. Depending on the context and the target, it can also be either a more socially or a more technologically oriented process. Based on this, when the aim of this study is to identify what is causing the problems with knowledge management and knowledge support, it seems essential to consider both the social and the technological processes to be able to get holistic results.

When trying to define knowledge management it becomes apparent that it is hard to separate the different orientations within knowledge management from each other, or to give an exhaustive definition for it. Managing knowledge is closely linked with managing know-how, but also information management, data management, document and content management are all part of the knowledge management concept, that is shaped by people, cultures, and technologies. Knowledge management is in addition closely linked with change management and learning. Girard & Girard (2015) has catalogued different knowledge management definitions within the academic literature that have an applied orientation. Based on these knowledge management could be defined as *a process for gathering, analyzing, storing, and sharing information, ideas, and experiences within an organization to enable informed decisions and to improve efficiency and quality. The aim of knowledge management should be to ensure that knowledge is available in the right place at the right time, reducing the need to rediscover knowledge.* This definition could also be

considered very accurate for the purpose of this study, that is concentrating on knowledge management from an operative perspective.

The benefit of effective knowledge management, as seen in this study, is that knowledge becomes controlled, organized, and filtered and therefore easier to apply. When knowledge is properly managed it is an asset that enables smooth, effective high-quality performance. In addition to efficiency, quality and financial success, effective knowledge management also has a positive effect on occupational well-being. The value of knowledge management becomes though apparent only when knowledge is utilized sufficiently. (Kulha 2015, 11; Lindén 2015, 9, 16; Laihonen & al. 2015, 13, 16.)

On the organizational level effective utilization of existing knowledge improves the performance, while creating new knowledge leads to innovations and continuous development and improvement. Effective knowledge management contributes also to process improvements, employee skill increases and improved customer satisfaction. On the operative level effective knowledge management basically enables better and faster decision making by providing relevant, targeted, and timely information easily through a single source. It also helps to avoid the need to reinvent the wheel and to repeat mistakes, when knowledge is available, best practices are reused, and lessons learned are shared. It helps to reduce the workload and eliminate overlapping work. Additionally, it helps to leverage existing expertise and makes it available for everyone. Processes and procedures become standardized which leads to more consistent results and higher quality. Furthermore, an advantage that is very essential now day, is that effective knowledge management takes into account the tacit knowledge that is bound to the members of the organization and helps to store and secure vital knowledge that can otherwise disappear with retiring or leaving employees. What is furthermore important is that good knowledge management also contributes to job satisfaction. An individual's performance is often a very central part of an organization's success and knowledge boosts that performance. Good knowledge management enables good performance and a feeling of success, that both relate to work engagement and job satisfaction. Knowledge management leads moreover to not just more effective working, but also to more meaningful working. Employees know their tasks and know what is expected of them, they gain a feeling of control, which in turn contributes to increasing motivation and reducing stress. (Edvardsson & Durst 2013, 353; Garfield 11 August 2019; Laihonen & al. 2015, 14- 16, 30; Lindén 2015, 16, 21.)

2.2.1 The knowledge management process

The knowledge management literature presents many different models that describe the knowledge management process and they slightly differ from each other depending on if they emphasize the information control or the knowledge refining (Laihonen & al. 2013, 24). This chapter presents some of the models that can be seen useful regarding this study. As the goal of this study is to improve the whole process and to locate and identify the bottlenecks and barriers in the process, it is important to understand the different aspects and the different steps that the process can include.

The traditional knowledge management literature generally perceives the knowledge management process as a procedure that modifies knowledge into explicit form (externalization) so that it can be managed more easily (Virtainlahti 2009, 70). Sydänmaanlakka (2012, 196-197) for example states that to be able to utilize knowledge as an asset of the organization it would be important to transform as much tacit knowledge into explicit knowledge as possible, since explicit knowledge is easier to share and conserve in the organization, it is easier to learn, and it does not disappear with leaving employees. On the other hand, Sydänmaanlakka (2012, 198), as well as Virtainlahti (2009, 72-73) both specify that there is also tacit knowledge that can't be directly transformed into explicit. Savage (1990, in Sydänmaanlakka 2012, 180) actually states that only 10-30% of the knowledge in organizations is explicit knowledge and the rest lies within people. Therefore, to be able to develop organizational knowledge that creates competitive advantage, organizations simply need to learn to endorse and exploit also that tacit knowledge which isn't descriptive and that can't be own, controlled, stored, or distributed authoritatively.

Bhatt (2001, 71) describes knowledge management as a process of creation, validation, presentation, distribution, and application. Knowledge creation refers to developing new ideas and solutions by innovating, reconfiguring, or recombining. Knowledge validation is evaluating the adequacy of the existing information, and presentation is the ways in which knowledge is displayed. Distribution refers to sharing of the information, while application means making knowledge active by employing it in products, processes, and services.

The knowledge management process can also be seen as an activity (procedures and techniques) that control the phases of the knowledge lifecycle, which is presented by both Kaario & Peltola (2008, 9-11) and Stenberg (2006, 42). The knowledge lifecycle includes according to Kaario & Peltola (2008, 9-11) recording, maintaining, and controlling, storing and archiving, presenting, publishing and sharing of knowledge. Stenberg (2006, 42) adds

creating, acquiring, modifying/refining, employing, developing, filtering, and deleting to it. The knowledge lifecycle adapted from Stenberg's view, is illustrated in the Figure 4 below.

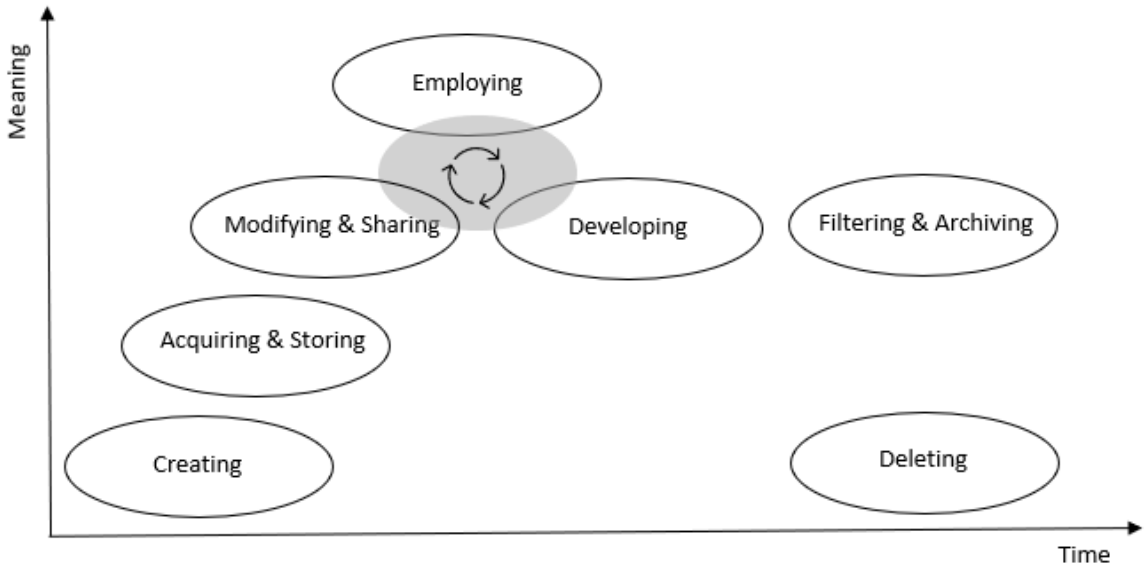

Figure 4. The knowledge lifecycle (adapted from Stenberg 2006, 42)

In addition to these descriptions Karadsheh, Mansour, Alhawari, Azar & El-Bathy (2009, 75) have created a very comprehensive model of the knowledge management process. Their view of the process is illustrated in
Figure 5 below. This model takes into account basically the same steps as Bhatt's (2001,71) description but includes some additional elements. In this model the emphasize is put on the knowledge infrastructure (discovering, capturing, creating), knowledge combination (gathering), knowledge evaluation (validating, relevancy), knowledge filtering (classification, categorization, organization, presentation), knowledge repository (storing), knowledge sharing (transferring, distribution) and knowledge application (translating into practice).

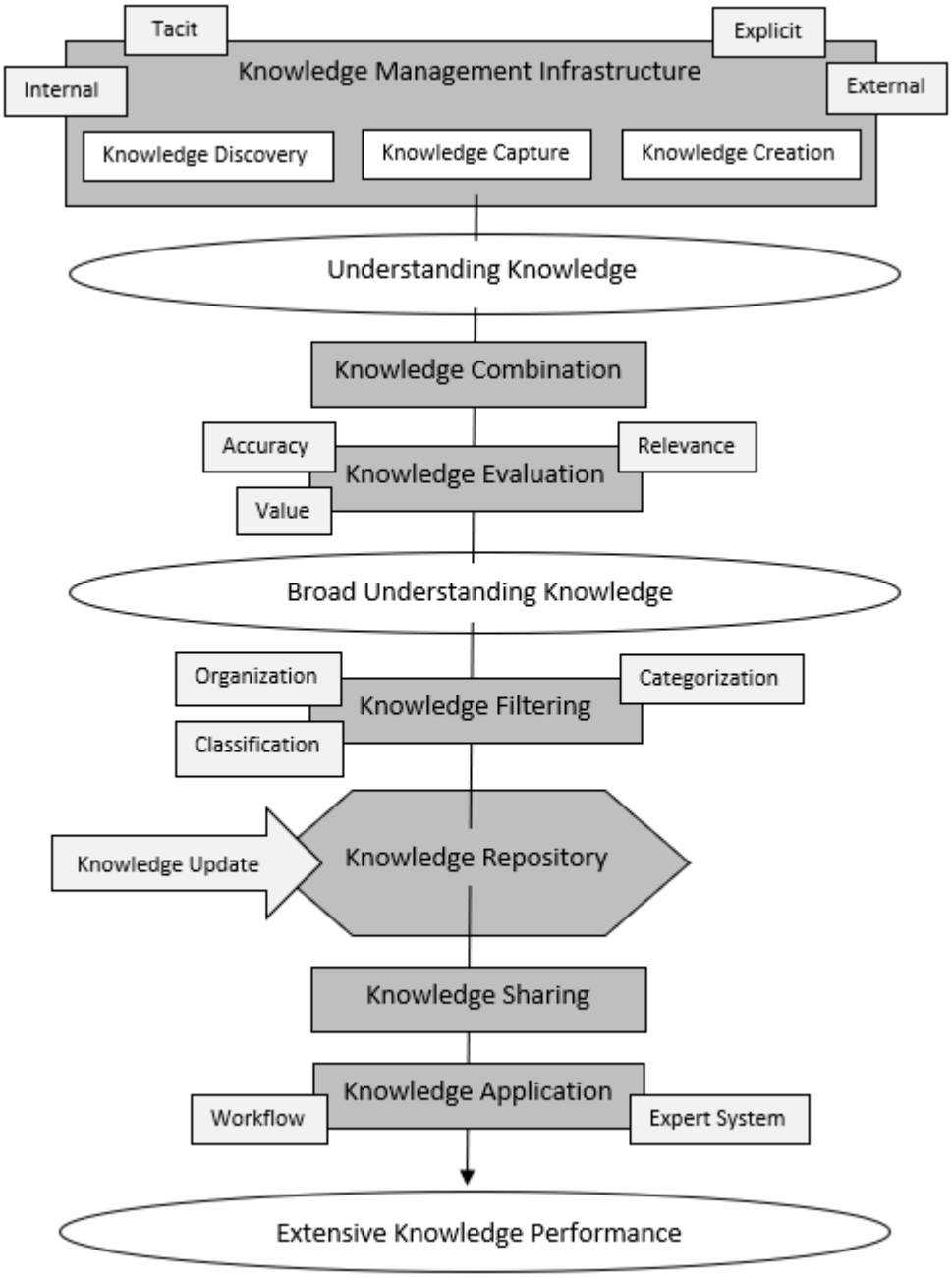

Figure 5. The knowledge management process (adapted from Karadsheh & al. 2009, 75)

Sydänmaanlakka (2012, 177) has also adequately illustrated the diversity of the knowledge management process in his knowledge management framework presented in Figure 6 below. Sydänmaanlakka (2012, 177) has enclosed the knowledge management process itself with elements from the organization, the individual and the culture, that all have an impact on it. Similarly, also Laihonen & al. (2013, 28) point out the meaning of the surrounding forces affecting the knowledge management process. According to Laihonen & al. (2013, 27-28) the knowledge management is an entity where the process of creating, collecting, organizing, refining, sharing, and maintaining is the core that is surrounded by enabling elements like culture, technology, management, and personnel.

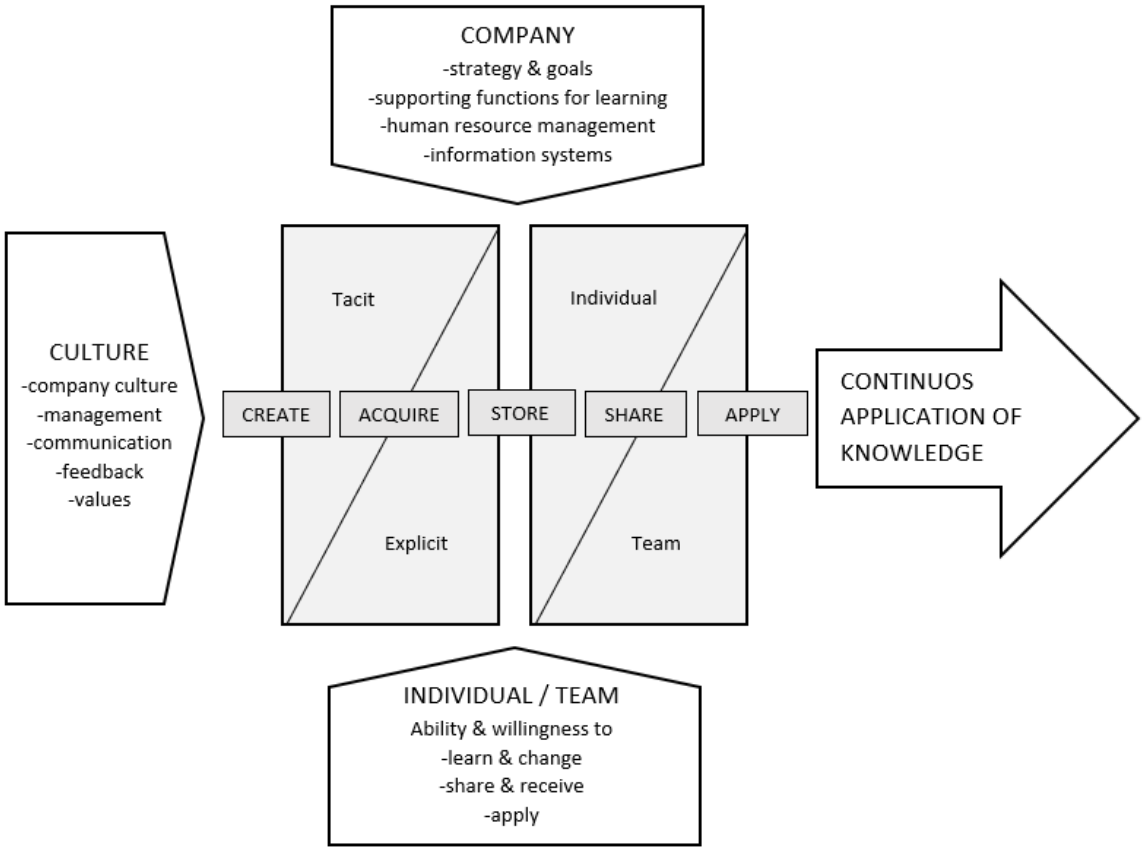

Figure 6. Knowledge management framework (adapted from Sydänmaanlakka 2012, 177)

2.2.2 Knowledge management in practice

The base for developing and implementing knowledge management into practice is to analyze the existing situation. The first thing is to assess and specify what kind of advantages more effective knowledge management could bring to the organization and what the main goal of knowledge management is. The target can be for example to cut costs, to increase income, or to enhance the operations and to improve quality, as in the target organization of this study. To do the analysis the whole knowledge management environment should be examined. A good way to start is to evaluate the performance and know-how and to consider if the needed knowledge for it is available. Is there enough knowledge, is knowledge created efficiently, is knowledge acquired from outside the organization, is knowledge stored, is it shared, and is it used and reused? The next step is to think about the processes. Are the main processes and supporting processes defined and are they continuously improved? Does the structure of the organization support effective knowledge management and is cooperation and knowledge transfer being reinforced? Are people motivated and willing to share knowledge, and do they understand the importance of it? Is the culture open and built on trust? And last but not least, is the information technology up to date so it supports all this. Are the available systems and applications sufficient and are they used adequately? Does the technology support the

knowledge management process? All these questions can help to create a general picture of the situation and identify what tools and means should be emphasized in the knowledge management process. (Sydänmaanlakka 2012, 198-200.) This process of transferring knowledge management from strategy to an organizational asset is illustrated in Figure 7 below and also used as a guideline in planning of this study that aims to make the knowledge management more visible and effective.

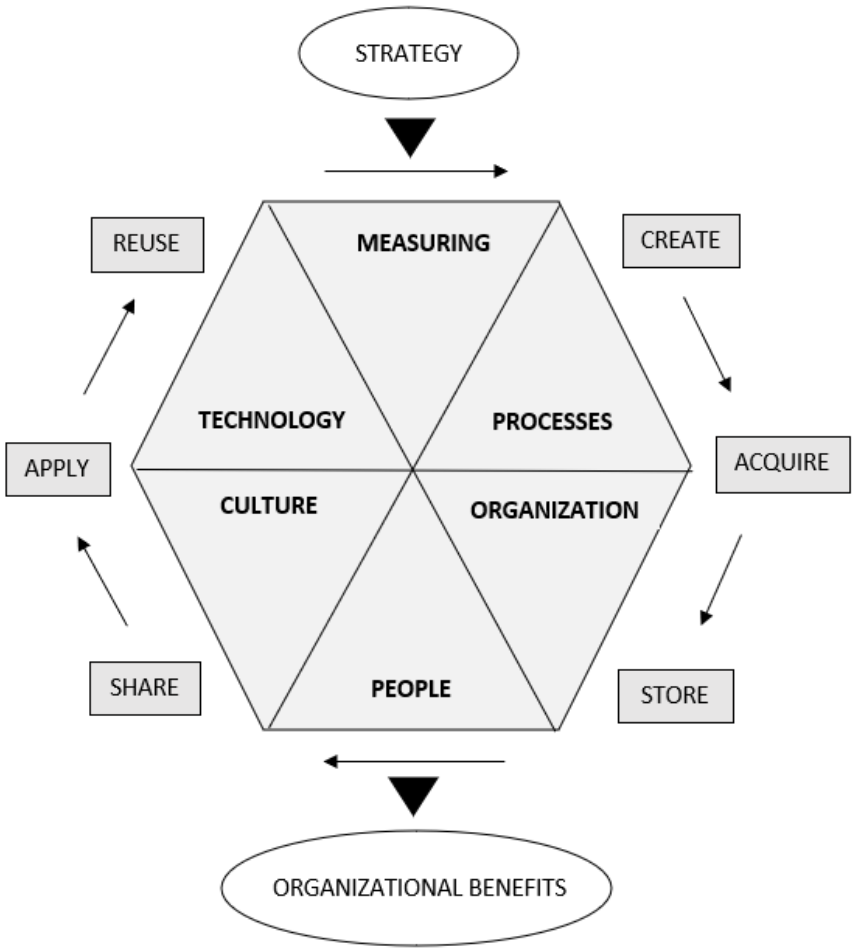

Figure 7. How knowledge management is transformed from strategy to an organizational asset (adapted from Sydänmaanlakka 2012, 199)

According to Sydänmaanlakka (2012, 203) the most important aspects of successful knowledge management are people, culture, and technology. People need to become active searchers of knowledge and they need to realize that sharing knowledge is power. The culture needs to support open and honest communication so that sharing of knowledge supports both the individual and organizational success. Furthermore, the technology architecture needs to be comprehensively designed so that it enables the effective movement of knowledge. Also, Karadsheh & al. (2009, 73) talk about the importance of people, technology, structure, and culture and call it the knowledge management infrastructure, which is the starting point in their knowledge management process

model (see Figure 5). Laihonen & al. (2013, 27) point though out that depending on if the strategy concentrates on people and tacit knowledge, or information technology and explicit knowledge, the emphasize on these things can vary. They remind though that very seldomly the strategy is purely either or, but mostly something in between, and therefore also the means and tools used are very diverse. (Sydänmaanlakka 2012, 202; Laihonen & al. 2013, 29.)

The knowledge management process that was presented in the previous chapter included activities like creating, acquiring, capturing, collecting, combining, organizing, evaluating, validating, filtering, refining, storing, presenting, sharing, applying, updating, maintaining and so on. To put these words into action it is essential to look at them a bit closer and to think of how to carry out these actions.

The knowledge management process most often starts with creating knowledge. The generation of knowledge can be described with the SECI model presented earlier (see figure 2), but in practice knowledge can be created in many different ways. New knowledge is often a mixture of already existing tacit and explicit knowledge, and a result of analyzing and combining. Knowledge can be created individually, but most often it is created through interaction between people. New knowledge can be provoked for example through individual studying, replication, experimenting, innovating, ideation in groups, brainstorming, teamwork, or job rotation. (Sydänmaanlakka 2012, 183; Bhatt 2001, 71; Karadsheh & al 2009, 73-74.)

The next step is acquiring, or sometimes also called capturing, collecting, and discovering. Sydänmaanlakka (2012, 183) calls this phase acquiring, as we can see from his previously presented models (see Figure 6 and Figure 7). Also, Stenberg (2006, 42) refers to acquiring, while Karadsheh & al. (2009, 73) talk about capturing and discovering. In practice they all though basically mean the same thing, that is, discovering and locating knowledge that already exists, inside or outside the organization. According to a study made by Mazorodze & Buckley (2019) the capturing process is the second most important knowledge management process. This can be done in practice for example by uncovering something new by examination of databases and documents, data mining, benchmarking, consulting, or transforming tacit knowledge to explicit form (Sydänmaanlakka 2012, 183; Karadsheh & al. 2009, 73; Stenberg 2006, 42).

After the knowledge is created and acquired, it needs to be validated, combined, organized, stored, and presented. Again, depending on the study a bit different terms are used, and sometimes all the activities are stacked under storing, while sometimes these

are seen as several different processes like validation/evaluation, filtering and presenting. This phase includes though always validating and organizing the knowledge so that the relevant and reliable up to date information is available for everyone in a structured and logical form. In practice, on the organizational level, this means documenting knowledge into memos, protocols, instructions, manuals and updating it continuously. On the individual level this also means reflecting and assimilating. This phase often requires time and resources for both the organization and the individual. If this phase is not handled properly what could be precious knowledge, becomes just harmful and confusing information flood that people are not using in their work. If knowledge is not validated, organized, stored, and presented well, it can delay and complicate decision making when getting the information is too time consuming, or when the information itself is not suitable for solving the problem. This phase is though often more problematic than it sounds. M-files benchmark report (2019, 3) about Intelligent Information Management for example show that nearly half of the studied workers in 1500 different companies say it is challenging or always challenging to find the information they are looking for, and an astonishing 86% of the respondents say they have problems searching for information they need to do their job. The most common challenges they face are wrongly labelled/named documents and information saved in incorrect folders/systems. Webster´s (2012, 1) study for example also reveals that in the studied organizations the unproductive time caused by inefficient information management amounts to a loss of 21% of organizations' total productivity, and costs almost USD 20 000 per worker per year. Poor document management with several repositories that are disconnected create silos and numerous "data ponds" instead of the united "data lakes" that would connect and contextualize information across multiple repositories and enhance the user's ability to find what they are looking for (M-Files 2019, 1-19). The means to tackle this problem with organizing and storing the organizations can in practice use for example indexing, mapping, cataloguing, usage of metadata, codification etc. What should though also be taken into consideration is the presentation style and the availability in different mediums. If the knowledge is scattered in many different locations and presented in many different styles it gets hard to for people to integrate it. Therefore, linking, coherent standards and formats, layouts, and for example predefined templates could be useful. It is important that the same information is easily available through different systems and mediums. In practice, the storage, or knowledge repository, is often some kind of a document management system that enables storing and retrieval, (for example Microsoft SharePoint), standard operating procedure system (SOP) or other information portals, from where the information can be retrieved and shared. (Bhatt 2001, 71-72; Jalonen 2015, 8; Karadsheh & al. 2009, 74; Lindén 2015, 12-14; Lindvall, Rus & Sinha 2004; 5-6; Sydänmaanlakka 2012, 184.)

When the valid knowledge is organized and stored, it is important to distribute it effectively. Sharing, distributing, and fostering the flow of knowledge between individuals in the organization is a core process of knowledge management, and part of all the presented knowledge management processes. According to a study made by Mazorodze & Buckley (2019) sharing is in fact the most important knowledge management process of them all. In practice it includes for example intranets, extranets, social media platforms, e-mails, bulletins, collaboration tools, communication channels, expert networks, knowledge portals, but also meetings, trainings, informal communication, and personal contacts. Knowledge can be made available by information technology or through human interaction. It can also be made available by automatically sharing and alerting people of new knowledge (e.g. push technology), or by being available on request through searches and questions (e.g. search engines). The relevant thing is to find the solutions that best meets the organizational needs and that the employees like to use. Even the best systems fail if the employees are not comfortable using them. Also, even though technology provides a lot of good tools for knowledge distribution, it is important to remember that in practice the organizational structure and culture plays a big role in knowledge sharing. Even if good tools for sharing are made available, it does not help if people are not motivated and willing to share their knowledge. Employees active participation and contribution to valuable content instead of just passive consumption can make all the difference. Willingness to share is in fact often considered as one of the most essential preconditions for successful knowledge sharing in organizations. Knowledge resources can be managed effectively only when employees are willing to share their knowledge with their colleagues. People need both extrinsic and intrinsic motivation to share their knowledge, and that can be achieved with reciprocal benefits and knowledge self-efficacy when their actions are acknowledged and valued. According to Mazorodze & Buckley (2019) a horizontal organizational structure is one of the key factors supporting the knowledge sharing, but also open-door policy, empowerment and the right kind of values and feedback culture, as well as a certain level of trust, help to speed up the information flow. When it comes to the cultural aspect, it is especially important that the middle management leads by example and continuously encourages communication, collaboration, and constructive feedback. In other words, that they facilitate and highlight the positive effects of knowledge sharing and welcome all kind of contributions. In practice this can mean for example openly highlighting and endorsing knowledge sharing by interacting themselves with what other people are sharing by giving comments, making suggestions, or just by saying “thank you” when having consumed and learned something from it. (Bhatt 2001, 72; Bran 2019, 1-2; Karadsheh & al. 2009, 76; Lin 2007, 136, 145; Lindvall & al. 2004, 8,11-12; Rode 2016, 153, 161-162; Sydänmaanlakka 2012, 184.)

The last phase of the knowledge management process is knowledge application. To benefit from knowledge management the knowledge needs to be used in the everyday operations, in processes, products and services, i.e., applied in practice. If reliable up to date knowledge is easily available, it is most often also utilized. Also, in this phase the culture plays though a role. If people are not willing to receive information, to learn and to change, even the best knowledge management processes fail because people do not use the available knowledge in their everyday jobs. (Sydänmaanlakka 2012, 185-187; Bhatt 2001, 72; Karadsheh & al. 2009, 76.)

2.3 Knowledge support

As the aim of this study, in addition to identifying the issues in knowledge management in general, is to find answers to how knowledge management could be improved so that it would effectively support employees in their everyday job by making knowledge better available, it is reasonable to consider that specific part of knowledge management a bit closer. The part of knowledge management that concentrates mainly on providing information to employees on site in operational environments, and focuses therefore on the availability of knowledge, is often referred to as knowledge support.

When an organization has established a broad understanding of how knowledge is managed in general and decided how that should be developed it becomes also easier to develop knowledge support. If the knowledge management process itself is unclear, the solutions are often sporadic and created only after the situations have already become problems. (Kasvi, Vartiainen & Pulkkis 2000b, 151.) This is also the reason why this study considers not just on the knowledge support, even though it is seemingly the most obvious problem at the target department, but tries instead also to figure out the whole knowledge management process behind it. Regardless, it is though apparent that when the strategic choice is to increase flexibility through redundancy of functions, as it is at Airline X OCC where the employees continuously work in more than one position, creating an effective knowledge support can help to avoid problems in beforehand and even create new possibilities for the organization, and can therefore be considered an important part of this study.

The concept of knowledge support was born around the same time as the knowledge management field evolved in the early 1990’s, because the traditional training and job guidance was not anymore enough in the constantly changing settings. Up to date information was more and more needed ad hoc, in the immediate proximity of the work performance, and faster and more often than training and guidance could provide. Kasvi (2003),

has studied knowledge support in learning operative organizations from the aspect of different on-site support programs in manufacturing companies, but addresses the concept though from a much broader perspective as one part of the knowledge management concept. The position of knowledge support in the knowledge management concept is illustrated in the Figure 8 below. As knowledge support is often described as the auxiliary memory, or the memory of the organization, it could be compared to the knowledge repository or storage (see Figure 5), but knowledge support is though often much more than that. It is the concrete and visible part of knowledge management with the ability to create, collect, control, store, share and apply knowledge (Kasvi & al. 2000a, 29). Laihonen & al. (2013, 26) don't directly name knowledge support, but as they state that the purpose of the knowledge management process is to create an organizational memory where knowledge is organized and stored to complement already existing knowledge, they do bring forth the importance of it.

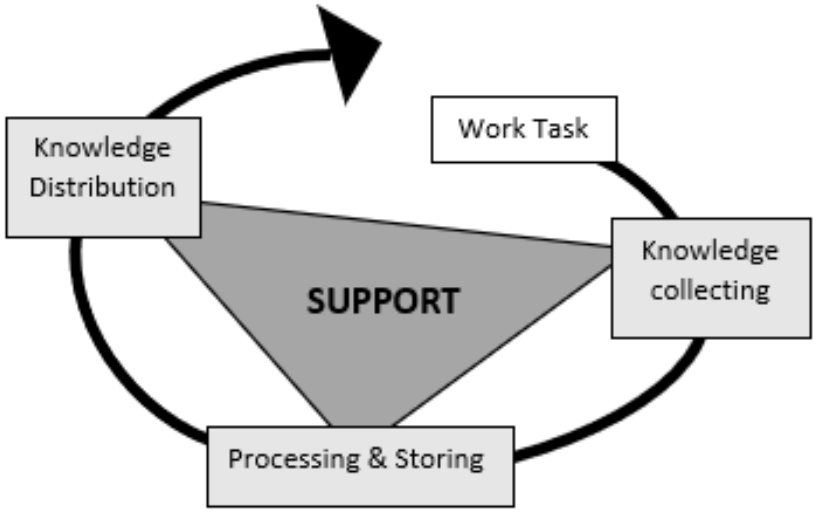

Figure 9. Position of knowledge support in the knowledge management concept (adapted from Kasvi 2003, 24)

The sources for knowledge support can be divided into four groups; own memory, physical environment (e.g. arrangement of tools), social environment (e.g. help and support from colleagues) and information environment (e.g. work instructions, checklist). Basically, any tools transmitting information can be called knowledge support. Crib sheets, work instructions, databases as well as advice and support from other persons, are all kinds of knowledge support. The essential thing about knowledge support is though that it collects, stores and shares information fluently, and that it is easy to find and understand and available on demand during the work performance. (Kasvi & al. 2000a, 9, 28-30, 37-40.)

A well-functioning knowledge support has many advantages for both the organization and the employees. Kasvi & al. (2000a, 26) for example list the following benefits:

- Reduces the time needed for training
- Improves learning – information is available when the problem occurs and the motivation to learn is high
- Increases independency and autonomy – releases experts to other tasks
- Improves quality and unifies the ways of acting – less remembering by heart
- Improves processes – processes and procedures are analyzed more deliberately
- Increases flexibility – enables more multi-tasking
- Increases and unifies the instructions – easier distribution inside and outside the organization
- Enables capturing of tacit knowledge and best practices – ability to apply employees' know-how more efficiently

It is however important to note that even though knowledge support can for example reduce the need for training, collaboration, and skills learned by heart by providing the information just-in-time, the purpose is not to rule out the need for training, know-how or cooperation, but instead to support these activities and enhance learning and professionalism. It is also essential to understand that the increased flexibility is not achieved with only new technology that supports and assists performance, but principally by expanding the assets of the social system by enabling extra competencies, or redundancy of functions as Kasvi & al (2000a, 127) and Kasvi (2003, 12-13) call it. This excess capacity, or redundancy of functions, is gained when knowledge support assists people in learning and developing their skills so that they are able to function for example in more roles. (Kasvi, Pulkkis & Vartiainen 2000, 117-120, Kasvi, Vartiainen & Nieminen 2000, 126-130.)

2.3.1 The main features of knowledge support

The central aspects of a well working knowledge support are individualization, interaction, and timeliness. The needs of the users vary and depend on the level of know-how, but also on the diverse situations. In addition, the different users often prefer different kinds of media and presentation styles. The knowledge support should be planned so that it can be used as a quick reference or as a step-by-step guide, depending on the current user and the current need. The amount, quality and level of information needs to be right so that nothing is missing, but so that relevant information does not either get lost in useless information floods. Furthermore, the knowledge support should in addition to sharing information, also be able to collect information. The knowledge support should be interactive so that the users are able to add, correct, modify and refine the knowledge provided by it, and therefore be able to share new ideas and insights easily throughout the organization. An interactive knowledge support can that way help to collect valuable information from real life situations and help to transform tacit knowledge into explicit form, so that lessons

learned do not get lost, but become instead visible knowledge for the whole organization. Finally, knowledge support should of course be up to date. Convenient updating and administration should be given special attention, so that the knowledge support remains trustworthy and always provides correct and updated information. (Kasvi & al. 2000a, 9, 31-32.)

In addition to the central features of a knowledge support system listed above, it is also essential that a knowledge support is usable. Usability is a key factor for a successful knowledge support system, but it is not enough that the system itself is easy to use, the information it is providing also needs to be useful and applicable. The usability of a knowledge support system is a combination of the system and the structuration, targetability and visibility of the information. It is often highlighted that it is important to involve the end users in the development of the knowledge support systems, and this is especially vital regarding the usability, where the baseline always needs to be the actual users. It is good to remember though that different users often have different needs, and that the usability of the system should be considered from both the end user aspect as well as the administrator user aspect. Administrator users maintain and update the system, and for the information to be accurate it is utmost important that also that process is easy and smooth. (Nieminen 2000,136-141.)

The factors that should be considered when planning the usability of a knowledge support system are according to Nieminen (2000, 141-144) detectability, findability, targetability, learnability and memorability. Nielsen (1993, 26) defines usability in addition with efficiency, errors, and satisfaction. These factors can be analyzed for example with questions presented in Table 1 below.

Table 1. Questions to help analyze the usability factors of knowledge support (adapted from Nieminen 2000)

Detectability	Is the information clearly displayed? Are the functions easy to detect?
Findability	Is the information fast and easy to find in a logical manner?
Targetability	Is the available information adequate and in suitable format? Is the amount of information reasonable?
Learnability	Is training required for the using? Is the amount of training acceptable?
Memorability	Are the functionalities easy to remember? Is the functionality based on other familiar systems
Efficiency	How fast and effective is the use?

Errors	How flawless is the result when using the system?
Satisfaction	How pleasant is the use from an individual's subjective point of view?

Detectability is about finding the right place to search for information and to understand the functions and possibilities of the system. It is also about finding the right path to follow, and staying on that, to find the correct information. Detectability needs to be considered so that the users don't need to find information about how to find information and can instead concentrate on the essential. The information is useless if it isn't found. Findability on the other hand concentrates more on the structure and the content of the information. Usually, the most logical structure simulates the actual task, but as the same information can be needed in many different situations by many different people, it is essential to think about various reasonable ways to find it. It is important that the information is found fast and effortlessly because otherwise people often choose to rely on their memory or even guess, rather than use their time to mine the information from disorganized systems. Targetability refers to the way to find and present the information so that it is essential and adequate in different situation. The same information may be used for different purposes. In some situations, a short note might be enough while other situations require more thorough knowledge of the matter, and the needed level should be easily available in both situations. Learnability is important because the constant changes in the operative environment require so much adaptation that the supporting tools should not need additional learning or training. To diminish the need for additional training, to speed up the initialization and to ensure the effective use, familiar platforms and elements, that users already know should be considered. Memorability is to some extent part of learnability but considers more the ability to remember the information or the system. To enhance memorability the support should utilize familiar mind structures and skills and terms that are used on daily basis. Efficiency means the level on which the support is used and the degree of fluentness, while errors refer to how flawlessly the work is done with the help of the support. The errors and fluctuations in quality can be minimized if the available information is clear and handy. And finally, the satisfaction, which is a subjective feeling of how amiable the system is to use, should be taken into consideration because an unpleasant and irritating system is surely not accepted and used as eagerly as a pleasant one. (Nielsen 2000, 26-34; Nieminen 2000, 137-144.)

2.3.2 Creating and developing knowledge support in practice

Creating and developing knowledge support should always start with an analysis of the starting points. When there is a clear understanding of the tasks, and the challenges these

tasks create, it is easier to present and target the support correctly so that the knowledge available in the organization can support the employees in their everyday work. The users should always be involved in the analysis, as they are the experts in their own work. Kasvi & al. (2000b, 154) has presented a three phased model for the analysis which includes the analysis and description of the work process, the work task, and the knowledge requirements. The model helps to create job descriptions, determine knowledge needs and identify cognitive requirements. The model is pictured in Table 2 below and complemented with questions that can help to make the analysis. (Kasvi & al. 2000b, 153-156)

Table 2. The phases of knowledge support planning (adapted from Kasvi & al. 2000b)

Work process analysis → Communication & Information flow analysis →	**Task analysis →**	**Cognitive task analysis**
- How is the work done? - What are the most critical phases of the process? - How and where is information used? - How is communication organized?	- What task are done? - What actions are needed? - What characteristics do the tasks have?	- What kind of information is needed? - In what format is information needed? - What kind of skills and know-how is needed?

In the work process analysis, the whole work process is described so that the operation that leads to the final product or service is clear. In this phase it is especially important to note the most critical points in the process so that these can be properly supported to ensure the best possible quality. At this point it is also good to map out the information and communication flows to get a general view of when and from where employees get information during the different phases of the work process, and to examine wheatear the communication and information flow is adequate or are decisions made without proper knowledge. The second step is task analysis, which includes a closer look at the tasks within the work process. The tasks are described and the categorized to better understand the character of them. The tasks can be for example simple physical tasks or complicated mental tasks that require problem-solving, they can require experience-based know-how, or they can be based on strict rules or standards. Different kinds of tasks usually require different kinds of support. The third phase concentrates on analyzing the knowledge need for these tasks. If the needed knowledge is for example based on experience-based know-how, it can often be revealed by talking to new employees, or if the needed knowledge requires more holistic understanding, it can perhaps be provided by databanks that have information available for further studying in addition to the just-in-time support.

At this phase it is also good to acknowledge the different skill levels, as the new employees often need more detailed support than the more experienced ones. (Kasvi & al. 2000b, 153-156.)

When the analysis is done, and the knowledge support is created it requires maintenance and administration. The tasks and responsibilities of the supporting system needs to be clearly defined. The responsible persons should be familiar with the system, but also with the operational environment where the system is used. Often the first thing that needs addressing is that changes and adjustments are needed even after the initialization as testing and analyzing never reveals all the problems. The usage of the system in real life often brings forth necessary development subjects. In addition, the creating and updating of information should be an easy and fluent, clearly defined process with designated persons in charge. The information base needs to be kept up to date all the time so that it stays effective and reliable. If the updating is not clearly designated, or if it is complicated, requires too much work, or involves too much hierarchy, the smaller changes and improvements are often disregarded or used but not documented, which severely damages the credibility. The same thing happens if feedback and development ideas and suggestions are not handled promptly. As the point is to also create and collect knowledge from the authentic environment, it is important to encourage people to give feedback and to react to that feedback accordingly. (Kasvi & al. 2000b, 158-164.)

3 The research process

The research process moves usually forward in stages and goes from familiarization with the topic, and planning the research to conducting the research, and reporting the findings. Usually, the different stages interact with each other along the way, so that the later phases can specify or sometimes even change the earlier phases. This is especially true in qualitative research that is a cyclic process. (Kananen 2017, 52-53, Koppa 2010.)

This was the case also in this research that was conducted mainly during the beginning of the year 2021, even though the familiarization and planning of the research had started already much earlier during 2019 and 2020. The familiarization and planning included mapping of the problem field and the information available about the subject, but also defining the scope and getting to know already existing studies in the field. Moreover, it involved formulating the research questions, defining the theoretical framework, assembling material, selecting the research approach and methods, and making a research plan. The reporting was also started already in this phase alongside with the other steps. After this phase the gained information caused though some changes to the original research plan, and the objective and the research questions needed to be specified and revised. The existing theory about knowledge management and knowledge support for example made it clear that it would not be sufficient to study only the knowledge supporting elements and technological aspects that were causing the most obvious problems, but that it was in addition essential to have a look at the social aspects and the knowledge management process as whole. When the needed changes were made the following phase was then to actually conduct the research. Conducting the research involved obtaining and gathering research material, analyzing the material, interpreting it, and deriving results and conclusions from it. After this the final phase was to finish the already earlier started reporting and complementing it with the findings and conclusions, and moreover with reflections on the process itself.

3.1 Approach and methods

A research is always carried out with specified methods, that together form a research approach. Choosing and using a research approach is a central part of doing research, and the chosen research approach affects all the different parts of the research. The research approach is an entity that includes the research strategy and the methods used to collect and analyze material and data. (Koppa 2015a.)

In this study the chosen research approach was a case study approach that uses qualitative data collection and data analysis methods. The choice of the research approach was based on the research problem that in turn was directed by the objective of the study, i.e., the aim to gain profound information of a limited entity in a specific real-life environment and to provide suggestions for development. Furthermore, the qualitative data collection and analysis methods were chosen based on the research questions that indicated a need to collect information, experiences, views, and opinions that are qualitative in nature.

A case study approach was seen as the most appropriate approach for the study as it generally strives to produce profound and detailed knowledge about the case it studies, and it is often a suitable approach when the aim is to produce suggestions and ideas for development. Case studies are moreover often used to understand for example circumstances, conditions, relationships, and behavior in an organization. When using a case study approach the aim is usually to get a lot of information about a concise research object rather than to get a little information about a broad object. A case study often answers to questions like “how?” and “why?” and uses abductive reasoning, which means that it starts with sporadic, incomplete observations and proceeds then to the most likely explanation in theory. In other words, it goes from specific to general. The case study approach often also combines many different kinds of methods to get as versatile material as possible about the research object. (Douven 2017; Kananen 2017, 40-48; Ojasalo, Moilanen & Ritalahti 2015, 52-55; Vuori 2021a.)

In this study the qualitative methods were considered most suitable as the aim was to study processes that tend to be so complicated that they are hard to get a grip of with quantitative methods. Qualitative research is often also descriptive in nature and uses words and sentences to answer the research questions, which seemed appropriate for the cause. The aim of qualitative research is generally to describe, interpret and understand the studied phenomena via meanings that people bring to them in their natural settings, and it does not strive to generalize the findings. In qualitative research the material is also mostly collected in interaction with the research objects, and the point is to give attention to their views and meanings of the situation. (Flick 2007, 2; Juhila 2021; Kananen 2017, 32-36.)

3.2 Data collection

To find answers to the research questions this study used three different qualitative data collection methods; document analysis, focus group discussion, and interviews. The pri-

mary data collection method was document analysis, which was used first to gather information about the current situation and the problems in the departments existing knowledge support infrastructure. The focus group discussion was then used to verify and complement the results from the document analysis and to collect development ideas. Finally, the interviews were used to get a deeper understanding of possible underlying reasons.

Three different data collection methods were used to breed the credibility of the study and to reduce the impact of potential personal and research method biases. This type of combination of methodologies to study the same phenomenon in one study is called triangulation and is often used in qualitative research to ensure that the findings are not simply artifacts of a single method or source (Bowen 2009, 28). The different data collections methods are introduced and justified closer in the following sub chapters.

3.2.1 Document analysis

Document analysis is a method where different documents, both printed and electronic, are systematically reviewed, evaluated, and interpreted to elicit meaning and gain understanding of the studied phenomenon. The documents that can be used in document analysis take a variety of forms and they can be any written, spoken, or filmed material, and even artifacts that are produced from the studied phenomenon. Documents can include articles, web pages, advertisement, brochures, journals, diaries, newspapers, organizational reports, photos and so on. The common thing about the documents is that they are produced without the researcher's intervention and that they are usually not intended for research, which makes them unobtrusive and non-reactive. They are not affected by the researcher or the research process and can therefore provide reliable data on the research context. (Bowen 2009, 27-30, Ojasalo & al. 2015, 136.)

Part of the problem formulation of this study was to identify the issues in the current knowledge management systems, and the assisting research questions stated a need to find answers to how knowledge is currently managed and supported at Airline X OCC, and what parts of the knowledge management process are the most critical ones at Airline X OCC. To be able to find answers to these questions the current situation at Airline X OCC was reviewed and analyzed by inspecting different written documents and tools that were part of the identified knowledge management and knowledge support infrastructure in the studied organization. The analyzed documents included the Operations Control Manual, which is an official company document stating the policies, principles, and procedures for the OCC department (Airline X 2020a, chap 0.1.4, 0.1.5, Airline X 2020b, chap.

0.1) and different other manuals, other knowledge sources, repositories, and channels that the Operations Control Manual referred to regarding the chosen aspects.

The aspects that were used in the document analysis were chosen based on the theory about knowledge management and knowledge support. The first aspect was to review the processes and tasks of Airline X OCC, as clearly defined processes can be considered fundamental for both knowledge management and knowledge support (see chapter 2.2.2 and 2.3.3). In this part also the appointed responsibilities were considered as they are according to the theory seen important regarding updating and maintaining knowledge support (see chapter 2.3.2). In addition, also the communication methods were considered in the analysis, as they are important especially regarding a well-functioning knowledge support (see chapter 2.3.2). The second aspect was to analyze the knowledge sources, and knowledge repositories and distribution channels to be able to get a better view of the current knowledge supporting tools and means. These were analyzed by inspecting especially those features that are according to the knowledge support theory essential for well working knowledge support systems (see chapter 2.3.1). The documents and tools were inspected and compared with the theory about knowledge management and support and examined in contrast with the reality based on the researchers own experiences. The findings from the document analysis gave a better understanding about the factors causing the problems and helped with finding the most critical points. The document analysis also gave a good base for the focus group discussions.

The documents were accessed and examined during early spring 2021. The document analysis was all in all a quite time-consuming process that started in January 2021 with systematic reviewing of the processes, communication methods and knowledge sources, repositories, and distribution channels used at the department, and a close reading of the documents. Especially the Operations Control Manual which is the Airline X OCC's official manual was emphasized. During the process the different documents and tools that the manual referred to were moreover reviewed and evaluated by systematically exploring them, but also by using them in real life situations as the researcher was working at the department during the process. The simultaneous close reading of the documents concentrated on correspondences and oppositions that could be observed between the documents and reality. The reviewing and evaluating took about two months, and it produced a lot of observations that were then interpreted and analyzed in March 2021.

3.2.2 Focus group discussion

A focus group discussion is a qualitative data collection method that is often used among others in organizational research. In focus group discussions a group of usually 5-10 people discuss a particular topic or a range of issues under guidance of a moderator that promotes interaction and ensures that the discussion stays on track and remains on the topic. The participants of a focus group are selected purposively so that they share some experiential knowledge regarding the topic and share a common feature that is relevant to the topic. Focus group discussions usually provide rich and detailed data about perceptions, perspectives, thoughts and impressions, and the method is often used in combination with other methods to, for example, facilitate interpretation and add depth to other obtained results and enhance understanding of the other findings. The traditional focus group method is about deep verbal reflection, but when it is combined with the brainstorming method it can continue or evolve into idea generation. When people first discuss about a topic, they often then feel natural to process the outcomes and use it to ideate around improvements. (Coghlan & Brydon-Miller 2014; Frey 2018a; Van De Ven 2018)

After the document analysis there was a need to verify the findings to be able to increase the credibility and reliability of the study, but at the same time, as the other part of the research problem of this study concentrates on finding development ideas for the knowledge management and knowledge support processes at Airline X OCC, that factor also needed to be addressed. To be able to do both the verifying and the pondering for possible solutions, the chosen method was a focus group discussion that was combined with the brainstorming method. The focus group discussion was used to verify and give depth and specification to the findings from the document analysis regarding the most critical points, and the brainstorming was a good tool for idea generation to find answers to the assisting research questions of how knowledge management and knowledge support could be improved.

The focus group discussion was based on the summaries from group discussion that had been held earlier at Airline X OCC, and the findings from the document analysis. The earlier held group discussion had revealed similar problems with knowledge management than the document analysis (Tuominen 15 April 2021), and therefore they were seen as a relevant starting point for the focus group. The main theme of the discussion was development of the knowledge management and knowledge support infrastructure at Airline X OCC.

The focus group session was organized in May 2021, and it was partly virtual. The team members were chosen from Airline X OCC employees based on their own interest in the topic, and their willingness to participate in the company's knowledge management and support project also in the future. Also, two of the department's duty managers participated in the discussion. The focus group consisted of altogether five persons. The participants were invited to a meeting via Microsoft Teams about three weeks before the session and they were given the option to participate at Airline X office, or virtually via Teams. Three of the participants were at Airline X office, while two of them joined the discussion virtually. The session lasted for about 2 hours. The discussion was led by one of the group members who assured that the discussion remained on the topic even though the discussion was otherwise quite unstructured to let the participants share their perspectives as freely as possible. The discussion was documented by taking notes and the notes were gone through together at the end of the session to assure that there was a mutual understanding of the outcome, and to ensure that everything was registered. The notes were then further analyzed and reported by the researcher rather promptly after the session in May 2021, while the discussion was still fresh in mind.

3.2.3 Interviewing

Interviewing is one of the most used methods in both research and development. Interviewing is a good method to get new aspects about the studied phenomenon and to clarify and deepen the subject. Interviews can be made in many different styles, depending on what kind of information is needed. The style of the interview, the format and the scope of the questions all have a big impact on the discussions and the received answers. Interviews are usually divided into structured interviews and other, semi-, or unstructured interviews. The definitions of the structured, and the semi-, and unstructured interviews are often quite inconsistent, but the main difference is in their structure. The structured interview often has clear predefined questions, and it reminds of a questionnaire, while the semi-structured interview has some predefined questions, or themes, but the interviewees can answer freely, and the questions can also be modified, or the discussion steered to different directions depending on the situation. The unstructured interview is then again more of a discussion about a topic without any questions. The important thing is though not to be able to name the type of the interview, but instead to be able to choose the most suitable type of interview, depending on the information need. (Hirsijärvi & Hurme 2001, 43-48; Hyvärinen, Suoninen & Vuori 2021; Ojasalo & al. 2015, 106-108.)

In addition to document analysis and focus group discussion the third method used in this study was interviewing. Interviewing was used in this study to get a deeper understanding

of the problems, and to find possible underlying reasons that could not be seen from tangible artifacts. As the findings from both the document analysis and the focus group concentrated more on the technological side and the explicit knowledge, the interviews were used to address the social aspects and the tacit knowledge. The aim was to understand possible cultural and organizational aspects that could have an affect the knowledge management at Airline X OCC. The interviews were used to find further answers to the questions about how knowledge is currently managed and supported at Airline X OCC, what are the critical points especially regarding knowledge management (if knowledge support that was addressed already in the earlier phases is disregarded) and how especially the social aspects of knowledge management could be improved.

As the objective was to deepen the knowledge about knowledge management, and as there was no presumptions about the social factors that affect it at Airline X OCC, it was important to give the interviewees the possibility to express their thoughts about the subject as freely as possible. Therefore, the structured interview with standardized questions seemed too restrictive for the cause. The totally unstructured interviews had on the other hand given too much freedom to the interviewees and could easily have led to getting lost in the quite broad concept. Therefore, a semi-structured interview with predefined themes was used. This type of a thematic interviews gave the possibility to get information about the specific topics from within the concept that were considered important, without restricting the interviewee's answers too much in advance.

The themes that formed the base for an interview frame, were derived from the knowledge management theory. Especially the surrounding forces, organizational elements, individuals, and culture, that according to theory affect the knowledge management process (see chapter 2.2.1) were emphasized, as the knowledge management and knowledge support infrastructure itself had already been addressed a lot in the document analysis and focus groups discussions. The interviews concentrated also more on tacit knowledge instead of explicit knowledge that was also considered already in the document analysis and focus group discussions. The interview frame had in addition to the themes also specifying and reinforcing questions that helped to keep the discussion on the right track and assured that all the wanted topics were discussed. To find out the interviewee's subjective views very detailed questions were though avoided in the interview situations, and the specifying questions were also modified depending on the situation. Open questions, follow-up questions and hypothetical questions were used. The themes that were discussed in the interviews were knowledge sharing and knowledge capturing, that are according to theory the two most important knowledge management processes (see chapter 2.2.2) and in addi-

tion, knowledge processing that can actually make or break all the knowledge management efforts (see chapter 2.2.2). The interview frame used in this study, with the themes and the guiding questions, is appended to this report as attachment 1.

The interviews were conducted during the latter part of May 2021 after the document analysis and the focus group discussion. The participants were randomly selected by the researcher among the Airline X OCC employees. The researcher contacted five employees and all of them agreed to participate. The topic and the themes of the interviews were told to the participants when the time for the interview was agreed, so that they would be familiar with the basic idea. Altogether five interviews were conducted, and each of the interviews lasted for 1-1,5 hours. All interviews were conducted in Finnish, as that was the interviewees native language. Four of the interviews were conducted at Airline X office in Vantaa, and one at another location in Helsinki. The locations and times were chosen so that they were convenient for the interviewees, and so that the interviews could be conducted privately without distraction. All the interviews were recorded to be able to concentrate better on the interview situation, and to be able to litter the interviews more precisely afterwards. Each of the interviews were littered right after the meeting to reassure that all the details and nuances would be documented while they were fresh in mind. After that the littering's were then analyzed, and the findings reported during summer 2021. In the reporting quotations from the interviewees' responses were used to make the analysis made by the researcher as transparent as possible, and to help the reader ensure that the interpretations of the data are consistent. As the interviews were conducted in Finnish, but the reporting language is English, the quotations were translated by the researcher. The translating was made as precisely as possible so that the quotations were true to the original citations, and retained the original meaning given by the interviewees.

4 Data analysis and findings

The data was analyzed in this study with the qualitative content analysis method that is an analytic method to systematically interpret and describe data generated from text or video. In qualitative research content analysis is used to interpret data by identifying codes and common themes to establish understanding of underlying meanings (Frey 2018b). Qualitative content analysis helps to reduce the material and focus on the selected aspects related to the research questions (Schreier 2014). The qualitative content analysis has different approaches, but when there is prior research or theory, and the aim is to expand the understanding, directed qualitative content analysis is usually the most appropriate (Frey 2018b). This is also why the directed qualitative content analysis was used in this study where the themes, i.e., the coding structure, used in the content analysis were derived from the knowledge management theory.

The analyzed documents and tools were rather large entities and after close reading they were further analyzed and interpreted with help of content analysis, by identifying relevant meaning based on the knowledge management and knowledge support theory and the research questions. Also the focus group discussion session and the interviews were analyzed with the help of content analysis so that the relevant meaning could be better identified. The analysis of these started with close reading of the notes from the focus group discussion and the littered interviews and continued with compressing and summarizing the discussed subjects so that they could be grouped together under themes derived from the theory and the research questions. The analysis of the data gathered from the focus group discussion was relatively easy, as that summarizing was partly done already during the session together with the participants, so that the relevant meaning could be checked and verified with the group. The analysis of the littered interviews was more time consuming, as every interview was first summarized and then the summarized findings were compared and grouped together with findings from the other interviews. After grouping the findings were once more arranged to smaller themes to find similarities and typical activity that was seen essential. All the analyses are reported below.

4.1 Document analysis

The analysis is based on close reading of the Operations Control Manual, which is an official company manual stating the policies, principles, and procedures for the OCC department. The Operations Control Manual is used as a guideline for Airline X OCC work, and it includes definitions of OPAC processes, as well as definitions of the documents that are used and the records that are stored. Furthermore, the Operations Control Manual also

provides instructions for Airline X OCC tasks. (Airline X 2020a, chap 0.1.4, 0.1.5, Airline X 2020b, chap. 0.1.) In addition to close reading of the manual, and the documents it referred to, the processes, the communication methods, the knowledge sources, repositories, and distribution channels that the manual appoints, are examined, and explored in practice. The document analysis starts with a process, task, and communication analysis, and continues with a review of the available knowledge sources, repositories, and distribution channels.

4.1.1 Processes

The processes of the Airline X OCC are presented in the Operations Control Manual. The Operations Control Manual presents Operations Control's Tasks, which are basically the processes of Airline X OCC, and divides them into routine tasks, operational control, rotational control, flight planning, crew briefing, delay monitoring, performance calculations, charter flights, crew control and flight tracking. In addition to these, the manual also states the OCC processes in problem situations and presents some work practices and special instructions. (Airline X 2020b, chap. 4-7.) These tasks can be considered the main processes of the Airline X OCC, and they serve as the guideline for the work at the department. In reality, all these main processes naturally consist of many minor sub processes and work tasks that together form the entity. The main processes of Airline X OCC, and the sub processes and task instructions that are defined in the Operations Control Manual related to the main processes, are listed in the

Table 3 below and analyzed based on this. But, as the manual states that some of the task instructions are also published in the OPAC section on the company network drive, also that section is inspected and analyzed to be able to create a more comprehensive view of the process and task definitions and descriptions. Also, the appointed responsible persons for the processes are marked (RP1, RP2, RP3) in the table, when they are stated in the manual.

Table 3. Processes and related sub processes and tasks at Airline X OCC according to Operations Control Manual (Airline X 2020b).

Main process	**Sub processes and tasks**
Routine tasks (RP3)	Checklist, OPS Log
Operational Control	-

Rotational Control	Advance Preparation, Priority Flights, Decisions in Case of Irregularities, Airport Slot Management, Collaborative Decision-Making, CTOT Monitoring, Notable issues, Task Lists, Turnaround times, Technical Coordination
Flight Planning (RP1)	Flight Planning process, Operations with MEL Reference, Weather Monitoring, Flight Numbers, Air Traffic Control, Filing, Changes, RAIM Checks, Route and Alternate Selection, Rerouting, Volcanic Ash
Crew Briefing	Route Changes, Standard Flight Brief Packages, Crew Information System, Ballast, SSRs, Deportees, President on Board, Dangerous Goods
Delay Monitoring (RP2)	-
Performance Calculations	-
Charter Flights (RP1)	Charter process, Responsibility Table, Contacts, Preparations
Flight Tracking (RP2)	Process for Tracked Flights, Actions in Case of Deviation, Actions in Case of Missed Time Stamps, Irregularities
Crew Control (RP3)	Responsibilities, Duty Time and Rest Validity, Crew Competence Validity / HOTAC and Transfer Booking, Changes, Use of Stand by and Reserve, Crew Check-in
Work Practices	Duty Roster, Psychoactive Substances, Communication, Reporting, Email Accounts
Problem Situations	Emergencies (RP3), Abnormal Situations, Aircraft Emergency Equipment, IT-Related Problems, Passenger and Media Communication in Abnormal Situations
Special Instructions	Ad Hoc Fueling, Crew Transport

As can be seen from the table, some of the processes have many stated sub processes and tasks, while others have none. In addition, when the process descriptions were inspected closer, it became evident that some of the main- and sub processes, and tasks are very specifically explained, while others are just mentioned briefly. The Operations Control Manual that has in general a clear structure and a distinct management process appears from this aspect somewhat confusing and illogical to the user. The main idea of the manual seems unclear, as the processes, tasks and instructions are not presented coherently. The inconsistency from this point of view actually starts already in the introduction of the manual itself. According to the Operations Control Manual introduction (Airline X 2020b, chap 0.1) it includes, in addition to the definitions of the processes, also instruc-

tions for performing the tasks, but on the other hand, later on, in the chapter that is presenting the tasks closer (Airline X 2020b, chap 5.1), it states that detailed instructions for performing the tasks are published in the OPAC section on the Company network drive. This is to some point contradictory. What remains unclear is the logic behind which instructions are included in the manual and why, and which instructions are published separately on the network drive. What adds to the confusion is that the manual refers to this network drive in different wording in different situations. In reality, this storage is often called the “Homebase” as that is how it is named also in the Operation Manual Part A, which is the company’s so-called master manual for general information, later referred to as the OM-A (Airline X 2020a chap. 0.1.4, 0.1.6, 2.2.1). In the Operations Control Manual it is though called among other things “Company network drive”, “Company SharePoint site”, “Company staff portal”, and “Company intranet”. What makes it further distracting is that OCC also uses an actual common network drive, called P-station, which is different from the Homebase (SharePoint) environment to which the manual is at this point referring to. For the clarity, the SharePoint based portal, with the OPAC folder including instructions for performing OCC tasks, will later in this study be referred to as the Homebase.

The illogicality in the process, sub process and task descriptions become evident in comparison of the defined processes. For example, the “Rotational Control” main process has 11 identified subprocesses that are mostly defined in detail, and of which some include even very specific task instructions. The subprocess “Decisions in Case of Irregularities” has for example very clearly defined principles, and the subprocess “Task list” a very detailed workflow. Also, for example the main process “Flight Tracking” is very clearly defined process and includes furthermore detailed subprocesses with clear workflow instructions. On the other hand, for example the main process “Operational Control” has no defined principles or subprocesses at all in the Operations Control Manual. This chapter has only a reference to the OM-A, that states the OCC’s general duties and responsibilities regarding operational control but does naturally not present any OCC processes or tasks, as that is defined to be the Operations Control Manuals function. Another example of a main process that has no defined subprocesses and a very short definition is the “Performance Calculations” process. Also in this chapter, there is only a reference to an OM-A section which defines aspects of performance calculations, but as it is mainly aimed for pilots, it is not in its entirety essential for the OCC process. What comes to the “Crew Control” main- and sub processes the definitions are scattered as they are partly defined under the Operations Control’s Tasks, like the other processes, but partly also under a special chapter about Crew Planning and Control process. Also, the “Special Instructions” process is a bit unclear, since it includes two totally different processes that could actually be linked as

subprocesses for some of the other main processes, or published as separate instructions in Homebase, like many other miscellaneous subprocesses and task.

When these main processes and subprocesses were compared with the instructions for the tasks, that are according to the manual published in the OPAC sections on Homebase, some instructions corresponded with these processes but mainly the instructions were hard to link to these. There was no difference in this if the process was well defined in the manual or not. All in all, what can be derived from the process and instructions comparison is that most of the processes, even the ones that are clearly defined in the manual, has no clearly identifiable corresponding instructions or task descriptions in the Homebase OPAC section. The structure of the Homebase OPAC section was though also found fairly inconsistent and complicated, and therefore even though there would have been matching instructions, it would have been hard to find them based on the processes that were not indicated in the section. The logic behind for example the folder structure or the naming of the documents was rather confusing compared to the manual. The OPAC section does have a lot of instructions for diverse miscellaneous OCC tasks, but they are not clearly linked with the processes and therefore difficult to identify and find. Some of the instructions are also long documents including many tasks (for example LIDO käyttäjäopas), while other documents concentrated on single tasks (for example LIDO MEL Automaatio). Some of the instructions were furthermore produced especially for OCC and contained filtered information (for example ATFCM manual) while others were general manuals (for example Elisa Ring 2.0) with a lot of non-targeted information. What also became evident as the task instructions were inspected, was that some of the instructions that could actually be linked with the processes, were unfortunately partly outdated.

The inconsistency between the processes and the tasks became visible for example by the following cases. The main processes “Flight Planning”, “Crew Briefing” and “Crew Control” had own subfolders inside the Homebase OPAC folder, but on the other hand so did also some of the subprocesses like for example “Emergencies” and “Airport slots”, while the other processes and subprocesses did not have corresponding folders. On the other hand, a detailed task instruction about the Crew Control subprocess “Crew Competence Validity” was found as an appendix to the manual, but it was not found in Homebase OPAC folder at all, even though there was a dedicated Crew Control subfolder. Another very comprehensive crew control instruction (Airline X OCC Crew Control ohjeistus) was neither located in the folder, but instead found on the common network drive P. The same problem could be observed with for example the Emergencies process, and the linked subfolder in Homebase. The EME & SEC subfolder does include some emergency in-

structions, but the most used “OCC Emergency checklist” is instead published in the “Others” section in the Homebase Company Library and not in the OPAC folder or the EME & SEC subfolder. This checklist was neither mentioned in the manual, even though it is essential for OCC in emergency situations. The same illogicality could be observed also with several other instructions that were not linked with the process, but that could be considered essential for the work at OCC. Some of the main processes with defined subprocesses, for example “Charter Flights,” did actually not have any instruction documents available. Of the main processes that had no defined subprocesses in the manual there were found no instructions for “Operational Control”, but the “Delay Monitoring” did have a related instruction document (Delay-koodit ja ED-viestit) under a subfolder named OPS general. Under the same folder there was though also instructions for, for example, the sub process “Priority Flights” (Prio ohjeet) and the main process “Flight Tracking” (Aircom Tracking). For the main process “Performance Calculations”, which did not either have defined sub processes in the manual, there were no specific instructions found, but a training material about the subject was though located under a subfolder called Ops Control Recurrent 2021 (Mass Balance and Performance).

What comes to the appointed responsibilities, the Operations Control Manual states that the Head of Operations Planning and Control is the responsible person for the Operations Control manual itself, and revisioning is done according to the company Document Management Manual which gives clear instructions about the process (Airline X 2020b, chap 0.2). Moreover, the Operations Control Manual also states the responsible persons for some identified processes but does not specify the revisioning and follow-up procedure for these (Airline X 2020b, chap 1.2.3). The appointed responsible persons (RP) stated by the Operations Control Manual are linked with the processes in

Table 3 above. As the listed appointed processes do not fully match with the processes presented in general, the RPs are linked with the closest main or subprocess in the table. As can be seen from the table some of the processes do have a responsible person, but many of them are not assigned to anyone specifically. The inconsistency comes from the fact that the list of dedicated processes is different from the described processes in general. What is positive is that the assigned responsible persons are the OCC duty managers that are familiar with the operational environment and the systems that are used. When the processes with appointed responsible persons were compared with the processes that did not have an appointed responsible person, it could be seen that the ones with responsible persons were to some point given more thought in the task and instruction parts. There was more up to date instructions and the changes in these processes were also better documented. This can be interpreted also as better identified knowledge

needs for these processes and tasks. For example, the Crew Control process has very thorough task descriptions and instructions available, and the Flight Planning process has many documented updates to the processes and tasks. Even though it was not directly evident from the analysis of the processes and task instructions, based on the researcher's own experience at the department, these processes with appointed responsible persons are also paid more attention to in general. For example, the Emergency process and the Flight planning processes and tasks are developed and revised frequently, while for example the Rotational Control and Crew Briefing processes and tasks are much more outdated. Also feedback regarding the appointed processes and tasks is usually handled better and faster which increases the credibility of these processes in general.

4.1.2 Communication

The communication methods as well as the communication practices at Airline X OCC are listed in the Operations Control Manual (Airline X 2020b, 3.3). The Operations Control Manual describes both internal and external communication methods and practices, and outlines how the OCC receives information, and how it shares information, both internally and externally. The manual also presents the regular meetings that are held at the department. The communication methods that are presented by the Operations Control Manual are listed in the Table 4 below. In the table the communication methods are linked with the respective type of information that they are used for (Airline X 2020b, 3.3). The Operations Control manual also separately mentions some communication practices, and they are added to the methods in this analysis.

Table 4. Communication methods and the type of information they are used for at Airline X OCC according to the Operations Control Manual (Airline X 2020b).

Communication Method	**Type of information**
Telephone	Urgent issues, internal and external
Email	One-to-one communication, secondary method for operational issues, report distribution, internal and external
ACARS	Communication with airborne crew, internal
SITA	Operational issues, external
Skype chat	Operational chat
Workplace	Non-critical operational issues

Workplace, OPAC group	Operational issues
Workplace, OPS/Crew Control and Crew Planning groups	Non-operational information within the company
Crew Info System (CIS)	Operational issues, information to flight crew
Crew Info Display (CIDS)	Operational issues, information to flight crew
SMS	Duty-related issues, information to flight crew
Opsmetrics	Operational status updates
Operations Control Bulletin	Instructions and work practices
Operational Bulletin	Operational issues
Outlook calendar	Scheduled tasks and notable issues
OCC Whiteboard	Operational issues

The communication methods are in general well identified, even though a couple of methods seem to be missing from the listing, while others are not in use anymore. For example, the radios, which are used for communication with the aircrafts and with the ground operations unit, are not mentioned at all, and Microsoft Teams, which is used for both communication and collaboration, is also missing. The mentioned Skype chat is in turn not in use anymore. In addition, also the general type of use of the communication methods are well outlined, even though they are rather generally defined. The communications flows are though somewhat insufficiently defined, and not clearly linked with the general work processes.

What comes to the communication practices, like the general work processes, also these processes and practices seem inconsistently defined and presented. For example, Crew Info System (CIS), Crew Info Display (CIDS) and SMS are all listed as methods for informing flight crew, but only Crew Info Display and SMS are mentioned in the “Communication Practices”, while Crew Info System is disregarded. Also, Email which is listed, has for example the used email accounts mentioned partly under the “Communication Practices”, but partly under a totally different chapter “Email Accounts”, where also phone numbers are listed. Some inconsistency can be observed also in the structure in general. Some of the communication practices are defined very specifically (for example Workplace and Daily conference calls), while others are only shortly mentioned (for example SMS) or

have a short reference to other manuals (for example, Informing flight crew and communication in Emergency and Incident Situations). Some of the methods listed (for example Outlook calendar and OCC Whiteboard) are in turn not mentioned at all in the practices. Additionally, links to some of the communication systems are provided (for example Opsmetrics) while others are not (for example ACARS). Some of the information provided regarding the communication methods and practices is also outdated or incomplete. For example, part of the information regarding operational chats, daily conference calls and Opsmetrics is obsolete, and the OCC and Maintenance part lacks information about clearly settled daily communication practices. Furthermore, the communication practices are not clearly linked with the general work processes. For example, a very essential communication practice in emergency and incident situations (FER incident report) is not mentioned in the Emergency Manual, in the Operations Control Manual's communications section, or the process description of problem situations and emergencies section, but only under "Passenger and Media Communication in Abnormal Situations" and "Reporting". Moreover, for example, the communication practice regarding Workplace states that daily updates are recommended, but this is not mentioned under any of the work processes.

4.1.3 Knowledge sources, repositories, and distribution channels

The Operations Control Manual divides the documents used at the department to internal and external documents, and aircraft documents. The internal documents consist of Manuals, Ops Control Bulletins and Specific instructions. Manuals refer to all company manuals, as in addition to the departments own Operations Control Manual, OCC often needs to use also other company manuals. Ops Control Bulletins refer to documented information used to notify staff about significant changes, notable issues, work practices and instructions that will be later added to the Operations Control Manual, while the Specific instructions refer to more individual task related and detailed work instructions. Of the internal documents the manuals are the primary source of information, Ops Control Bulletins the secondary, and Specific instructions the tertiary. The external documents refer in turn to all documents of external origin that are used as is, or that are in included in other company-controlled documents. The external documents that are used in OCC are in general different web-based services. The aircraft documents refer to aircraft specific documents, and different official certificates. (Airline X 2020b, 2.2.1, Airline X 2020c, 4.)

Of the internal documents used at the department, only the manuals are company-controlled documents that are handled according to the company document management

process. The manuals have a document owner, specific structure, identification and revisioning according to the company's Document Management Manual. Also, the distribution and publication processes are defined. For the OPS Control Bulletins the publishers, the name and the distribution channels are defined separately in the Operations Control Manual, and the reach is monitored, but otherwise it is not controlled. The specific instructions are not controlled at all, and only the publishing channel is specified. What is to be noticed is that the Document Management Manual does have instructions for both Bulletins and Instructions, but the OPS Control Bulletins and instructions are not handled according to those regulations. The external documents are company controlled in the sense that the company's Document Management Manual states the owners of the documents, as well as distribution, monitoring and revisioning processes used for them. Regarding the aircraft documents, the management process is not defined, and only the storage is stated. (Airline X 2020b, chap 2.2.1, 2.2.2, Airline X 2020c, chap. 2.5.2, 2.5.3)

The knowledge sources are linked with the relevant knowledge repositories and distribution channels according to the Operations Control Manual in the Table 5 below. The knowledge repositories and distribution channels are combined due to the fact that the manual often states only either or, and in some cases the distribution channel also works as the repository.

Table 5. Knowledge sources and linked knowledge repositories and distribution channels at Airline X OCC according to the Operations Control Manual (Airline X 2020b).

Knowledge source	**Knowledge repository and distribution channels**
Company Manuals →	Company Library in Homebase
Ops Control Bulletins →	OPAC group in Workplace
Specific Instructions →	OPAC folder in Homebase
External Documents →	Document Management Manual in Company Library in Homebase
Aircraft Documents	Aviodocs

The knowledge sources are well identified as internal documents like manuals, bulletins and specific instructions and external documents and aircraft documents, but also in this part there is some inconsistency in the manual. For example, aircraft documents are mentioned with the same emphasis as the internal and external documents, even though they are not actively used at the department at all. In addition, the distribution and publication of the documents is presented somewhat illogically. The distribution and storage is not

mentioned at all regarding the manuals (only a reference to the Document Management Manual is provided), while the distribution is stated, but not the storage regarding the OPS Control Bulletin. Furthermore, the storage is stated, but not the distribution regarding Specific Instructions. What moreover causes some confusion is the presentation of the external documents. The Operations Control Manual states that the external documents are listed in the Document Management Manual, where their use is instructed. In closer inspection of the Document Management Manual, only the principles and procedures of external document usage is though stated, and no actual instructions were found. The part "Most commonly used external documents by OPS Control" in the Operations Control Manual also lists for example many documents that are very rarely used but does not mention others that are frequently used. The provided list therefore seemed inappropriate for the OCC department, as a lot of the external documents used at the department were missing from the list. For example, the IFPS User Manual, which is specifically stated as an external manual in the Operations Control Manual, was not available in the Document Management Manual. Also, for example the weather service Ilmanet, the Eurocontrol Network Operations Portal and Aviamaps, that are all frequently used, were not mentioned in the listing. On the other hand, the manual does though state that "Other documents" are used according to the general instructions of the Management Manual, but as these instructions couldn't be found, the entity remained unclear. The most problematic inconsistency regarding the knowledge sources and repositories and distribution channels seemed though to be caused by the fact that became evident already in the analysis of the processes; As the processes, subprocesses and tasks are not all clearly defined, they get mixed up, and especially specific instructions are not stored and shared consistently in the named repositories or shared through the named tools.

In addition to the official sources and repositories the department also uses other miscellaneous information sources and repositories and distribution channels. In reality Airline X OCC often needs to gather a lot of information and knowledge via different communication tools like traditional phone and email, but also collaboration channels like Microsoft Teams operational chats and groups as well as various additional documents and different daily, weekly and monthly meetings. For example, maintenance information, scheduled tasks and crew information coming in via phone and email, delay information and aircraft changes from the operations control system, general information from various Workplace groups and Microsoft Teams chats and groups, and different documents from Homebase and Company Library. These knowledge sources are mostly communication methods that are considered already earlier in this chapter, or various random documents and instructions (e.g. loose equipment lists, emergency equipment list, licenses, approved airports, approved routes etc.) and therefore here referred to only as miscellaneous sources. The

information and knowledge gathered from these sources is though mostly stored and shared on repositories and channels that are not mentioned in other contexts and not identified in the manual, and they are therefore acknowledged here. These are listed by the researcher based on her own experience in Table 6 below.

Table 6. Additional knowledge repositories and distribution channels used at Airline X OCC.

Knowledge source	**Knowledge repository and distribution channels**
Miscellaneous →	Common network drive P, shared email folders, Microsoft Teams-groups, -chats, and -files, shift handover, OCCLog & Checklist, Workplace groups, Homebase folders

As these sources repositories and distribution channels are not clearly identified in the manual their use is neither clearly defined nor instructed. These repositories and distribution channels are therefore used casually and ambiguously and based on tacit practices that are often incoherent. For example, the use of the common network drive P, the Teams groups, -chats and -files, the shift handover and the email folders are not mentioned in the official manual. The use of other Workplace groups than the directly OCC related (OPAC, OPS/Crew Control, Crew Planning and Control) is neither acknowledged. These include for example Flight Planning, CMS, WTF, and All company groups. The OCCLog & Checklist is to some extent instructed in the Operations Control Manual under “Routine Tasks”, and in the document itself, but for example the included OPS private log, and crew control handover functions are not mentioned at all.

To analyze the identified knowledge sources and knowledge repositories and distribution channels the strengths and weaknesses of the tools were examined. Especially aspects concerning usability were examined, but also other general strengths and weaknesses were observed. The factors that are according to the theory creating good usability are detectability, findability, targetability, learnability, memorability, efficiency, and errors (see chap. 2.3.1). In addition to usability factors also the individualization, interaction and timeliness factors are considered, as also they are mentioned as fundamental factors for a well working knowledge support. The satisfaction factor, which is also part of usability, is left out because the user’s subjective point of views cannot be analyzed based on the documents. The strengths and weaknesses were considered as they are displayed, even though they would be stated differently in the manual. In reality the strengths and weak-

nesses of knowledge sources are generally a combination of the strengths and weaknesses of the source itself and the repository and/or distribution channel which is used to deliver the source to its users. The sources and the repositories and distributions channels are though analyzed separately here, to be able to distinguish the strengths and weaknesses of the source itself and the tool that is used. Aircraft documents are disregarded as a knowledge source in this analysis as they are not commonly used at the department. The results of the analysis's are presented in Table 7 and Table 8 below and explained in writing after the respective table.

Table 7. Strengths and weaknesses of the knowledge sources

Detectability, Findability, Targetability, Learnability, Memorability, Efficiency, Errors, Individualization, Interaction, Timeliness		
	Strengths	**Weaknesses**
Company Manuals	-clear and logical structure -easy functionalities -good search function -clear document management process -appointed responsible persons	-large amount of info -a lot of non-targeted info for OCC -only general info -uneasy updating process
OPS Control Bulletins	-targeted for OCC -filtered info -clear structure and identification -the reach is tracked -appointed responsible persons	-not included in manuals or other instructions -not updated -no frequent use
Specific Instructions	-targeted for OCC -mainly filtered info -good learnability due detailed instructions -frequently added	-inconsistent identification -inconsistent structure and format -poor findability -high risk for errors due obsolete info available
External documents	-clear structure -up to date info	-large amount of info -a lot of non-targeted info for OCC -training needed, not based on familiar systems
Miscellaneous	-mostly current info -frequent use and update -interactive	-large amount of non-defined information -displayed in various ways -lack of logic in storing and sharing -poor findability

The analysis of the knowledge sources reveals that the controlled documents (Company Manuals, OPS Control Bulletins, External Documents) have a clear structure and can therefore be seen to have a better detectability than the uncontrolled ones (Specific Instructions, Miscellaneous information), but on the other hand the timeliness is better for the Specific instructions and Miscellaneous sources that are not controlled. The used External documents that are in general administrated by the publisher, are mostly both well-structured and timely but they are usually not targeted. They are neither based on any familiar systems and therefore the learnability and memorability can be inferior, and they might need training. The findability is in general better for the controlled documents as they have a unified structure and logic, while the uncontrolled documents lack logic in both identification and structure and format. The result can be considered more flawless when using the controlled documents as they are official company documents, and considered therefore more reliable, while the uncontrolled ones are not official documents, and have a lot of obsolete information. In reality, as especially the miscellaneous information is often more current and updated more frequently, the result might be more accurate when using the miscellaneous information, but still the risk for errors is though bigger. None of the knowledge sources were very individualizable, and the miscellaneous information sources were basically the only ones that had interactive elements in a way that the user could to some point share insights and comment on the knowledge that the source was providing.

Table 8. Strengths and weaknesses of the knowledge repositories and distribution channels

Detectability, Findability, Targetability, Learnability, Memorability, Efficiency, Errors, Individualization, Interaction, Timeliness		
	Strengths	**Weaknesses**
Company Library	-clearly displayed -clear functions -easy to learn and remember	-poor search function -inconsistent folders -a lot of non-targeted info for OCC
OPAC folder in Homebase	-targeted for OCC -familiar structure (windows folders) -good search function	-large amount of inconsistent subfolders -poor findability -high risk for errors due obsolete info available
OPAC group in Workplace	-targeted for OCC -familiar user interface (Facebook based) -interactive -possibility to individualize -fast info sharing	-common and specific information mixed -poor findability -high risk for errors due obsolete info available

Document Management Manual	-clear and logical structure -easy functionalities -good search function -clear document management process -appointed responsible persons	-a lot of non-targeted info for OCC -incomplete info -missing instructions for use
Common network drive P	-targeted for OCC -familiar structure (windows folders)	-unclear logic for usage -poor findability
Email folders	-familiar user interface (outlook) -targeted for OCC	-inconsistent folders -a lot of unstructured info -poor findability -unclear logic for usage
Microsoft Teams -groups and -files	-targeted for OCC -interactive -fast information sharing	-unfamiliar interface -lack of instructions for use -unclear logic between the different functions
Shift handover	-targeted for OPS -familiar structure (excel) -timeliness -current topics -effective and easy	-no traceability -not archived -not used in all positions
Checklist & OCC Log	-targeted for OCC -familiar structure (excel) -fast to use -good findability -good traceability -reliable	-many different functions in one document -fluctuations in quality
Other Workplace groups	-familiar user interface (Facebook based) -interactive -possibility to individualize -fast info sharing	-not targeted for OCC -many different groups -poor findability -high risk for errors due obsolete info available
Other Homebase folders	-clear structure	-not targeted for OCC -poor findability

The analysis of the knowledge repositories and distribution channels showed that many of the systems seemingly had a weak findability. Even though some of the repositories had clear structure and familiar functions that could have improved findability, inconsistent folders, a lot of non-targeted information, poor search functions etc. made it hard to find the needed information. An interesting point that became evident from the analysis was

that the tools that provided more general information, not targeted for OCC, (Company Library, Document Management Manual, Other Homebase folders) had mainly a better structure and a better logic than the ones that shared only OCC specific information. They therefore also had better detectability even though the findability and therefore efficiency was necessarily no better. What was positive about the repositories that were mainly targeted for OCC, was that they were in general more interactive, and timely, as they also worked well in urgent information sharing. What comes to learnability and memorability, especially the ones with familiar user interface and familiar structure (OPAC folder in Homebase, Workplace, Common network drive P, Email, Shift handover and Checklist & OCC Log) could be said to have a good learnability as they probably don't require instructions for use, but the as the logic and the use is somewhat inconsistent within the system, the memorability can still be considered poor.

What can be derived in general from the analysis of the knowledge sources and knowledge repositories and distribution channels at Airline X OCC is that the official knowledge sources (manuals, bulletins, instructions, and external documents) and official knowledge repositories and distribution channels (Company Library, Workplace OPAC group, Homebase OPAC folder and Document Management Manual) identified and defined in the manual, are only part of the actual tools and means used. The document analysis revealed a whole bunch of miscellaneous sources, repositories and distribution channels that were actively used but not officially or clearly defined, or regarding some of them, even mentioned in the official manual. What also became evident was that even though the official knowledge sources and repositories and distribution channels were identified and defined better, they had necessarily no better usability than the other tools that were not defined.

4.2 Focus group discussion

The discussion started with a part where the findings from the departments earlier held group discussion and the findings from the document analysis were presented, and the participants were asked to assess the validity of them. The participants were asked to comment on the findings and to add their own view of the central problems with knowledge support. After this the discussion continued with defining goals that should be achieved to solve the revealed problems. Finally, the participants were also asked to brainstorm about methods that could help to reach these goals. The participants were asked to define the concrete steps that should be taken to develop a working knowledge support system for the department. The main points of the discussion are summarized in Table 9 below.

Table 9. Summary of the results of the focus group discussion

Identified and verified problems
The illogical location of the instructions & poor search functions The inconsistent publication practices of the instructions The poor updating practices of the instructions The incoherent content of the instructions

Goals	**Methods**
• One single location • Good search functions • Easy browsing • Clear content and structure • Concrete and tangible content • Clear process for publication • Clear process for updating • Regular updating	• Decision of a technological solution for storage and publishing • Updating of the Operations Control Manual • Defining the structure • Going through the existing instructions • Adding missing instructions and deleting obsolete ones • Moving the existing instructions to one single location • Defining policies for publishing, updating, using, and deleting • Defining policy for feedback

The focus group had a fruitful discussion about the problems and many examples were discussed and analyzed closer. The problems that were presented to the participants based on the earlier findings were verified, but the factors causing these problems were discussed further. There was also discussion about in what degree the findings from the document analysis affect the daily work and the actual supporting sources and repositories. The group members did feel that there is an urgent need to define the processes and tasks so that they can be consistently arranged in the supporting systems, but they did not have a unified vision about whether this should be done in the manual or just directly in the supporting systems, because updating the manual was seen too complicated due to the hierarchy and the authority regulations connected with it.

All, in all it was though the findability and detectability of the information and the updates that was seen to be the most critical problem, and this was closely related to the illogical locations, long paths, and unclear and incoherent structure and content of both the

sources and the repositories and distribution channels. Also, poor search functions in the different sources and repositories were noted to be a big issue that affected findability a lot. Moreover, the weak findability and detectability was seen to directly affect efficiency and satisfaction. As it was hard to find the information, it delayed the working and decision making, and it also frustrated the employees. Furthermore, the lack of publication and updating practices, that was also seen as a significant problem, was considered to affect the error factor the most. As the information was not updated consistently, or the updates were published incoherently and in various distribution channels, the risk for using outdated information was seen considerable. Based on these discussed factors that were causing the problems, the reasons behind them and the issues they were causing, it can be concluded that the large number of different insufficient and inconsistent sources, repositories, and distribution channels, as well as the lack of clear process and task descriptions and knowledge management practices are together the most central issues.

When the discussion continued to the goals of the development process the group discussed the most important aspects regarding a knowledge support, and listed points that should be fulfilled in an ideal solution. At this point a single location that would be easy to browse, that would have clear paths, and a good search function was considered the most important factor. This was also considered as the main goal to be able to tackle the earlier defined most critical issues. Furthermore, the group wanted also to have clear and tangible content and structure, and clear processes for publication and updating.

Finally, the group was asked to list steps that should be done to reach the goals. The participant continued the discussion and concluded that the first thing to do is to choose what technological solution will be used for storage, distribution, and publishing of the information. Both the currently existing solutions and new solutions were discussed thoroughly. The group was though unanimous that none of the existing solutions have all the features that would be required for good usability from the OCC's point of view. Therefore, a new comprehensive system that would gather the information from all the existing systems to a unified entirety, was seen as the only viable option. In addition to a new system, the group then also discussed methods that would help to clear up the content of the sources and make it more concrete and tangible. The group continued to discuss the Operations Control Manual's part in the equation, and findings from the document analysis. Even though most of the participants did not consider the manual as a usable information source they would use in their daily work, they agreed that the processes should be clearly defined there, while more detailed instructions, and other more specific information, should be described, but moved to a more logical location with better timeliness.

The group concluded that this would help in creating clear and consistent content for support, that could also be better organized in the new system. Additionally, this was seen to enhance the identification of knowledge needs connected to these processes and tasks. Therefore, updating the manual according to this, was listed as one of the first steps together with the selection of a technological solution. After this, the group stated that the following step should be to additionally define the structure of the instructions, so that they would have a solid form that would enhance findability, memorability, and efficiency. Also, the structures effect on targetability was discussed and it was recognized as an important factor, so that the information would be adequate and easy to use in many different situations. The group concluded that to be able to reach this goal, all the existing instructions should be reviewed and updated according to a new structure, and at the same time obsolete instructions should be deleted and possibly missing instructions added, so that they correspond with the existing processes. After the instructions would have clear and concrete content, a new better structure and a new repository and distribution system with better usability, the policies for publishing, updating, using, and deleting should be carefully defined and instructed, so that the information would be timely and using the information would have a low risk for errors. The group also listed that the policy and the means for feedback and comments should be described in detail, so that the system would provide some interactivity by giving the users a clear process how to add, correct and modify the provided information.

4.3 Interviews

All the interviews started with an introduction of the topic, and a short explanation about the aim and structure of the interview. The researcher pointed out that there are no predefined questions, but instead just themes to discuss about. The interviewees were also told that in general the aim was to concentrate on their personal views and experiences, rather than to get factual information. Furthermore, the researcher also explained that the explicit knowledge (the manuals, the official instructions) had been acknowledge already in the document analysis and focus groups, and therefore the aim was to concentrate more on the tacit knowledge (experience-based knowledge, hints, tips, and word of mouth) in the interview. The interviewees were regardless though encouraged to freely express themselves about the whole concept. The interviewees were also asked permission for recording of the interviews.

In general, the interviews revealed that there is a lot of tacit knowledge at Airline X OCC. Some felt that there is more tacit knowledge in the crew control position, while other felt that there is more of it in the operations control position. All of the interviewees felt that the

amount of tacit knowledge is extensive, but they also found it very natural, as they felt that the work itself actually requires a lot of experience-based knowledge that is often tacit. The biggest part of the tacit knowledge was considered to consist of the experience-based knowledge that was derived from different cases, discussions with duty managers, and tips and hints shared among colleagues. Many of the interviewees also talked about tacit knowledge that they felt was hard or impossible to make explicit as they described it more as a gut feeling.

"…yes, there is a lot [tacit knowledge]. In fact, there is a considerable amount of it. Tricks and hacks and things that you have learned if there have been some unclear and rare cases that have been discussed during the shifts. But then it is only the ones in that particular shift that know it, while others don't. That kind of stuff is pretty common."

" I'm sure there is a lot of it [tacit knowledge], as the experience-based knowledge is a big part of this job, and a lot of knowledge comes from colleagues. Some part of it is things that you can't even put in writing, but I think it is really easy to work with a more experienced colleague because then you get that kind of tips and insights that help you to solve the problems with less effort. Like for example that something gets solved with one phone call, when you otherwise would have needed to make fifteen. That kind of stuff really saves a lot of time."

" I think we have a lot of tacit knowledge, as this is a job that requires a lot of know-how and skills that can't be measured in any way…And the tools you use to perform the job consist of small things that you are only able to collect to your toolbox through experience. And if you come up with that kind of things or discover those things from some case you have had, and then talk about them with the duty managers to get sufficient methods for yourself, that will stay between you and the duty manager, and will never get out to others. And that kind of stuff is something we certainly have a lot."

" There is a lot more tacit knowledge and variance in the ways of working in the Operations Control function. Crew Control is a far more distinct entirety."

"I'm sure there is a lot of that kind of [tacit] things that ease and speed up the working. Especially in the Crew Control position there are things that you learn only by doing it for a while. But they are things that are hard to make explicit as they are mostly not factual knowledge, so they cannot be instructed or written down."

"I feel that we have a lot tacit knowledge that isn't written down anywhere. Probably more especially in the Operations Control position. Tips and hints are better displayed in Crew Control thanks to the instruction "bible"."

4.3.1 Sharing of knowledge

The first theme of the interview was knowledge sharing, and the interviewees were asked to tell their view on how well knowledge sharing was working, and to reflect on reasons why knowledge sharing is working/not working in their opinion. Eventually it also turned out that the knowledge sharing part was the one that the interviewees had the most to say about.

The positive thing was that the culture was considered relatively open, and the general view was that there is an atmosphere of trust in the organization that contributes to people wanting to share knowledge. It was seen very important that colleagues have as much information and knowledge as possible, and therefore no one felt information was withhold in any way. The work community clearly seemed to recognize the benefits of knowledge sharing, and many even stated that it eases up their own work remarkably if they share their knowledge to others.

"*We do have kind of an open sharing culture where we try to get all the information to everybody. We don't withhold information, and we want that our colleagues are up to date."*

"There's no signs of people holding on to information, or that they would intentionally restrain knowledge sharing."

"I don't believe that anybody is withholding information here."

"I think the atmosphere encourages people to share information, and I don't believe there is any fear that would prohibit people to express themselves… Everybody shares tips and hints pretty openly, which is very nice… There's no judging of new ideas, and people are very open-minded about that kind of stuff."

Despite the open culture, and the understanding of the importance of knowledge sharing, it became evident that knowledge sharing was not promoted or supported very actively in the organization. Even though some said that they had at some point in general been encouraged to share their knowledge and to express their thoughts, no one felt they would have been instructed or advised in the matter. All of the interviewees said that there had been very little or no discussion about sharing of tacit knowledge, and therefore they felt that they did not know how they should, or could, do it in an appropriate and effective way. The knowledge flow was considered good during a shift and between people that were present in the situation, and to some point also between subsequent shifts during shift handovers, but beyond that the interviewees felt in general that they did not have enough,

or good enough tools, or did not know what tools to use for sharing. Especially sharing of minor tips and hints and other experience-based knowledge was seen problematic, as they were often things that the interviewees felt were not appropriate to add in any official instructions, but that were still very useful in the everyday job. There seemed though to be a clear demand for a tool and a process that would enhance this kind of knowledge sharing on a wider range than just through personal contact.

”It [knowledge sharing] has really not been encouraged, or at least very little… There was some discussion about it in the group meetings, but really nothing more than please tell if you have some special knowledge… Often the thing is though that you don’t know what you know before the situation is at hand, and we are missing a tool or channel to share the knowledge at the time when it arises.”

”There’s really no easy channel, and it [knowledge sharing] isn’t really promoted either…Often the small tips don’t cross the threshold for sharing in the distribution channels we have available at the moment. You often come to think of those things during your shift, but they are necessarily not things you bother to do a separate [workplace] posts about.”

”…so how should I share it? It is not a big enough thing to make a workplace post, so do I pick up the phone and start calling everybody? Or do I tell the duty managers, and then it stays there as it isn’t a big thing or instruction, so they won’t post it or send e-mail either…”

”There’s no encouraging [to share knowledge], it has not been discussed…The information flows mainly between those working in a same shift and when some situation is actually on. The ones that are present in the situation get the information, but the others won’t… So, it totally depends on whether you happen to be there and hear it or not. But that is because there is no such forum that could be used for sharing of insights and some minor hints. We are short of tools to share these kinds of things on a wider scale, so that you would get these kinds of insights even though you are not present in the actual situation.”

”In my opinion sharing is not encouraged really.”

”…probably a lot of good insights and observations are lost cause there’s no rational place to put them.”

”It [knowledge sharing] has never been advised, or of course in the shift handover situations and the communication in the current situation, but not more than that”

”…specialties that are not updated in the official instructions, and stuff that is transmitted during shift handovers, is information that you can’t get anywhere later.”

”It [knowledge sharing] is often more just discussions during a shift about stuff that emerge just then, but then the information stays in that shift, and is usually not shared, even though it is apparent that somebody else would also benefit from the brainstorming that was done.”

“The knowledge and information sharing is really hard because we work in shifts, and we never really see each other than during the shift handovers… We come up with new methods and learn new things mainly during shifts, when we share information with our colleagues, but then at some point the talk stops, and the ones that happened to hear it learned it… So, it would be good if we had some place where we could put this kind of knowledge that isn’t something worth to update in the official instructions or workplace.”

”Maybe just that there’s no distinct way to share. What should be shared, where and how.”

”Nobody asks for your insights or encourages you to bring forth your ideas.”

The lack of support and instructions for sharing appeared further in the fact that sharing of tacit knowledge was also consider very unsystematic by all of the interviewees. Sharing of tips, hints and other experience-based knowledge was considered very random, and dependent of the person sharing, but sometimes also the other person’s assumed general knowledge level. Many had experienced situations where the knowledge flow was insufficient because it was assumed that the other part already had the knowledge. Some felt also that the social connections affected knowledge sharing in some cases and the knowledge flow depended on who was on the shift. Furthermore, the interviewees had no clear picture of who should be sharing knowledge, and to whom it should be shared. Many felt also insecure about sharing their knowledge directly, without approval or request from a duty manager. On the other hand, some felt that as they did not have any place to put the information, or as they were not confident that their knowledge was accurate, they shared it with a duty manager that they hoped would validate it and forward it to others. This indicated clearly that the lack of processes and support directly also blocked sharing in some cases.

“…of course, if you figure out something you tell that to others that you think might face the same problem, but you probably don’t tell it to everybody, only to those you personally think need it”

”It is probably that people don’t come to share something without prompting because they think that the others already know.”

”As I don’t really know where to put the information, or what kind of information, I would rather take it to the duty manager first.”

”We don’t have a working system to forward knowledge so that somebody would do something with it.”

”We don’t share tacit knowledge systematically. It is not clear who should share and how. It is not organized.”

The interviewees furthermore thought that the managers are not showing example in knowledge sharing. Everyone felt that colleagues were sharing their knowledge adequately, but many stated that managers could take a more active role and show a better example in knowledge sharing. The general opinion was that the bigger changes were communicated well, and the instructions were updated pretty frequently, but sharing of experience-based knowledge and smaller tips and hints was something that happened mostly between colleagues. Some felt that the duty managers did not always show respect or interest in the information people were sharing, while others felt that their information was well appreciated, but that it did still not go forward or lead to anything.

“…the information often somehow gets stuck there [at the duty managers].”

”I think my knowledge is appreciated. I have even received some recognition for it, but often the information still gets stuck there and never goes forward.”

”The duty managers do inform about things in workplace, and they do it well, but minor details, not so big changes, you more often get from your colleagues.”

”In my opinion, as the duty managers are responsible of instructions and training, it is also their responsibility to distribute it [hints] onwards.”

”The instructions are pretty well updated if there is a clear change in the ways we work, but if there is some smaller hint, more like experience based, it is not updated nor shared in any other way.”

”…If I share something to them, I would assume that they put it somewhere. It should go through them [duty managers]. I can’t go and change any instructions by myself.”

”The duty managers don’t always have a very open and receptive attitude for new ideas or information. All colleagues have a better attitude overall.”

”Well, usually it goes like that they [duty managers] note it as a good point, but then nothing happens. Not that they would not appreciate it, they do pay attention to it, but I don’t know if anything ever happens to it.”

”There’s not always a very responsive atmosphere. And sometimes they almost like keep sighing… It makes me feel like it isn’t then really worth saying about it.”

”…so when the culture is that nothing goes forward, then that is something that definitely reduces sharing of initiatives and observations.”

When the interviewees were told to think about how and why they share, or don’t share knowledge, all of them stated that the main motive for sharing was the aim to make the work as fluent as possible for the whole department. They did not necessarily think of it as helping others, but as everybody acknowledged the importance of teamwork and realized that the work performance of others had a large impact on their own performance, they wanted others to have all the available knowledge. Also, the fact that the work would be consistent, and that the processes and procedures would be unified, was considered a motive for knowledge sharing. Some recognized the motive of wanting to appear good in the eyes of colleagues and managers and getting peer recognition, but it was not seen as the most important motive, since the interviewees thought that their skills would be noticed also in other situations as the department is rather small. All interviewees generally also felt self-efficacy and believed that they have knowledge that is valuable to others in the organization.

“It’s not maybe to help others, but more that you want that everybody does right, and so it would be easier for everybody if nobody needs to correct mistakes. You want to do well, and you also want others to do well.”

”The nature of our job, the thing that we don’t do individual work but teamwork, so everything that the others do directly affects your own work, probably takes away all selfish motives not to share information. So, the first and most determinant motive to share, at least for me, is that I want everything to work as well as possible. Maybe of course also that if you share something you want to get respect and recognition from others, but that is not the main reason.”

”My foremost thought is that I just want everybody to know the things. Of course I want to help others, but that is maybe not the motive, I just want that everything gets done by the rules.”

”Well, probably you ought to think that you are somehow better when you know something special or have some skills, but if I just use it by myself and do things according to it just in my own shift, then in the end, what do I really gain from it, if nobody else knows. And of course, it is also nice to get recognition from my peers, when I tell them some tip.”

”Yes I think I probably have some knowledge that many others don’t, but it’s hard to just suddenly start shouting it out, or list it on a paper.”

”I do believe that I have valuable knowledge. Especially because I am good at questioning things and being critical.”

The interviewees were also asked to think about solutions that would improve the knowledge flow and enhance their own knowledge sharing. The ideas included mostly some new effortless, low threshold tools and procedures to share tacit knowledge, but also wishes to get some positive individual outcomes and personal recognition of sharing was mentioned. The interviewees moreover felt that if they would be encouraged to share more, it would probably enhance their sharing. Moreover, there also seemed to be call for managers more active role in gathering and sharing the employees’ tacit knowledge to the whole community.

“Maybe there should be something else than workplace. Everything just gets lost there anyway.”

”An instruction ”bible” [like in the crew control], where there would in addition to instructions, be also tips and hints. That kind of thing is missing from the operations control position.”

”The crew control instructions are updated with some specific cases, but there’s no such thing where examples would be updated in operations control.”

”…maybe some kind of document where you could write, for example like a diary, how some situation was handled. Maybe also that the duty managers would then check it and verify if it is a way that could be used also in the future.”

”Some kind of idea or case document would be good, which the duty managers would go through once a month or so, and then meetings where these cases and changes would be discussed and gone through, and information would be shared. And then if all of us are not able to attend, then there should be a proper summary, or a video recording or something like that.

”What I think would be good is that changes for example for one week would be gathered somewhere. I have missed instructions on workplace especially if I have been off for several days.”

”Maybe if there would be more time in the weekly meetings, so that there would be a possibility to discuss cases and go through information based on them. What has happened, and what problems there have been etc. More focus on the current situation, as it is not so relevant for us to know what will happen in the next month. And then clear, and more informative protocols that everybody are required to read.”

”Not that I think there should be any prize or reward [for sharing], maybe just that everybody would be more receptive.”

”One totally free and very simple way that would motivate a lot is that the managers would give you good feedback about it, or even that they would just notice it [sharing]. Then maybe I would do it again sometimes”

”…it’s maybe part of the culture, but that sharing would just simply be encouraged more…but of course we still then have the problem that there is no place to share it.”

”Maybe that people should just be encouraged more to talk about things even though they think everybody else knows. It can well be that not everybody knows. The new ones can also have knowledge that they have just gained from their training that nobody has remembered to tell the more experienced ones, or that the older ones do in some old more complicated way. The trainings have also developed, but they take for granted that the more experienced ones know.”

”I also feel that the persons that are actively sharing their knowledge should be rewarded with for example possibility to take part in special projects or something.”

4.3.2 Capturing of knowledge

The second theme of the interview was knowledge capturing, and the interviewees were asked to think about how well the organization captures knowledge and how well the organization knows the existing knowledge level.

The interviewees felt in general that the organization does not capture evolving knowledge actively, and also that the managers don’t really know what kind of knowledge the employees have or what kind of knowledge they would need. Many mentioned that they believe that the duty managers know people’s strengths and weaknesses, even though they probably don’t know the specifics. All of the interviewees felt though that there was a pretty good understanding about everyone’s knowledge level among colleagues.

“Nobody is in fact very interested. Experience-based knowledge, or knowledge of how something was handled, is not collected or captured.”

”Nobody has really ever asked about my knowledge, or tips and hints that I might have. Only colleagues have been asking during shifts. But nobody on behalf of the company.”

”…somehow it feels that there is always talk about how for example somebody’s past experiences are useful in this and that, but then nobody has really thought it through, and it is actually not really captured in any way.”

”I’ve been told that new ideas are welcome, but knowledge is not in any way pro-actively captured or collected…”

”…there hasn’t been any active or systematic way to get the knowledge to stay in the organization”

”…often it feels that we employees know better what everybody are good at, or what their strengths and weaknesses are. It comes from working together, and even though the duty managers are also here among us, they don’t pay attention to in that way. I mean if I would ask my boss what I have succeeded in or managed especially well, she would probably not be able to answer.”

”The organization does not know what people know, or what knowledge they would need, or how well they recall things they have learned a long time ago”

”On some level I think the assumption is that people know more than they do, and the company assumes that all the nuances are clear for everyone, and then they think this kind of knowledge is not needed.”

”They are not up to date about what someone might not know, or if somebody has different working methods. They probably know the style in general though.”

”They just look that this kind of thing has been handled, but I don’t think they know, and they don’t ask, how it was handled, as this is a job that can be done in many different styles.”

”…they are not really asking. Of course we tell them if there’s something special, but there is never any debrief or anything. They are usually only interested if there were some consequences like delays.”

In addition, the interview also revealed that the employees felt that there was lack of consensus among the duty managers what knowledge is important and relevant and what is more on nice to know level, which of course was seen to lead to problems in knowledge capturing as the important information was not always recognized.

“We have three very different duty managers, so it depends a lot on who is on duty. If the thing is somehow important to that duty manager in person, then he might be interested… Nevertheless, I don’t think it goes anywhere, not to any data bank anyway. It is not systematically captured.”

”It feels that not even the duty managers have a clear picture of what the main task at our department are, in a way that what knowledge is actually important, and what is not. They often disagree about that.”

”The duty managers often have divergent views about what we should know and what skills we should possess. There are clear differences in the opinions about what is necessary and essential.”

When the interviewees were asked to think about ways to capture knowledge and to recognize the relevant knowledge, but also to identify the knowledge needs, almost all of them mentioned debriefing and feedback as tools that would help them to capture the relevant knowledge themselves, but also help them to share the relevant knowledge for the company to capture it. Furthermore, brainstorming sessions about different cases was mentioned as a preferred tool that would make the existing tacit knowledge more visible and easier to capture for both colleagues and the organization. Also simply trying to share the experience-based knowledge more to duty managers who should gather and capture the information for future use was highlighted. The interviewees felt that a good way for duty managers to capture knowledge, and also to identify knowledge needs, would be that they work together in operative shifts systematically with each and every one, and that they during their duty manager shifts pay more attention to the operative activity.

“We have done that with colleagues that when a case is over, we revise it and think about what we could have done better. I think it has been extremely useful. That is when you benefit the most of it when you go through why some way is better than the other, especially if you haven’t been present yourself but hear about it afterwards.”

”…getting feedback is minimal here, and that is something that should definitely be invested in…especially when you are new you really don’t know if you are doing fine or if you are just screwing up.”

”Nobody has ever told me if I am doing good or not. Nobody really talks about it if you don’t go and talk about it yourself. They should come to you and go through the situation, and give you feedback, and advice and tips how to possibly do better in the future. These would be situations that could give you a lot.”

”It would sometimes be nice to know what everybody else thought about the situation. For example, what did [stakeholders] think…I have asked a couple of times but have never got any clear answer.”

”I think it would be nice to analyze situations and to ponder on what could have been done better, but the duty managers have not been very eager to participate in that…”

”…experience-based knowledge would probably be easiest to recognize in some kind of debriefings.”

”We should just somehow get that information more efficiently to the duty mangers that should register it and put the tips and hints somewhere so they would be available for everybody.”

”It would be good if the duty managers would collect it, as they have then the possibility to share it to everyone”

”I think that if duty managers would follow the operative work a bit more, how we work, and how we handle situations, they would easily find things that could be highlighted”

”A way to get information about our real knowledge needs is that the duty managers would work with us. That would be a good opportunity to see what things are unclear, and what things somebody is very good at. I don’t know if anybody has thought about it that they would regularly work with each and everyone.”

4.3.3 Processing of knowledge

The third and the last theme of the interview was knowledge processing. The interviewees were asked to talk about how they process and internalize knowledge and new information, and how that could be improved or eased.

The interviewees seemed to agree that processing the information often needs practice before it is really assimilated, and therefore a lot of information is often just first glanced through and processed only when the actual situation requires the use of the information. All of the interviewees told that they usually first just scroll through the headlines and delve into the information only when the situation is in hand. This was done because many felt it was also hard to process, or hard to remember the information without actual example cases or possibility to experiment. Many also mentioned the lack of time to process the information without distraction as a reason. There was also discussion about not always having even time to glance through the information not to mention process it. It was also though recognized that this is not necessarily the best way and that it would be more efficient to internalize the knowledge before the real situation. Some of the interviewees also mentioned information overload and the amount of non-targeted information as a hinder for effective knowledge processing.

“We often have a lot of theoretical things to read, and if you don’t have anything to apply it to then it isn’t really natural. That’s why I usually look at them only when I actually face the problem in reality.”

”I first only look what the information is related to… when the situation comes to me in real life then I’ll read it through and process it, and maybe I’ll remember after that.”

”When there’s really busy days, it can very well be that I miss the information, let alone that I would be able to process it in that chaos.”

”There is actually not really much time for it [processing]… It feels that it is always depending on whether there by chance is a quiet moment so that I have time to really have a look at it.”

”When I am on duty, I feel that my focus is on the job and the current situation, and I don’t feel that I am able to delve into new instructions when I need to be alert and stay focused on the present situation.”

”Actually, in our job you aren’t able to process the information right away. If you see some new information, then there’s always something interrupting you. I usually just try to register that there is something new about this, and then I read it more carefully when the situation is in hand. It would though be much more efficient to go through these before they hit you, so that you don’t need to start learning them at that point.”

”When you come to your shift you should always immediately go through the new things, but it is quite challenging. Now with corona [the COVID-19 situation] there has been time to do so, but when the normal traffic is back, then there is no time.”

”The assumption is always that I do everything during the shift along with the actual work. If I want to learn something, or process some information or some situation, it is possible only on the side of the everyday job.”

”If you think about the time when there was a lot of traffic [before COVID-19] then maybe the information overload was the most challenging thing. Information comes in from every direction, and it is not targeted in any way”

The interviewees also talked a lot about not having a possibility to process the information as they were often simply losing the information, and not noticing the shared information, because of the functionality of the systems and lack of time and monitoring. This indicated that it was not just the information processing that was not given time and attention, but also the basic information handling seemed to be partly neglected. The interviewees told that there were no clear processes for ensuring that everybody has received the information.

“Nobody really checks if I have noticed or read the instructions.”

”Nobody keeps track of it [if I get the new information]. The only thing is that colleagues then point out if I am doing wrong… Of course, I check workplace, but if there is a rush when I start my shift, things will get lost there and I don’t catch them.”

”They assume that if there is a new workplace post everybody sees it and processes it right away, but mostly nobody keeps track of if this really happens.”

”…there should be some kind of follow up, then it would be noticed if somebody has missed some new information.”

”When the traffic gets back to normal there won’t again be time or suitable moments, and if I don’t see it then, it is easily lost in the feeds.”

”I don’t think there is a need for actual follow up. It is part of your job to stay up to date, but the problem is that there is no time, and then you don’t know what information is updated and where. I would rather fix the system so that the information would be somehow more reasonably assembled. Even just the headlines.”

When the interviewees were asked to think over what kind of things would help them to process and internalize the information better, almost all mentioned examples, linkage to real cases, and test possibilities as good ways to process new knowledge. Also targeting and filtering was mentioned, as some felt the relevance of the knowledge highly contributed to the motivation to process and assimilate new knowledge. Furthermore, the interviewees also talked about diverse sense-making as a good tool to help process and accept new knowledge. Giving meaning to the information by explaining why it is beneficial, and how it is linked with the bigger picture, was seen useful. Some interviewees also considered that the possibility to be involved in creating new knowledge and new processes could speed up internalizing of them. What was furthermore obvious from the previous answers was that handling and processing should be given some time, as it is not always possible during the shifts.

”Examples are maybe most effective.”

”There could be some examples or a blueprint or something”

”…I am able to digest the information only when I have the possibility to use it. So, some exercises would be good, or some possibility for testing.”

”Maybe if it would be possible to click around and test it in a peaceful environment…”

”A test environment would of course be brilliant, so that you would be able to try it yourself.”

”When we get new information my question is often, what are the situations when this could happen, or what can lead to this happening”

”Sometimes it remains a bit unclear who will benefit from the changes, at least not us. So, if they would be better linked with a bigger picture, and maybe if it would be explained how they affect other people.”

”For many it might be that they would want to participate more. The information would be better adopted if their opinion would have been heard. Not so that things are just decided, even though people would have had a lot of ideas about the subject.”

4.4 Summary of the findings

The findings from the document analysis revealed that the processes and task of the Airline X OCC are to some point inconsistently identified and defined. Some of the processes are clearly determined and described, while some are identified but not defined, and some are totally unidentified, or not classified as processes. The same applied to the tasks related to the processes. Some of the tasks were well identified and the actions needed to carry out the process were described, while other tasks were not mentioned at all. As the process and tasks were inconsistently defined, also the recognition of the cognitive needs for these processes and tasks was incomplete. The instructions that provided supporting information were often not systematic in neither form or content, and only few of them were linked with the processes and tasks. What therefore became evident from this comparison was that even though the processes and task had been given some consideration, the actual information and knowledge needs had not been systematically recognized. The analysis revealed though that it mainly made a difference in this whether the process had an appointed responsible person or not. The processes that had an appointed responsible person had better and more up to date instructions available, which points to better identified knowledge needs. These tasks were also developed and revised more frequently, which points to better identified workflows. The analysis furthermore displayed that the communication methods were well identified, but also these processes and practices were inconsistently acknowledged and defined. The communication methods were not properly linked with the general work processes, and even though some of the communication practices were well described, the use of the methods remained disconnected from the entity.

The analysis of the strengths and weaknesses regarding the usability of the sources, revealed that the official company-controlled documents (that also had appointed responsible persons) had better detectability, findability, and less risk for errors, while the uncontrolled ones (usually no appointed responsible person) were clearly more targeted, had better timeliness, and were also often more interactive. What comes to the usability of the knowledge repositories and distribution channels, the findings showed that many of the systems had weak findability and only few of them were interactive or individualizable. What became evident also regarding the repositories and distribution channels was that the tools that provided more general information had mainly a better structure and logic than the ones providing targeted information for OCC. In general, also the analysis of the knowledge sources, repositories, and distribution channels disclosed a lot of inconsistency. Some knowledge sources, repositories, and distribution channels were identified, but a lot of information sources and distribution channels were not acknowledged, or they were for example listed only as communication methods even though they were used also as repositories and distribution channels. What the analysis also revealed in general was that there is actually a very large amount of different knowledge sources, repositories, and distribution channels in use at Airline X OCC that can be considered as knowledge support, but that are not considered to be very suitable for OCC needs.

The findings from the document analysis were verified by the focus group discussion that summarized the most critical points regarding the management of the explicit knowledge. The group concluded that the large number of insufficient repositories and distribution channels is the most critical issue. The usability of the existing repositories and distribution channels was not seen sufficient for OCC. In addition to this issue that was seen to affect both findability and detectability, but also efficiency and satisfaction, the group named though also incoherent content and structure of the sources as a critical factor that should be addressed. This was basically considered to be a result of the incoherent process and task descriptions and weak or delayed identification of actual knowledge needs connected with these. Furthermore, the knowledge management processes, like unsystematic updating practices and inconsistent publication practices, were also considered critical, as they were seen to be closely linked with the error factor.

Finally, the interviews that concentrated more on the tacit knowledge and the knowledge culture, revealed that in addition to the problems with the explicit knowledge, there is

also some factors in the culture that would require attention so that the knowledge management would work ideally, and so that the knowledge would really be utilized in the best possible way. In general, the findings implied that there is an open culture, and an atmosphere of trust were everyone realizes the advantages of knowledge sharing and feel relatively comfortable sharing their knowledge. Therefore, socialization of knowledge (tacit to tacit) seemed to be working quite well, especially between colleagues in the same shift, even though it had not been specifically encouraged in the organization. The problems that were identified mostly concerned knowledge flow throughout the work community, to those who are not present in the situation. This seemed to be mostly because there was no clear processes or tools to make this knowledge explicit so it could be shared in other than personal contact. The same problem could in general be seen in the capturing of knowledge. The interviews revealed that externalization of knowledge (tacit to explicit) was seen insufficient. Tacit knowledge was considered often not articulated well enough, and it seemed that it is not systematically turned into explicit form. Moreover, the findings also indicated that the combination of knowledge (explicit to explicit) was deficient, which further lead, together with lack of time, to insufficient internalization of knowledge (explicit to tacit). The provided knowledge was not always linked with a bigger picture, nor presented with examples or possibility to test, which affected internalization negatively. All in all, the findings from the interviews also indicated a clear need for more time, more support and encouragement, and a more active role of the managers regarding the knowledge management processes in general.

5 Discussion and recommendations

The background information and the findings from the research indicate that knowledge management and knowledge support is something that has not been systematically considered in the organization so far. Knowledge seems to be handled inconsistently and supported in an unstructured way, which leads to occasional lack of relevant knowledge among the staff at the department. The findings imply that some of the company wide knowledge management and knowledge supporting structures and processes are defined, but especially the Airline X OCC departments own internal and targeted knowledge management and support processes seem to have been left without systematic frameworks.

5.1 Conclusions and development ideas

The findings of the research imply that both the work processes and the work tasks, as well as the knowledge management and knowledge support processes and responsible persons are not clearly defined, which leads to the fact that recognizing and capturing of relevant knowledge is hard, and especially validating, combining, organizing, storing and presenting, as well as sharing, that are all fundamental steps of knowledge management (see chapter 2.2.1) have become disconnected activities without a systematic structure. Additionally, when it comes to knowledge supporting, also the jungle of knowledge sources and technological solutions for storing and sharing of knowledge seem to be critical. Ultimately also this can though be considered to be related with the unclear knowledge management processes behind it.

The department has an impressive number of knowledge management and knowledge support tools available, but as the basic work processes, work tasks and related knowledge and communication needs are not aligned, the tools are able to provide only unstructured, illogical information in an unstructured and illogical way. When the underlying knowledge management processes are furthermore not clear, it is hard to use the available tools consistently and effectively. In addition, the knowledge management and updating do in large part not have clearly defined responsible persons. It seems that so far, the knowledge management and knowledge support problems have been addressed by creating more and more random technological tools and solutions, while the underlying reasons for the problems have been left with less attention. Often this kind of scattered solution is what happens when the underlying constructions have not been given the needed attention (see chapter 2.3.2). At the moment there is so many sources, repositories, and distribution channels in use, that instead of making knowledge management and knowledge support easier, they in fact seem to make it more complicated. Furthermore, many of the tools and solutions have some good elements that can be considered helpful

in both knowledge management and knowledge support, but none of them can be seen as a comprehensive unified tool that would have good usability from the Airline X OCC's point of view. To be able to create a well working knowledge support the baseline should always be the actual user (see chapter 2.3.1) but the findings clearly imply that this has not been the case from the Airline X OCC point of view. The different aspects of usability have not been sufficiently considered, or they have been considered for a too wide user group, so that they don't fit the specific needs of the OCC department, even though they would be sufficient for some other department.

To solve the knowledge support problems, both the work processes and tasks, as well as the knowledge management processes, and responsible persons should be first clearly defined and also clearly stated and communicated to the whole organization. When these basic processes and responsibilities are clear it is then usually also easier to develop a working knowledge support (see chapter 2.3.2). The communication and information flows should also be considered together with the processes to be able to understand how, where, and what kind of information flows there are within the processes, and how these could be utilized more effectively and more coherently. Furthermore, the knowledge needs linked with the processes should be analyzed in detail. After that a best suitable technological solution, that would specifically meet the needs of Airline X OCC, should be chosen for both storing and distribution, so that the way to both share knowledge and to find accurate knowledge, would be fast and easy through one single channel. Especially the findability and detectability should be emphasized when choosing the solution, as they seem to be the most critical points that widely affect also other aspects like efficiency and satisfaction. Furthermore, the interactivity should be considered as that could support and encourage knowledge sharing and give the possibility to share tips and hints more effectively, while it could at the same time give the company an opportunity to capture the employees' tacit knowledge, and to understand their knowledge needs better. Moreover, the structure and content of the current knowledge sources should be unified and matched with the defined processes and tasks and made available through the chosen technological solution in a way that would support targetability and memorability of the information. Finally, also the maintenance of the information, publishing, updating, and deleting, should be given some special attention as that is according to the findings also a critical factor that has a big impact on errors and timeliness. If the maintenance requires too much work, or involves too much hierarchy, especially the minor changes and updates are often neglected, which seriously harms the credibility and can lead to a situation where new working methods are used but not documented (see chapter 2.3.2). It is additionally good to remember that knowledge support is never ready, instead

it develops and takes shape as new information and knowledge comes in from the operational environment. Therefore, it is though not enough to just concentrate on the updating procedures, also the collecting and handling of feedback should be considered, as it is according to the findings not working ideally at the moment. It would be highly important that new ideas and proposals would be clearly noted and handled promptly. The persons that have given the feedback should also be kept up-to date about the situation of their ideas, otherwise they easily lose motivation to share their insights, which in turn affects the whole knowledge management infrastructure negatively. In general, it is worth to note though that as the findings of this study reveal aspects mainly from the end user (employee) point of view, there will most certainly be also other aspects to consider. In the actual development it will be essential to furthermore consider more closely at least the administrator (manager) perspective, which can include some additional factors especially regarding the maintenance, publishing, updating, and deleting.

The findings furthermore imply that the lack of clear knowledge management processes is the factor that also has an effect on the knowledge culture at Airline X OCC. Especially regarding the knowledge sharing culture, it seems though clear that it is also affected by the tools and technological solutions, that are considered inappropriate. In general people seem though to understand the importance of knowledge, and they also seem to be motivated to share knowledge. In addition, the culture seems to support knowledge sharing, but as the tools, processes, and the responsibilities for sharing, are unclear and undefined, sharing is confined. Moreover, as knowledge creation and knowledge sharing are not especially encouraged, it is not done as systematically as it should. As it is now, sharing of tacit knowledge through socialization seems good, which is positive, but to some degree rather insufficient in an organization were people due to shift work seldomly have enough time to socialize with their colleagues. Therefore, the process of externalization of knowledge, which can be seen as a good tool for knowledge capturing (see chapter 2.2.2), should be better defined and encouraged, so that the people would know what kind of sharing is expected of them, to whom they should share, and how they should share it to make it available as widely as possible. This could make the knowledge flow more systematic and moreover help to make the large amount of tacit knowledge explicit, and therefore possible to capture and store for further use. The concrete actions to externalize and capture this knowledge could for example be systematic debriefings, and simply giving and receiving feedback in a more systematic way. This is something that should be given some closer thought as sharing and capturing are also generally considered the most important knowledge management processes (see chapter 2.2.1). Also, the internalization of knowledge should be defined better, as now it seems that it has been widely dis-

regarded. As it is, internalization and processing of knowledge seem to be solely the employees own responsibility, even though making it a clear process, and giving it time and tools, it would not just enhance learning, ensure employing and applying of knowledge, but also generate evaluation of knowledge and creation of new knowledge based on it.

In addition to defining the processes the knowledge culture could be improved also by making the knowledge management concept as a whole more visible by underlining the importance of it. The company should highlight the importance of everyone's personal contribution and show more interest in the knowledge reserves that the employees hold. Knowledge sharing should be encouraged and acknowledged, and the management should take a more active role in both showing good example themselves, but also in giving positive feedback and recognition regarding active knowledge sharing. If feedback and ideas are not handled properly it harms the culture, but it also harms the credibility of the knowledge support (see chapter 2.3.2). For example, actively capturing, collecting, and collectively sharing the employees' tacit knowledge would not just provide more explicit knowledge for the company, but also give a positive signal, and further encourage the employees to create and share knowledge more actively. For example, follow up on handled cases, case-based team meetings, and brainstorming sessions could be handy tools to get in touch with the employees' tacit knowledge. Employing the knowledge in everyday activities and harnessing it to broader use by making it explicit in instructions, could in turn be beneficial in motivating people to share more. Moreover, to ensures efficient, consistent, and high-quality performance also effective processing of knowledge should be promoted. Allocating time for handling and processing of knowledge would be essential, but also providing support, for example tools like examples, test cases, and clear reasoning and meaning, could improve processing of the shared knowledge significantly. This in turn would enhance the conversion of data and information into knowledge and understanding. Eventually it is though especially the processed knowledge, the understanding and wisdom, that is the real organizational asset that can't be replicated (see chapter 2.1).

All in all, what can be concluded from research is that even though the most visible problems at Airline X OCC are linked with the explicit knowledge and the availability and findability of it in the current sources and repositories, there seem to also be some underlying reasons that need addressing. To be able to develop a well working knowledge support that would make the knowledge better available, easier to find, and more efficiently shared, the whole knowledge management process behind it would require some attention. The results imply a need for a more suitable technological solution, but they also clearly indicate a need for coherent processes and practices. Furthermore, the results also reveal a need to more carefully consider the tacit knowledge, and the complex social

systems and the culture connected with it. The conclusion of this research is therefore that Airline X OCC should start the development of knowledge management and knowledge support by creating a new technological “data lake” suitable for OCC needs, but also by clarifying the work processes, task, and the related knowledge needs, and by clearly defining the whole process of knowledge handling. In addition, special attention should be given to how knowledge is acknowledged and valued in general. Understanding the importance of knowledge is on a good level, but concrete actions that would show more clearly that knowledge is appreciated should be considered.

5.2 Reflections on the research process and the credibility of the study

Reliability and validity, as well as generalizability are concepts that are typically used to evaluate the quality of a research and to demonstrate rigor. In the broad concept validity can be explained as the “integrity and application of methods, and the precision in which the findings accurately reflect the data” while reliability is the “consistency within the employed analytical procedures”. Generalizability is moreover explained as “the transferability of the findings to other settings and contexts”. (Noble & Smith 2015, 34) There is though a lot of debate about whether these terms are appropriate in qualitative research, or only applicable for quantitative studies. There is mutual understanding that it is essential to examinate the credibility also in qualitative studies, but many scholars propose that different terms are used. For example, Guba & Lincoln have already in the 80’s (in Morse, Barrett, Mayan, Olson & Spiers 2002, 14) presented trustworthiness as a parallel concept for reliability and validity, and also Seale (1999, in Golafshani 2003, 601) states that reliability and validity is actually about trustworthiness in qualitative studies. These differences in terms became evident also when assessing the credibility and quality of this study. As this study is qualitative in nature it felt challenging to use the terms’ reliability and validity that could not be statistically measured, and therefore other terms were applied. To demonstrate rigor in this study, and to assess the factors that could have had an effect on the trustworthiness of this study, especially the truth value, but also the consistency/neutrality and applicability are discussed further. These are also the factors that Guba & Lincoln (1981, in Morse & al. 2002, 15) state that all research must have if they are to be considered beneficial.

What comes to the truth value of the findings in this study, the first and most apparent thing that could have influenced it, is the fact that the researcher is part of the studied organization and the target department. As the researcher works at the department, she has been facing the problems that were the starting point in this study, in person, and might have had some presumptions about them, but also some own opinions regarding the

ways to solve them. This could have easily led to researcher bias where the researchers own hypotheses about the studied phenomenon would have affected for example the wording of the questions, or the interpretation of the answers. The risk of researcher bias was though acknowledged all the way from the start and could therefore be minimized by consciously trying to avoid it during the data collection and analysis processes. The questions were strictly based on the theoretical framework, and for example the interviews were conducted so that they were more like discussions that moved forward based on the sayings of the interviewees, rather than the questions made by the researcher. During the document analysis the focus was also mostly kept on the information that the documents directly provided, even though the researcher would have had some deeper outlook about the things based on reality. Researcher bias, as well as methodological bias was additionally minimized by using several data collection methods. Several methods furthermore added trustworthiness by giving a more comprehensive set of findings that could then easily be compared to ensure that different perspectives were acknowledged.

In addition to avoiding biases the truth value was also enhanced by providing a lot of concrete examples from the collected data. This was done to make the findings as transparent as possible, and to let the reader make judgements about whether the interpretations are true to the original data, and clearly and accurately present participants' perspectives. Concrete examples were used in reporting of both the document analysis and the interviews. Moreover, the representativeness of the findings in relation to the studied phenomena was considered. For example, the extent of the document analysis could have been limited to only OCC's own sources and repositories, that would possibly have given more specific results about the flaws in them, but on the other hand, as OCC uses a lot of company wide information, it would not have revealed the problems that the department is facing regarding these other sources. Furthermore, the representativeness was also considered in the selection of focus group members as well as the interview respondents. The focus group members were not randomly selected as it was in this case seen more important that they were interested in the subject and willing to delve into it and carefully weigh different options. This also minimized the acquiescence bias, i.e., the tendency to agree with, or be positive about whatever is proposed, which could have occurred in verifying results if the respondents were not interested enough in the subject. The focus group furthermore involved, in addition to employees, also two of the department's duty managers, to ensure that also they would have a chance to comment. The interviewees were then on the other hand selected randomly as the aim was to get data that would represent as accurately as possible the whole departments perceptions, and not just the specialist's opinions. The interviewees were all OCC employees though, which lead to a narrower view about the knowledge culture than what could have been accomplished if also the

managers would have been interviewed. The managers would probably have contributed with different aspects to the problems and enriched the findings. With the resources available for this study, it was though a conscious choice to concentrate on the employees' point of view, as the aim of the study was to find development ideas that would support especially them in their work. This choice was not seen to affect the credibility of the findings, but rather only to delimit the amount and scope of the findings.

The consistency of this study was enhanced by trying to achieve auditability through transparent and clear description about the research process. The research methods and the data collection processes were for this reason justified and rigorously explained to make sure that the researcher's decisions are apparent to the reader. Furthermore, the applicability of this study was considered. As this was a case study about a specific organization, the aim was not to get generalizable results that could be transferred to other units or other settings, but instead to get results that are specific and therefore meaningful to the target organization. In general, as the research can be seen credible and the results are not contradictory, they should also be applicable for the organization. The aim was though to start the development of knowledge management and knowledge support with this study, but as this research process was prolonged, the company started the process already before the results from this study were published. It could be argued that this reduced the need for this study and affected the applicability, but in reality, as this research looked at the departments knowledge management from a much wider perspective than what had been considered so far, it still succeeded in providing applicable results. The results seem to, not just support the already planned actions, but also to provide substantial depth to the subject for further planning. Moreover, the results also bring forth new aspects and ideas that haven't been considered.

All in all, the research can be seen successful as it managed to answer the research questions, as it can based on the above be considered to have good credibility, and as it also managed to provide applicable results for the target organization.

References

Airline X 2020a. Operations Manual Part A. Intranet. Company Library. Manuals. Accessed: 26 April 2021.

Airline X 2020b. Operations Control Manual. Intranet. Company Library. Manuals. Accessed: 26 April 2021.

Airline X 2020c. Document Management Manual. Intranet. Company Library. Manuals. Accessed: 26 April 2021.

Bhatt, G.D. 2001. Knowledge management in organizations: examining the interaction between technologies, techniques, and people. Journal of Knowledge Management, 5, 1, pp. 68-75. URL: https://doi-org.ezproxy.haaga-helia.fi/10.1108/13673270110384419. Accessed: 4 January 2021.

Bowen, G. 2009. Document Analysis as a Qualitative research Method. Qualitative Research Journal, 9, 2, pp. 27-40. URL: https://doi.org/10.3316/QRJ0902027. Accessed: 15 April 2021.

Bran, Livia. 2019. Creating a knowledge-sharing culture: six top tips on building and sustaining it. Development and Learning in Organizations, 33, 5, pp. 1-3. URL: https://www-emerald-com.ezproxy.haaga-helia.fi/insight/content/doi/10.1108/DLO-11-2018-0151/full/html. Accessed: 4 January 2021.

Coghlan, D. & Brydon-Miller, M. 2014. Focus Groups. The SAGE encyclopedia of action research, 1-2. London. SAGE Publications Ltd. URL: https://methods.sagepub.com/reference/encyclopedia-of-action-research/n132.xml. Accessed: 20 February 2021.

Douven, I. 2017. Abduction. The Stanford Encyclopedia of Philosophy. Summer 2017 Edition. URL: https://plato.stanford.edu/entries/abduction/. Accessed: 7 April 2021.

Edvardsson, I.R., Durst, S. 2013. The Benefits of Knowledge Management in Small and Medium-sized Enterprises. Procedia – Social and Behavioral Sciences, 81, pp. 351-354. URL: https://www.sciencedirect.com/science/article/pii/S1877042813015085. Accessed: 6 March 2021.

Finto 2018. Tietotermit. Tietojohtaminen. URL: https://finto.fi/tt/fi/page/t9. Accessed: 22 October 2021.

Flick, U. 2007. What is qualitative research? In Designing qualitative research, pp. 2-15. SAGE Publications, Ltd. URL: https://www-doi-org.ezproxy.haaga-helia.fi/10.4135/9781849208826. Accessed: 5 April 2021.

Frey, B. 2018a. Focus Groups. The SAGE encyclopedia of educational research, measurement, and evaluation, 1-4. SAGE Publications, Inc. Thousand Oaks, CA. URL: https://dx-doi-org.ezproxy.haaga-helia.fi/10.4135/9781506326139.n270. Accessed: 20 February 2021.

Frey, B. 2018b. Content Analysis. The SAGE encyclopedia of educational research, measurement, and evaluation, 1-4. SAGE Publications Inc. Thousand Oaks, CA. URL: https://methods.sagepub.com/reference/the-sage-encyclopedia-of-educational-research-measurement-and-evaluation/i9299.xml. Accessed: 20 February 2021.

Garfield, S. 11 August 2014. 15 Knowledge Management Benefits. LinkedIn. URL: https://www.linkedin.com/pulse/20140811204044-2500783-15-knowledge-management-benefits. Accessed: 6 March 2021.

Girard, J.P. & Girard, J. 2015. Defining knowledge management: Toward an applied compendium. Online Journal of Applied Knowledge Management, 3, 1, pp. 1-20. URL: https://www.iiakm.org/ojakm/articles/2015/volume3_1/OJAKM_Volume3_1pp1-20.pdf. Accessed: 4 January 2021.

Golafshani, N. 2003. Understanding Reliability and Validity in Qualitative research. The Qualitative Report, 8, 4, pp. 597-606. URL: https://core.ac.uk/download/pdf/51087041.pdf. Accessed: 05 October 2021.

Gorman, M.E. 2002. Types of Knowledge and Their Roles in Technology Transfer. Journal of Technology Transfer, 27, 3, pp. 219-231. URL: https://search-proquest-com.ezproxy.haaga-helia.fi/docview/203604190?pq-origsite=primo. Accessed: 4 January 2021.

Hansen, M.T., Nohria, N. & Tierney, T.J. 1999. What's Your Strategy for Managing Knowledge? Harvard Business Review, March-April. URL: https://hbr.org/1999/03/whats-your-strategy-for-managing-knowledge. Accessed: 4 January 2021.

Hirsijärvi, S. & Hurme, H. 2001. Tutkimushaastattelut. Teemahaastattelun teoria ja käytäntö. Yliopistopaino. Helsinki.

Hyvärinen, M., Suoninen, E., Vuori, J. 2021. Haastattelut. In Vuori, J. Laadullisen tutkimuksen verkkokäsikirja. Yhteiskuntatieteellinen tietoarkisto. Tampere. URL: https://www.fsd.tuni.fi/fi/palvelut/menetelmaopetus/kvali/laadullisen-tutkimuksen-aineistot/haastattelut/. Accessed: 7 April 2021.

Jalonen, H. 2015. Tiedolla johtamisen näyttämö ja kulissit. In Virtanen, P., Stenvall, J. & Rannisto, P.H. Tiedolla johtaminen – Teoriaa ja käytäntöjä, pp. 40–68. Tampereen yliopistopaino Oy. Tampere. URL: https://www.researchgate.net/publication/275329037_Tiedolla_johtamisen_nayttamo_ja_kulissit. Accessed: 4 January 2021.

Juhila, K. 2021. Laadullisen tutkimuksen ominaispiirteet. In Vuori, J. Laadullisen tutkimuksen verkkokäsikirja. Yhteiskuntatieteellinen tietoarkisto. Tampere.

Kaario, K. & Peltola, T. 2008. Tiedonhallinta: avain tietotyön tuottavuuteen. Docendo. Helsinki.

Kananen, J. 2017. Laadullinen tutkimus pro graduna ja opinnäytetyönä. Jyväskylän ammattikorkeakoulu. Jyväskylä.

Karadsheh, L., Mansour, E., Alhawari, S., Azar, G. & El-Bathy, N. 2009. A Theoretical Framework for Knowledge management Process: Towards Improving Knowledge Performance. Communications of the IBIMA, 7, pp. 67-79. URL: https://ibimapublishing.com/articles/CIBIMA/2009/423360/423360.pdf. Accessed: 4 January 2021.

Kasvi, J.J.J. 2003. Knowledge Support in Learning Operative Organisations. Doctoral dissertation. Helsinki University of Technology. Department of Industrial Engineering and Management. Helsinki. URL: https://aaltodoc.aalto.fi/handle/123456789/2040. Accessed: 4 January 2021.

Kasvi, J.J.J., Vartiainen M. & Pulkkis, A. 2000a. Tieto työn tukena. In Kasvi, J.J.J. & Vartiainen, M. Organisaation muisti: tieto työn tukena, pp. 22-48. Oy Edita Ab. Helsinki.

Kasvi, J.J.J., Vartiainen M. & Pulkkis, A. 2000b. Ohjeita ja suuntaviivoja. In Kasvi, J.J.J. & Vartiainen, M. Organisaation muisti: tieto työn tukena, pp. 151-164. Oy Edita Ab. Helsinki.

Kasvi, J.J.J., Pulkkis, A. & Vartiainen M. 2000. Tietotuen arvot. In Kasvi, J.J.J. & Vartiainen, M. Organisaation muisti: tieto työn tukena, pp. 108-125. Oy Edita Ab. Helsinki.

Kasvi, J.J.J., Vartiainen M. & Nieminen, M. 2000. Joustavuutta osaamisesta. In Kasvi, J.J.J. & Vartiainen, M. Organisaation muisti: tieto työn tukena, pp. 126-135. Oy Edita Ab. Helsinki.

Koppa 2010. Tutkimusprosessi. URL: https://koppa.jyu.fi/avoimet/hum/menetelmapolkuja/tutkimusprosessi. Accessed 2 April 2021.

Koppa 2015a. Menetelmäpolku. URL: https://koppa.jyu.fi/avoimet/hum/menetelmapolkuja/menetelmapolku. Accessed: 5 April 2021.

Kulha, T. 2015. Työkaluja tiedon parempaan johtamiseen. Tietoasiantuntija, 2-3, pp.11-12. URL: https://www.tietojohtaminen.com/sites/default/files/tietoasiantuntija_2_3_2015.pdf. Accessed: 6 March 2021.

Laihonen, H., Hannula, M., Helander, N., Ilvonen, I., Jussila, J., Kukko, M., Kärkkäinen, H., Lönnqvist, A., Myllärniemi, J., Pekkola, S., Virtanen, P., Vuori, V., Yliniemi, T. 2013. Tietojohtaminen. Tampereen teknillinen yliopisto. Tiedonhallinnan ja logistiikan laitos. Tampere. URL: https://www.researchgate.net/publication/268630718_Tietojohtaminen. Accessed: 6 March 2021.

Lin, H.F. 2007. Effects of extrinsic and intrinsic motivation on employee knowledge sharing intentions. Journal of Information Science, 33, 2, pp. 135-149. URL: https://doi-org.ezproxy.haaga-helia.fi/10.1177/0165551506068174. Accessed 4 January 2021.

Lindén, J. 2015. Tiedonhallinta & yrityksen menestys. Netera Consulting. Lempäälä. URL: https://docplayer.fi/2710362-Tiedonhallinta-yrityksen-menestys-uusi-painos-jukka-linden-yrityksen-tulos-syntyy-prosesseista-tiedonhallinta-on-prosessien-tarkein-voiteluaine.html. Accessed: 4 January 2021.

Lindvall, M., Rus, I., Sinha, S. 2003. Software systems support for knowledge management. Journal of Knowledge Management, 7, 5, pp. 137-150. URL: https://doi-org.ezproxy.haaga-helia.fi/10.1108/13673270310505449. Accessed: 4 January 2021.

Mazorodze, A.H., & Buckley, S. 2019. Knowledge management in knowledge-intensive organisations: Understanding its benefits, processes, infrastructure and barriers. South African Journal of Information Management, 21,1, pp. 1-6. URL: https://sajim.co.za/index.php/sajim/article/view/990/1408. Accessed: 4 January 2021.

M-Files 2019. The 2019 Intelligent Information Management Benchmark Report. URL: https://resources.m-files.com/featured-content/2019-intelligent-information-management-benchmark#main-content. Accessed: 7 April 2021.

Morse, J.M., Barrett, M., Mayan, M., Olson, K. & Spiers, J. 2002. Verification Strategies for Establishing Reliability and validity in Qualitative Research. International Journal of Qualitative Methods, 1, 2, pp. 13-22. URL: https://doi.org/10.1177/160940690200100202. Accessed: 05 October 2021.

Nielsen, J. 1993. Usability Engineering. Academic Press. San Diego.

Nieminen, M. 2000. Käytettävän hyvää tietoa. In Kasvi, J.J.J. & Vartiainen, M. Organisaation muisti: tieto työn tukena, pp. 136-150. Oy Edita Ab. Helsinki.

Noble, H. & Smith, J. 2015. Issues of validity and reliability in qualitative research. Evidence-Based Nursing, 18, 2, pp. 34-35. URL: https://ebn.bmj.com/content/ebnurs/18/2/34.full.pdf. Accessed: 05 October 2021.

Nonaka, I. & Takeuchi, H. 1995. The Knowledge-Creating Company. Oxford University Press. New York.

Ojasalo, K., Moilanen, T. & Ritalahti, J. 2015. Kehittämistyön menetelmät: Uudenlaista osaamista liiketoimintaan. 3.-4th Edition. Sanoma Pro Oy. Helsinki.

Poikela, E. 2001. Ongelmaperusteinen oppiminen yliopistossa. In Poikela, E. & Öystilä, S. Tutkiminen on oppimista – ja oppiminen tutkimista, pp. 101-117. Tampere University Press. Tampere.

Rode, H. 2016. To share or not to share: the effects of extrinsic and intrinsic motivations on knowledge-sharing in enterprise social media platforms. Journal of Information Technology, 31, pp. 152-165. URL: https://journals-sagepub-com.ezproxy.haaga-helia.fi/doi/pdf/10.1057/jit.2016.8. Accessed: 4 January 2021.

Saaranen-Kauppinen, A. & Puusniekka, A. 2006. Tutkimustekstin rakenne. KvaliMOTV - Menetelmäopetuksen tietovaranto. Yhteiskuntatieteellinen tietoarkisto. Tampere. URL: https://www.fsd.tuni.fi/menetelmaopetus/kvali/L4_1_2.html. Accessed: 7 April 2021.

Schreier, M. 2014. Qualitative content analysis. The SAGE handbook of qualitative data analysis, pp. 170-183. SAGE Publications Ltd. URL: https://methods.sagepub.com/book/the-sage-handbook-of-qualitative-data-analysis/n12.xml. Accessed: 21 February 2021.

Stenberg, M. 2006. Tieto: tietojohtamisen arkkitehtuurit. Otava. Helsinki.

Suurla, R. 2001. Avauksia tietämyksen hallintaan: Helmiä kalastamassa. Teknologian arviointeja: loppuraportti. Eduskunnan kanslian julkaisu. Tulevaisuusvaliokunta. Helsinki. URL: https://www.eduskunta.fi/FI/naineduskuntatoimii/julkaisut/Documents/ekj_1+2001.pdf. Accessed: 4 January 2021.

Sydänmaanlakka, P. 2012. Älykäs organisaatio. Talentum Media Oy. Helsinki.

Tuominen, S. 15 April 2021. Crew Planning and Control Manager. Airline X. E-mail.

Van De Ven, F. 2018. Focus group or brainstorm? Why not both? URL: https://uxdesign.cc/focus-group-or-brainstorm-why-not-both-35f4f06be908. Accessed: 20 February 2021.

Virtainlahti, S. 2009. Hiljaisen tietämyksen johtaminen. Talentum Media Oy. Helsinki.

Vuori, J. 2021a. Tapaustutkimus. In Vuori, J. Laadullisen tutkimuksen verkkokäsikirja. Yhteiskuntatieteellinen tietoarkisto. Tampere. URL: https://www.fsd.tuni.fi/fi/palvelut/menetelmaopetus/kvali/tutkimusasetelma/tapaustutkimus/. Accessed: 7 April 2021.

Webster, M. 2012. Bridging the Information Worker Productivity Gap: New Challenges and Opportunities for IT. IDC. Framingham. URL: https://warekennis.nl/wp-content/uploads/2013/11/bridging-the-information-worker-productivity-gap.pdf. Accessed: 7 April 2021.

Attachments

Attachment 1.

INTERVIEW FRAME

Introduction to the topic: The problems with explicit knowledge and the instructions are considered in the document analysis and the focus groups, and therefore the aim of this interview is to concentrate more on tacit knowledge/the experience-based knowledge, culture, personal views, experiences etc.

- **Is there a lor of tacit knowledge at Airline X OCC?**

THEME 1:

KNOWLEDGE SHARING (Socialization, conversational knowledge sharing / social interaction / tacit knowledge, know-how, know-why sharing, tips, hints)

- **Is knowledge sharing working? Why/Why not?**
  - Culture / organizational issues
    - Is sharing valued?
      - Is sharing acknowledged? Rewarded? Valued in other ways?
      - Is there an atmosphere of trust?
      - Is sharing encouraged?
        - Does the organizational hierarchy encourage / hinder sharing?
        - Do people want to share? Do they see the advantage of sharing or do they want to hold on to info?
        - Does knowledge move from projects / shifts / situations to another well?
        - Is the attitude positive or negative towards sharing?
        - Between colleagues / from/to managers
  - How is knowledge shared within Airline X OCC?
    - What systematic processes / planned actions is there to share knowledge?
      - Is knowledge sharing defined / instructed?
      - Do managers show good example?
  - How do you share information / knowledge?
    - How actively do you share?
    - Tools and means?
    - What situations? What situations not?
    - Motivational factors
      - Extrinsic (positive individual outcomes, peer recognition, reputation, financial benefits, reciprocity AND Intrinsic (satisfying, interesting, feeling of competence, altruism, enjoyment in helping others)
      - Self-efficacy and capability
  - How would you develop knowledge sharing?
    - Tools or practices? Culture? What?

THEME 2:

KNOWLEDGE CAPTURING (tacit / new knowledge identified and externalized and combined with explicit and existing knowledge)

- **Is knowledge capturing working? Why/Why not?**
  - Culture / organizational issues
    - Systematic processes to evaluate what people know
    - Is necessary and important information / knowledge identified / recognized?
  - How is knowledge captured at Airline X OCC?
    - feedback / debrief / meetings / brainstorming / other?
    - Is there a systematic process to capture best practices?
    - Is there a systematic process to capture new evolving knowledge?
    - Is there a systematic process to capture new employee's knowledge?
    - Is there a systematic process to capture knowledge of leaving employees?
  - How would you develop knowledge sharing?
    - Tools or practices? Culture? What?

THEME 3:

KNOWLEDGE PROCESSING (combination, evaluation, filtering) Combination and Internalization. Changing from data and information to knowledge and understanding.

- **Is knowledge processing working? Why/Why not?**
  - Culture / organizational issues
    - Is there ability to innovate, develop, adjust processes based on the knowledge?
    - Is there change resistance?
    - How is processing supported?
  - How do you process knowledge? Why/Why not?
    - Do you have time /possibility to process knowledge? Reflect on it?
    - Is information / knowledge aligned with a bigger picture?
    - Is knowledge filtered/focused on the relevant things? Core functions / processes of what OCC is / should be doing?