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# Optimizing ITSM Processes by Knowledge Management

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# Optimizing ITSM Processes by Knowledge Management

MASTER'S THESIS

submitted in partial fulfillment of the requirements for the degree of

**Diplom-Ingenieur**

in

**Information and Knowledge Management**

by

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to the Faculty of Informatics
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Dedicated is this thesis to Natalie, my family, and friends who make this world a lovely place.

# Abstract

This thesis evaluates how the operative IT service management (ITSM) processes can be supported and optimized by the introduction of selected knowledge management methods. For this reason, it evaluates the usefulness and applicability of existing knowledge management recommendations for ITSM as a first step. Particular emphasis is placed on IT Infrastructure Library (ITIL) as de facto standard for ITSM. These recommendations are complemented by new knowledge management methods, which arose through technological innovations especially from the area of enterprise 2.0.

All recommended knowledge management methods are evaluated against the requirements of the various operative ITSM processes and the theoretical findings and concepts of knowledge management. As a result, the actual usefulness and applicability of the individual, recommended methods is assessed. These recommendations are subsequently modified where appropriate to be able to actually increase the efficiency and effectiveness of the ITSM processes. As a further result, this thesis outlines fundamental and appropriate knowledge management methods which generally can be applied in ITSM organizations.

ITSM organizations can differ considerably regarding their internal structure, the type of their provided IT services, and many more influencing factors. Hence, these fundamental, generally applicable knowledge management methods have to be adopted for any specific ITSM organization. In this thesis, this is done for the specific case of DeLaval Information Services (IS). The outlined recommendations are adopted and specified in detail to be suited for an introduction at IS. Furthermore, assistance is given for their successful introduction.

**Keywords**: Enterprise 2.0, IT Infrastructure Library, ITIL, IT Service Management, ITSM, Knowledge, Knowledge Management, Processes.

# Kurzfassung

Diese Diplomarbeit untersucht, wie die operativen Prozesse des IT Service Managements (ITSM) durch die Einführung von ausgewählten Methoden des Wissensmanagements unterstützt und optimiert werden können. Aus diesem Grund wird als erster Schritt die Nützlichkeit und Anwendbarkeit bestehender Empfehlungen für Wissensmanagement im Bereich des ITSM untersucht. Besondere Aufmerksamkeit wird dabei auf den Industrie- bzw. De-Facto-Standard IT Infrastructure Library (ITIL) gelegt. Diese Empfehlungen werden durch neue Methoden des Wissensmanagements ergänzt, die sich aus technologischen Innovationen ergeben, insbesondere solchen, die im Zusammenhang mit dem Begriff Enterprise 2.0 stehen.

Sämtliche empfohlenen Methoden des Wissensmanagements werden gegen die Anforderungen der verschiedenen operativen ITSM Prozesse sowie der theoretischen Erkenntnisse und Konzepte des Wissensmanagement evaluiert. Als Ergebnis wird die tatsächliche Anwendbarkeit und Nützlichkeit der einzelnen empfohlenen Methoden festgestellt. Die Empfehlungen werden im Anschluss soweit notwendig angepasst, damit diese tatsächlich in der Lage sind die Effektivität und Effizienz der ITSM Prozesse zu erhöhen. Damit skizziert die Diplomarbeit als ein weiteres Ergebnis grundsätzliche, angemessene Methoden des Wissensmanagements, die in ITSM Organisationen praktisch angewendet werden können.

ITSM Organisationen unterscheiden sich bezüglich ihrer internen Struktur, der Art der bereitgestellten IT Services und weiterer Einflussfaktoren teils deutlich. Deshalb sind diese grundsätzlichen, allgemein anwendbaren Methoden des Wissensmanagements für den Einsatz in einzelnen ITSM Organisationen anzupassen. In dieser Arbeit findet dies für den spezifischen Fall der DeLaval Information Services (IS) statt. Die skizzierten Methoden werden für die Einführung bei der IS adaptiert und näher festgelegt. Überdies werden Hilfestellungen zur erfolgreichen Einführung gegeben.

**Keywords**: Enterprise 2.0, IT Infrastructure Library, ITIL, IT Service Management, ITSM, Wissen, Wissensmanagement, Prozesse.

# Contents

CHAPTER 1

# Introduction

## 1.1 Motivation

Oscar Wilde had certainly not information technology (IT) and even less IT service management (ITSM) in mind, simply because in his days neither IT nor ITSM had been invented but nonetheless he pointed out very well the motivation of this thesis:

> *You know more than you think you know, just as you know less than you want to know [200].*

Both aspects of his quote are experienced frequently in ITSM nowadays. Hence, this thesis examines the very same aspects for the field of ITSM, namely how IT organizations can become aware of all that they know and how they can ensure the availability of all required knowledge. The inherent goal of this thesis is to evaluate how a knowledge management can lead to a sustainable further improvement of the ITSM and how the knowledge management should be specified in order to support its processes effectively and efficiently.

The thesis' question arose originally in DeLaval's internal ITSM department called DeLaval Information Services (IS) which does not actively manage its knowledge at the moment. With the background of the continuingly rising importance of knowledge in today's working environment and a general desire for an increased excellence in the provision of IT services, it is intended to change this. Among some other technologies, IT is one of the currently most rapidly developing technologies and so does the knowledge which is required to operate the IT. Knowledge and its management have thus become a more important factor in ITSM [25], [53], [63], [171].

Both management areas, ITSM and knowledge management, have gained their today's high importance in the most recent years [3], [12], [70], [154]. In almost the same manner, a large extent of the research about these approaches has taken place recently. A theoretical examination

of the current state of research about them and their links between each other seemed therefore logical. The resulting insights can then be used to design a knowledge management which supports and optimizes ITSM processes.

## 1.2 Scope

First of all, this thesis has been written in cooperation with IS, a department of the DeLaval GmbH in Glinde near Hamburg that is a subsidiary of DeLaval (DeLaval International AB). It forms together with Tetra Pak and Siedel the Swedish Tetra Laval Group and is a manufacturer of dairy farming products. DeLaval develops, produces, and sells all kind of products related to dairy farming. Its product portfolio ranges from simple commodities and accessories over milking system through milking machines and automatic milking systems to computer controlled herd management systems. The company is active in more than 100 countries, occupies about 4.100 employees, and generated lately a turnover of 845 million € in 2010/2011 [36], [182].

IS is responsible for the provision of the company IT services but not for the creation and support of the IT in the end-products of DeLaval. Around 100 employees work for the department on four locations: Glinde in Germany, Kansas City in the USA, Tumba in Sweden, and Wroclaw in Poland. Its ITSM processes are orientated on the IT Infrastructure Library (ITIL) which can be considered as the de facto standard for ITSM [81], [118].

This thesis focuses primarily on the most important operative ITSM processes, viz. incident, problem, change, and configuration management. It evaluates how these processes can sustainably be further optimized by a better usage of knowledge and how knowledge can be efficiently preserved and reused because often knowledge is created but not preserved. Ideally, the knowledge is not only available inside IS but as well directly available to the end users in order to improve self-support. It has to be evaluated when, by whom, for whom, how, and which knowledge is made available. For the purpose of ensuring an enduring efficiency and effectiveness of the knowledge management, potential measures are assessed and adequate ones are chosen.

Based on the current state of research, this thesis makes proposals for a knowledge management which meets these requirements. Subsequently, the proposals can be applied in practice. For the case of IS, a complete exchange of its processes was not taken into consideration but rather a continual further development of the existing processes. The theoretical based proposals are hence adapted in a way that they fit for an application and introduction at IS. Evidence is given why they suit for IS and how far improvements can be anticipated.

The aspect of information security may not be ignored in all these considerations, i.e. it is taken into account when parts of the knowledge have to be considered as confidential and have to be protected against unauthorized access. Moreover the knowledge management has to meet or implement the requirements which arise from of DeLaval's governance, risk & compliance (GRC) [16], [28], [82].

## 1.3 Goals

This thesis fulfills the following goals which were defined before its creation:

- Analysis how the knowledge management can contribute to the realization of IS' strategy.
- Identification of the relevant aspects of DeLaval respective IS and its current status.
- Evaluation of ways how knowledge can be generated.
- Proposal of future processes including the explanation why these are appropriate.
- Planning of an implementation of the knowledge management into the existing process landscape including associated key performance indicators (KPIs). The focus lies primarily on practicable connections of the knowledge management with the most important operational processes of ITSM, viz. incident, change, problem, and configuration management.
- Definition of criteria and systematics for structuring the knowledge with regard to its storage and access.
- Support of a continual improvement of ITSM processes by knowledge management.

Most of these goals are of general interest for similar ITSM organizations. IS can be seen as a prototypical example for ITSM organizations in similarly-sized, multi-national companies like DeLaval.

## 1.4 Methodological Approach

To start with, knowledge management and ITSM are defined and described independently from each other. Both areas have been covered relatively recently by science as figure 1.1 displays. It also shows that science has dealt relatively intensively with knowledge management. The resulting findings lay the foundation for the evaluation of the proposed knowledge management methods in this thesis. These theoretical findings are summarized in a way that they express its general principles and importance for organizations. In addition, its most important developments and concepts are presented to give a complete impression of what knowledge management actually means.

ITSM is less prominent in science. Actually, it is mainly influenced by ITSM frameworks which were developed by organizations outside the academic life [100]. When science dealt with ITSM, research was directly related to these frameworks in most cases, mainly ITIL. The foundations of ITSM in this thesis are hence derived directly from these frameworks to a large extent.

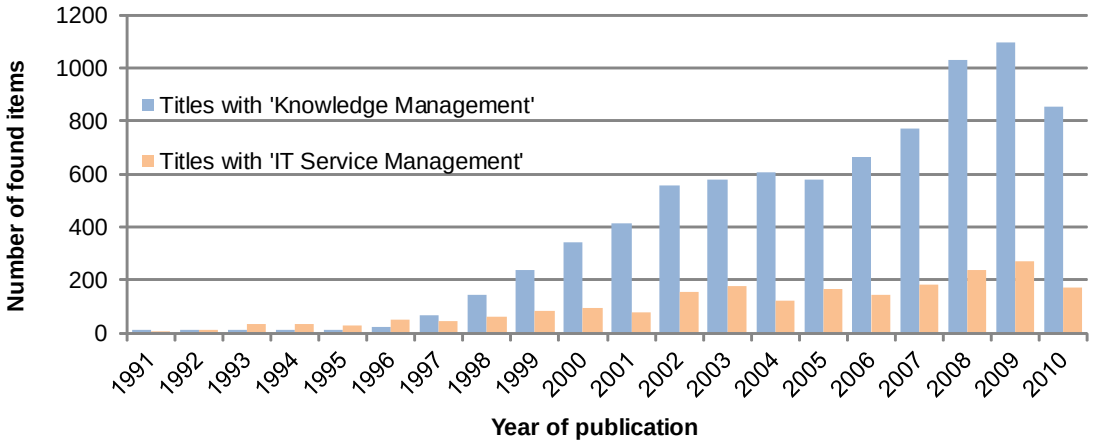


**Figure 1.1** – Web of Science: Titles with Knowledge Management and IT Service Management [184]

Some of these frameworks already contain knowledge management proposals for ITSM. They are presented with their advantages and disadvantages. They do not yet contain the latest developments within knowledge management or information and communications technology (ICT) technology. For this reason, they are supplemented by other proposals. Subsequently, all these proposals are critically evaluated on their practical applicability. Additions and modifications of these proposals are recommended whenever the existing proposals provide only insufficient guidance. The presentation and evaluation of these proposals refers to the theoretical foundations.

Practical experiences are also part of this thesis. Existing documentation was studied, qualitative interviews about different subjects took place, and a knowledge management workshop was hold during the situation analysis. The resulting findings are summarized in the situation analysis. They guide the subsequent examination how the proposals can be applied for an introduction at IS. In addition, they influenced the evaluation of the knowledge management proposals when certain topics were not covered adequately by science like e.g. the usage of forums in ITSM organizations. The preceding theoretical foundations supported the situation analysis in the way that they indicated which aspects have an influence on the introduction of a knowledge management.

## 1.5 Structure of the Work

Basis of the thesis are the theoretical foundations of knowledge management in chapter 2 and ITSM in chapter 3 on which all following activities build upon. The fundamental scientific theories and the current state of research are given for these management areas.

Core of the thesis are the following two chapters 4 and 5 that go into detail on how both management areas can be related. They propose actionable knowledge management approaches which optimize the most important operational processes of ITSM. Chapter 4 presents specific knowledge management proposals for ITSM and recent general knowledge management approaches which are likewise suited to be applied within ITSM. Chapter 5 evaluates these proposals afterwards. Moreover, these two chapters state how these proposals improve the ITSM and outline the expected improvements which are illustrated by examples.

Chapter 6 contains the situation analysis of IS. It focuses on the overall context of DeLaval, IS, and relevant aspects of its ITSM. It examines inter alia how the department is organized and which IT services are provided.

In chapter 7, the knowledge management proposals are adapted subsequently for IS based on its strategy under given circumstances. They are adapted as far as necessary and appropriate. During this adaptation, the future knowledge management of the department is specified in detail. Finally, assistance is given on how the knowledge management can be introduced practically in chapter 8. This chapter specifies necessary and assisting steps for a successful introduction of the adapted knowledge management proposals.

CHAPTER 2

# Foundations of Knowledge Management

## 2.1 Background

For centuries, knowledge has been passed from generation to generation. After the invention of the printing press, it spread more easily but the people did not thought much about the management of knowledge until the 1990's. The rise of computing power, storage, and networks (especially the internet) can be regarded as one of the main reasons for the emergence of knowledge management. The other main reason can be found in the ongoing shift of the economy in developed countries towards a more knowledge-oriented economy in which knowledge has become more important [70]. Even in classical manufacturing companies, the greatest part of employees work outside the actual production areas nowadays, like e.g. in design, logistics, marketing, purchasing, sales, or IT [156]. By the time organizations started knowledge management activities, they realized soon that the path towards a professionalization of this area had just begun and that the effective application of knowledge management measures into practice is not a trivial task [154].

To begin with, this chapter defines the terms knowledge and knowledge management and outlines their characteristics in the context of related terms and areas. Subsequently, the fundamental knowledge management concepts are presented. These are taken up during the presentation and evaluation of the specific proposals for a knowledge management in ITSM in the chapters 4 and 5 to ensure that they enable a holistic knowledge management.

## 2.2 Knowledge

### 2.2.1 Definition

Already the classical, ancient Greek philosophers thought about the question how to define knowledge. Since then, uncounted philosophical debates took place and even some of the most influential, contemporary philosophers still discuss the term knowledge as for example Foucault [58] or Habermas [68]. A deeper contemplation of the different philosophical perspectives on the term knowledge would go too far for the purpose of this thesis as its topic relates to managing organizational knowledge only. Therefore a more fundamental and application-oriented perspective seems more appropriate, derived from the areas of IT, management, and organizational theory [4].

A dictionary provides a first and fundamental view on the term. The Oxford Dictionary as an example gives the following definition of knowledge:

> *1. facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject.*
>
> *2. awareness or familiarity gained by experience of a fact or situation [147].*

Davenport and Prusak, who have published major contributions about knowledge management, define the term as follows:

> *Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms [33].*

Another definition comes from Probst who also researched knowledge management extensively. He gives the following definition:

> *Wissen bezeichnet die Gesamtheit der Kenntnisse und Fähigkeiten, die Individuen zur Lösung von Problemen einsetzen. Dies umfasst sowohl theoretische Erkenntnisse als auch praktische Alltagsregeln und Handlungsanweisungen. Wissen stützt sich auf Daten und Informationen, ist im Gegensatz zu diesen jedoch immer an Personen gebunden. Es wird von Individuen konstruiert und repräsentiert deren Erwartungen über Ursache-Wirkungs-Zusammenhänge [154].*[1]

[1] Translation: Knowledge includes all the insights and skills which individuals use to solve problems. It includes both theoretical insights as well as practical everyday rules and instructions. Knowledge is based on data and information and is in contrast to these always personal. It is constructed by individuals and represents their expectations about relationships between cause and effect.

The definitions have some similarities. All of them require the involvement of people and define knowledge to be both, theoretical and practical. Information and skills are commonly regarded to be its essential components. On the other hand, they also have some dissimilarities. Probst e.g. links knowledge to the ability of solving problems in his definition whereas the Oxford Dictionary defines knowledge independently from any usage or purpose.

### 2.2.2 Knowledge Hierarchy

Knowledge bases on information. Likewise, information bases on data. Hence, data, information, and knowledge can be put into a hierarchy. This hierarchy is represented normally by a pyramid as displayed in figure 2.1. It is also known as knowledge pyramid, knowledge hierarchy, and information hierarchy [163].

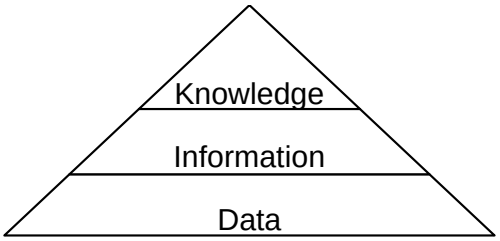


**Figure 2.1** – Knowledge Pyramid

The different levels of the knowledge pyramid are defined as follows:

- **Data**: Symbols or sequences of symbols without context. Data can be e.g. the number 42, the string 'asdf' or a blinking, blue light.
- **Information**: When data is put into context it becomes information. E.g. the blinking, blue light bears a meaning when it is on top of a police car or the number 42 when it is given as an answer on the question how old someone is. If some information cannot be linked with other current or past information it will have no value.
- **Knowledge**: When information is processed by the mind it becomes knowledge. Knowledge is the linking of information. Obviously, information can possibly be linked differently. Thus the same information can lead to different knowledge [135].

This hierarchical representation is used by many authors and is often varied. Additionally common in literature is the extension with wisdom at the top of the pyramid [163]. Wisdom refers not to know how but why to do things (or not to do them). Wisdom can be regarded as a form of high understanding which goes beyond knowledge [203]. The extended pyramid and how well programmable algorithms can cope with the complexity of the different levels is displayed in figure 2.2.

For the extended knowledge pyramid, Zeleny defines the levels briefly as follows:

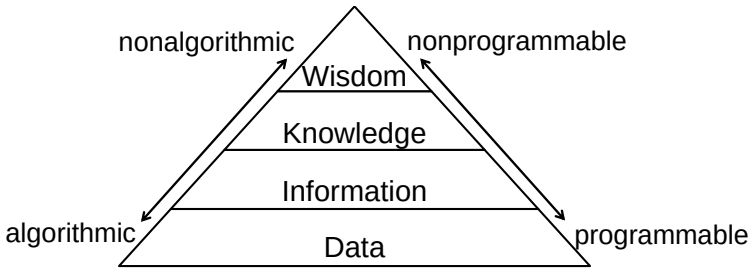


**Figure 2.2** – Extended Knowledge Pyramid According to Awad and Ghaziri [10]

- **Data**: Know-nothing
- **Information**: Know-what
- **Knowledge**: Know-how
- **Wisdom**: Know-why [203]

In opposition to these approaches the relationships between data, information, and knowledge can alternatively be seen as recursive. In this case the differentiation between information and knowledge depends mainly on its interpretation, meaning that information can be regarded as knowledge and vice versa from different points of view. Likewise the differentiation between data and information depends on its regarded organization. Changes in either of them (data, information, or knowledge) can have a direct influence on the respective others [17].

### 2.2.3 Types of Knowledge

One useful differentiation of knowledge is between tacit and explicit knowledge. People can possess knowledge of which they are not or only partly aware. This knowledge is called tacit knowledge. An example is the ability of face recognition. Most people can recognize faces but they are not able to explain how they do it. The level of awareness can vary. It is still relatively high when people know that they have a certain knowledge but which they cannot access, e.g. in an examination situation when the correct answer is known but does not come into mind. The level of awareness is lower when the existence of the knowledge is only anticipated. Besides that anticipated knowledge, there exists also unconscious knowledge whose existence is not known at all by the owner. This can contain for example beliefs, intuitions, and patterns of thought. In opposition to tacit knowledge, explicit knowledge can be reproduced by the owner. Explicit knowledge is normally well-structured and generally understandable. In contrary to tacit knowledge it can also exist as externalized knowledge, e.g. stored in a database or a file. The higher the level of awareness of a certain tacit knowledge the higher is the chance that it can be converted into explicit knowledge with qualified efforts. This implies that the conversion or extraction of a certain tacit knowledge may not always be feasible [152], [191].

Another possible differentiation is between declarative and procedural knowledge. If someone has the ability or knowledge to carry out a certain task or predict a certain outcome but cannot explain how to do it, the knowledge will be called procedural. If it can be explained or reported, the knowledge will be called declarative [6]. This differentiation can be illustrated well by the face recognition example from above. Declarative knowledge corresponds largely to explicit knowledge. Procedural knowledge is only a part of tacit knowledge because tacit knowledge contains additionally other types of knowledge which are not actively available like e.g. passive knowledge of which the owner is not aware that he possesses it.

The previous categorizations evince the aspect that people know more and are capable of more than they can explain but they differentiate knowledge only roughly. Actually, there are more types of knowledge which cannot be categorized neither as declarative nor as procedural. Therefore Roumois proposed another categorization:

- **Know-that**: This type is equivalent to declarative knowledge (e.g. rules, facts, or theories) and it can be explicated easily.
- **Know-about**: It corresponds to fact knowledge about experiences, stories, rumors, or history. It can be gained by experiences or tellings. It is easy to explicate by tellings, either verbally or in writing.
- **Know-how**: This type is equivalent to procedural knowledge. It can be learned best by doing. It is hard to explicate. Possibilities to transmit this kind of knowledge to another person are demonstration, story-telling, or interactive communication.
- **Know-why**: This type requires know-that, know-about, and know-how and is best described as the knowledge why something is like it is. It can be gained by self-reflective considerations or reflective discussions. Both can be explicated.
- **Know-what-to-do**: It is the knowledge required to take strategic decisions and to solve complex problems. It includes all previous four types of knowledge and is gained during complex decisions or problem solving tasks. It is hard to explicate [191].

## 2.3 Knowledge Management

### 2.3.1 Definition

The term knowledge management can be defined differently. One definition comes from Spek and Spijkervet who define it as follows:

> *It [knowledge management] strives for the optimal use and development of knowledge, now and in the future. It determines the form, the place and the time, as well as what kind of knowledge must be available in an organization or network of organizations. To achieve this a broad range of techniques are utilized which vary according to the situation and the organization [193].*

According to Kamara et al. knowledge management can be defined as follows:

> *Knowledge management refers to the organizational optimization of knowledge to achieve enhanced performance, increased value, competitive advantage, and return on investment, through the use of various tools, processes, methods and techniques [103].*

A more specific and relatively detailed definition of the term has been proposed by Turban et al.:

> *Knowledge management is a process that helps organizations identify, select, organize, disseminate, and transfer important information and expertise that are part of the organization's memory and that typically reside within the organization in an unstructured manner. This structuring of knowledge enables effective problem solving, dynamic learning, strategic planning, and decision making. Knowledge management initiatives focus on identifying knowledge, explicating it in such a way that it can be shared in a formal manner, and leveraging its value through reuse [190].*

Remarkably, the definitions of the term knowledge management are relatively identical compared to the wide-spread definitions of the term knowledge. All of them express that knowledge management has the purpose to organize knowledge related activities in a way that they optimize the benefits for the company and help achieving its goals. To do this it utilizes numerous measures and techniques.

### 2.3.2 Closely Related Management Areas

Knowledge management is closely related to the following management areas:

- **Information Management**: As shown in section 2.2.2, knowledge bases on information. Hence, information management is also closely related to knowledge management. It regards information as an organizational resource which can be managed actively [78]. It is also closely related to ICT and ITSM as ICT is primarily used for the storage, processing and transmission of information [153]. This connection is described in section 3.3.3.
- **Innovation Management**: Innovations can be described briefly as radical or incremental changes of products or processes which improve them [2]. Innovation Management contains not only the development of innovations but also their implementation[2]. Both aspects are closely related to knowledge management. The application of innovations can lead to new knowledge requirements. Obviously, knowledge management should support

[2] The continuous development and application of incremental innovations can be called continual improvement. Its support is a goal of the knowledge management which is proposed in this thesis.

its acquisition and distribution. An effective knowledge management is especially important for the development of innovations. It is regarded as the component with the most significant influence on the development of innovations because knowledge constitutes a prerequisite of practically any innovation [29].

- **Competence Management**: A competency can be regarded as the ability to apply knowledge effectively in a specific field of practice. Competence management is the management of the competencies from the perspective of individuals or an entire organization [15]. It can be seen as inside knowledge management since knowledge is an integral part of any competency but it is better related to human relations management (HR), especially strategic HR [98]. In the context of universities it gets even another, slightly different meaning [46].

### 2.3.3 Conflicts within Knowledge Management

In knowledge management science arose a dispute on how to organize knowledge management. There are two fundamentally different, basic types of approaches: mechanistic and systemic knowledge management.

The mechanistic knowledge management stands in the tradition of Taylorism. Besides the commonly known division of work into its smallest elements it also suggests a separation between management and the actual workers. The management provides detailed, favorable work instructions and the workers execute these instructions. In addition, the execution is supervised by the management. Incentives are used to obtain the motivation and initiative of the workers in this model [179]. Mechanistic approaches recommend concentrating on small, manageable measures which lead to fast viewable and controllable successes. They also recommend monitoring the execution of the measures to ensure a successful implementation and orderly execution. Partly they also recommend incentive systems to support the orderly execution [191].

The systemic knowledge management believes that knowledge work cannot be managed with the traditional management approaches of the mechanistic knowledge management. It states that knowledge evades measurability which is required for control purposes by the traditional management approaches. Furthermore it argues that the separation into small tasks cannot reproduce adequately all the factors which have an influence on the knowledge creation, transfer, and use of the individuals and the organization. These factors are regarded to be manifold and mostly mutually interrelated. Therefore the systemic knowledge management suggests to control the organization indirectly instead of the direct control of the mechanistic knowledge management. The systemic knowledge management suggests to improve the basic conditions of the organization and the working environment for knowledge related work. Its aim is to create an intelligent organization which is able to self-control and to adjust flexibly to changing external conditions [191], [201].

## 2.4 Knowledge Management Concepts

### 2.4.1 SECI Model

As well as Polanyi, Nonaka regards the commitment of the members of an organization as the base for any successful knowledge related activity or knowledge management. According to Nonaka, the commitment is comprised of three basic factors [134], [152]:

- **Intention** refers to the attention which the members of an organization show towards objects. This attention requires their active consciousness about these objects. This is strongly influenced by the way how they regard their environment. Nonaka uses this term in the sense coined by Husserl [85], [134].
- **Autonomy** expresses how far members of the organization have the flexibility to self-organize their work and to decide how they want to carry it out. An increase of this flexibility extends the possibilities how to relate existing information and knowledge, to interpret it, and to acquire new knowledge. Furthermore it raises their motivation to create new knowledge [134].
- **Fluctuation** refers to the level of discontinuities in the organization. Acquiring and creating new knowledge involves necessarily interactions with the external world. Hence, changing members and internal reorganizations lead to new patterns of interaction between the members among each other and with their environment. This increases the number of available sources of information and knowledge as well as motivational stimulations to acquire and create new knowledge. Fluctuation does not mean total chaos, just a certain level of vitalizing discontinuities. Evolutionary algorithms and evolution itself are both more successful through the introduction of some randomness [30], [55], [134].

| *From* \ *To* | *Tacit Knowledge* | *Explicit Knowledge* |
|---|---|---|
| *Tacit Knowledge* | **Socialization** | **Externalization** |
| *Explicit Knowledge* | **Internalization** | **Combination** |

**Figure 2.3** – SECI Model: Modes of Knowledge Creation [134]

The base of the model proposed by Nonaka is the separation between tacit and explicit knowledge as already described in section 2.2.3. It assumes that organizational knowledge is generated by the different conversions between these two types of knowledge. Altogether, four different

modes of conversion between tacit and explicit knowledge are possible. The name of the SECI model originates from the names of these four possible modes of conversion: socialization, externalization, internalization, and combination. Figure 2.3 displays these modes of conversion or knowledge creation [134].

- **Socialization** converts tacit knowledge to tacit knowledge through the interaction of individuals. Socialization does not require language, it can also happen through observation and imitation.
- **Externalization** of tacit knowledge can take place when an individual is able to articulate the foundations of his tacit knowledge.
- **Combination** refers to the exchange of explicit knowledge through conversations e.g. via e-mail, via phone, or directly from face-to-face. The recategorization and recontextualization of the exchanged knowledge can lead to the creation of new knowledge.
- **Internalization** can best be described as learning. When individuals come in touch with explicit knowledge they put it in relation to their existing knowledge and by that create new tacit knowledge [133], [134].

All four modes of knowledge creation can create new knowledge independently from the others but they release their full potential only in combination. This can best be displayed in form of a spiral as shown in figure 2.4. Through the dynamic, iterative interactions between the different modes the knowledge can flow easily inside an organization and the acquisition and creation of new knowledge is stimulated [133], [134].

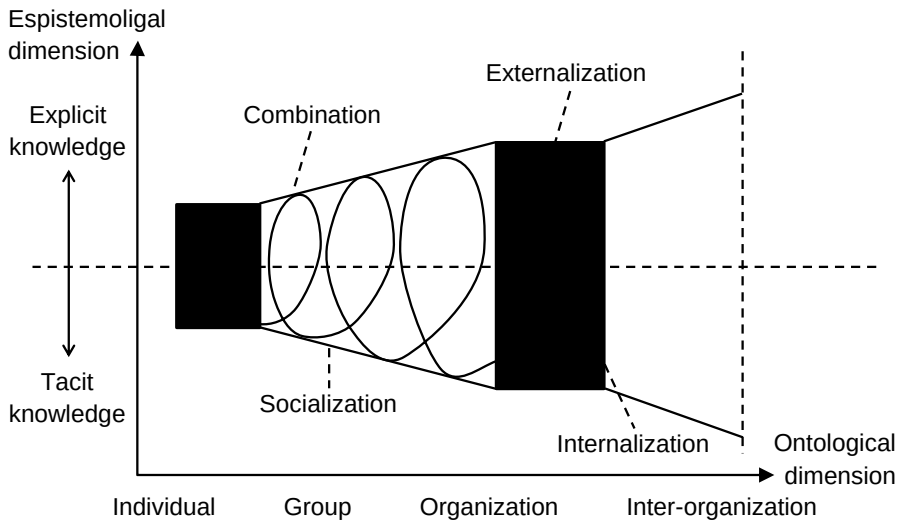


**Figure 2.4** – SECI Model: Spiral of Organizational Knowledge Creation [134]

In summary, the SECI model regards organizations less as machines which only process hard codified data using fixed processes but more like organisms which evolve and function only

through the manifold and complex interactions between its members. The model has a close relation to the field of organizational theory. The understanding of the underlying processes is regarded as the base of knowledge management activities. A certain level of redundancy in form of overlapping information, activities, and responsibilities is important for this model because it stimulates to maintain a frequent dialogue and communication [133].

In compliance with the SECI model, Nonaka makes inter alia the following recommendations for a better knowledge management:

- **Access to Information**: A free access to as much stored information as possible helps individuals to find information and knowledge from different perspectives. This can then be related to the existing knowledge of the individual and supports the acquisition and creation of new knowledge.
- **Strategic Rotation**: A rotation of individuals between different departments, tasks, or jobs helps them to broaden their horizon and to increase their knowledge especially about the organization.
- **Team building**: Teams lead necessarily to interactions between the team members which sustain a constant dialogue. This, in turn, broadens the perspective of the individual team members and leads to an increased self-reflection [133].

The main task of the management in this model is to combine the measures in such a way that they do not lead to chaos but form a sense-making framework. It requires the responsibility of managing all four modes of knowledge creation from an organizational perspective in order to enable a continual flow of knowledge [133], [134].

### 2.4.2 Building Blocks Model

Probst et al. introduced a model called building blocks of knowledge management in 2002. It defines knowledge management as two dynamical cycles of knowledge activities which are displayed in figure 2.5.

The model is comprised of the following eight building blocks:

- **Identification**: Before starting expensive knowledge activities an organization should make transparent which knowledge already exists inside and outside of the organization.
- **Acquisition**: One way to gain required knowledge is to acquire it. Acquiring knowledge can happen in various ways. Possible methods are recruiting external specialists, involving stakeholders into projects, buying knowledge products like patents or software, cooperating with other companies, or even taking over another company.

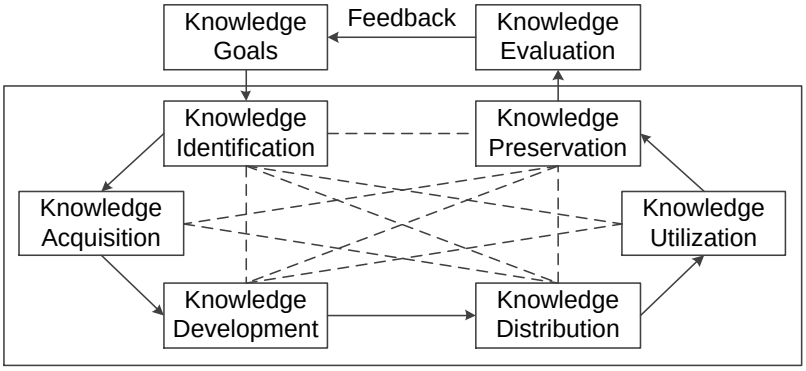


**Figure 2.5** – Building Blocks of Knowledge Management According to Probst et. al. [154]

- **Development**: The other way to gain required knowledge is to create it internally. The knowledge management has to support both individual and collective knowledge development. A trustful and open atmosphere inside the company is a critical factor for a successful collective knowledge development.
- **Distribution**: Nobody can know everything and nobody has to know everything. Nevertheless it should be specified who should know what and how the knowledge management can support the desired knowledge distribution. Especially an intelligent usage of IT can raise the efficiency of the knowledge exchange which in turn is able to generate time, cost or quality advantages, and a raised satisfaction of staff or customers.
- **Utilization**: The main goal of knowledge management is the use of knowledge. Knowledge should not only be gained or increased. It should be used. The success of knowledge management activities relies strongly on the knowledge usage. It is desired that potential users can see the advantages of the knowledge management activities for their acceptance.
- **Preservation**: Knowledge has to be stored in order to protect the company from knowledge losses. It is not possible or useful to store everything. Hence knowledge has to be chosen which is desired to be preserved. The question whether to save certain knowledge has to be decided in daily business. Therefore, the implementation of a practicable selection process is a useful support. It is only useful to preserve information that can be understood and used independently by a third party. In case of doubt the model proposes the rule-of thumb: less is more [154].

The inner cycle concentrates on the operational aspects of knowledge management but this cycle alone does not guarantee that the knowledge management complies with the company's strategy. Hence there is also an outer management cycle which adds two more building blocks to the model:

- **Goals**: They point out the direction of the knowledge management activities. They can be split into three different types of knowledge goals. The first type of goals are normative knowledge goals that deal with the general organizational culture. This culture should be knowledge-sensitive and support sharing and development of knowledge. The second type, the strategic knowledge goals, specify the core capabilities of the organization and the required, future knowledge. The last type of goals are the operational knowledge goals which split the normative and strategic knowledge goals into feasible goals for smaller, individual activities.
- **Evaluation**: The model sees high potential in controlling the knowledge management activities. It is necessary to ensure a continuous improvement, a good allocation of resources, and the achievement of the targeted goals. Nonetheless, the measurement of the knowledge management activities is regarded as complicated. Knowledge can rarely be measured by a single influencing variable and the required efforts for the knowledge measurement are often regarded as potentially too high and socially unacceptable by the staff [154].

### 2.4.3 Process Oriented Knowledge Management

The process oriented knowledge management presumes that the methods and activities of knowledge management differ and depend of the specific area of application. In an organizational context, these different areas of application correspond to its processes [72]. A process is according to Davenport:

> *[...] a structured, measured set of activities designed to produce a specific output [...] [It] is thus a specific ordering of work activities across time and place, with a beginning, an end, and clearly defined inputs and outputs: a structure for action [32].*

A similar, but more open definition comes from Hammer and Champy, who define a process as:

> *[...] a collection of activities that takes one or more kinds of input and creates an output [...] [69].*

In general, knowledge supports processes as a required or beneficial input and is often a desired output. Processes are normally optimized for operational excellence. By contrast, knowledge management activities often aim at more global improvements like an increased competitiveness or the preservation of organizational knowledge. As a consequence, knowledge management activities can be in conflict with the process optimization because they can lead to longer process times [158]. Hence, the aim of the process oriented knowledge management is to combine and balance both areas [159]. It pays particular attention to the integration of knowledge management activities in the processes with knowledge as in- and outputs [1], [113].

### 2.4.4 Cynefin

Snowden introduced the so-called Cynefin model in 2002 [170]. The model understands itself as a sensemaking framework in opposition to classical categorization frameworks. Categorization frameworks are often parted into four different quadrants inside a two-by-two matrix, e.g. like in the Boston Consulting Group (BCG) matrix [73]. The axes are valued and the upper right quadrant is normally equivalent to the most desirable situation. These frameworks give advice how to improve the situation and how to arrive in the upper right quadrant. In a sensemaking framework the axes are not valued and all quadrants are equally desirable. Quadrants are called domains because they create clearer boundaries than quadrants in categorization frameworks. A sensemaking framework helps to understand changing situations and supports decision-making in a dynamical environment by making perspectives and conflicts transparent [107], [170].

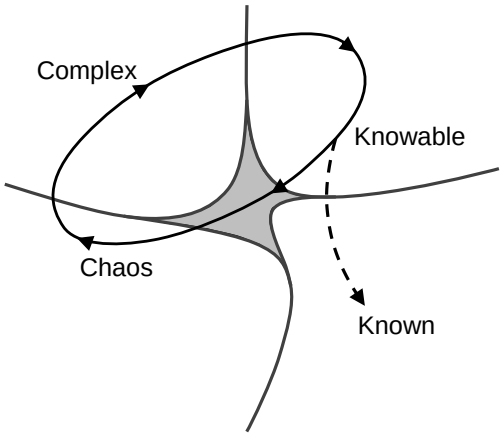


**Figure 2.6** – Cynefin Domains [107]

The Cynefin model has two purposes. On one side it helps to find a well-balanced equilibrium of different knowledge domains within an organization and on the other side it helps to understand and manage the different movements of knowledge between these domains. The model contains five knowledge domains as displayed in figure 2.6. Four of them are named. One is unnamed. Knowledge flows between these domains over time. The directions of these knowledge flows are not fixed and can be manifold. The different domains can be described as follows:

- **Known**: In this domain people agree commonly on the same cause and effect relationships which are stable and fully understood. Decisions are made by categorizing incoming data and applying predefined responds depending on the chosen category. This domain focuses on efficiency. Hence, the knowledge is embedded in structured processes. Process reengineering can be applied on this domain.
- **Knowable**: The cause and effect relationships of this domain are also stable but not fully known or only known by a few individuals. In order to make a decision the incoming data is sensed and analyzed. Responses are then chosen with the help of expert advice

or by interpreting the analysis results. This domain is related to the concepts of systems thinking and the learning organization.

- **Complex**: This domain deals with the complexity resulting from the interactions between many agents. The cause and effect relationships are too diverse to be categorized or analyzed effectively. Decisions can be supported by creating probes and should consider multiple perspectives.
- **Chaos**: There are no visible cause and effect relationships in this domain. It is advised to reduce the turbulence in order to make decisions. A possibility is to act and sense the results of these decisions immediately afterwards in order to respond accordingly.
- **Disorder**: The central, unnamed domain is the domain of disorder. In practice, there are many situations which are assigned to different areas by different individuals because of differing assessments of the situation. The domain of disorder represents these situations. Before making decisions, the involved individuals have to agree on a domain which suits best for the situation [107].

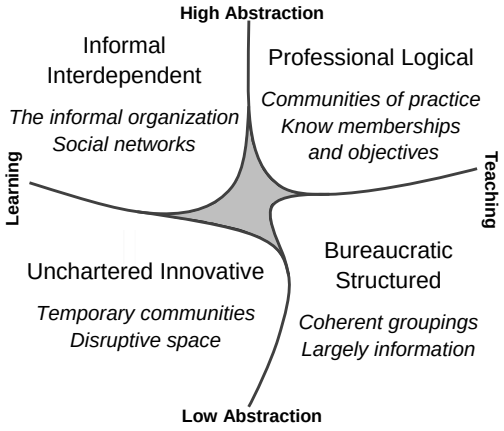


**Figure 2.7** – Cynefin Sense Making Model [170]

Organizations often concentrate on the lower two domains known and chaos but they should also occupy themselves with the upper two domains as well. Figure 2.7 presents a related view on the Cynefin model that considers the axes abstraction and culture. It makes the different knowledge management domains inside a company visible. Each of the domains requires its own appropriate knowledge management activities. It is not possible to manage all domains in the same way or by the usage of the same activities or measures. Individuals are not limited to one domain. They can work alternatingly in different domains at the practically same time. In the ordered domains it is worthwhile to aspire to efficiency. Through the existing order in this domain it can be expected that the whole is the sum of the parts. Snowden noticed that the existing knowledge management models from the 1990's deal only with ordered domains but that there are also un-ordered domains. Sub-optimal behavior should be allowed and accepted in the un-ordered domains [107].

### 2.4.5 Knowledge Management Maturity Model (KMMM)

The Knowledge Management Maturity Model (KMMM) views knowledge management from a fundamentally different perspective as the other concepts. It is a maturity model adapted from the well-known Capability Maturity Model (CMM) [150]. Its purpose is not to provide background information about knowledge management or to explain its foundations but to support organizations to assess their maturity in relation to knowledge management. This has the purpose to identify possible measures for improvement. The KMMM defines five maturity levels from *initial* to *optimizing* in which organizations can be. For an assessment of an organization's maturity level the most important aspects of knowledge management are represented by 64 so-called topics which can be evaluated. They are arranged in eight areas as shown in figure 2.8. The different areas give an impression of the diverse factors which influence knowledge management [49].

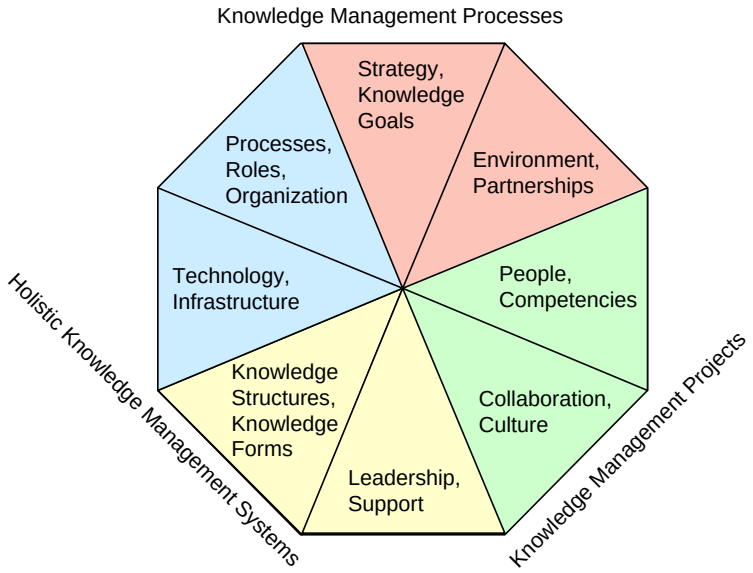


**Figure 2.8** – Areas of the Knowledge Management Maturity Model (KMMM) [49]

Besides these topics for assessment, the model also provides guidance on how to develop further the knowledge management maturity. The topics and guidance are not made public as the model is only partly published and the more detailed information can only be accessed after purchasing a license [49], [50].

CHAPTER 3

# Foundations of IT Service Management

## 3.1 Background

This chapter will give a basic overview what exactly an IT service is and what ITSM distinguishes from related management areas. The area of ITSM is strongly influenced by ITSM frameworks. Many organizations orientate on these frameworks as they provide valuable assistance for the establishment of an effective and efficient ITSM. In addition, they are used when an ITSM organization needs to be audited. The most important ITSM frameworks are presented in this chapter as well as other important approaches which provide guidance for ITSM organizations. But to begin with, IT services and ITSM are defined and the basic fields of conflict, in which the ITSM operates, are outlined.

The today's importance of ITSM results from some simple facts. 65%-80% of the total spendings for ICT can be related to ITSM nowadays in larger organizations. Besides the financial aspect, one of the major problems in the operation of ICT concerns the assumption that the greater part of all problems in ICT usually happens because of poorly managed changes. Without an appropriate ITSM in place, any IT service would deteriorate over time until its inevitable abandonment [3].

## 3.2 IT Services

### 3.2.1 Definition of Services

During the last century the tertiary sector, which subsumes all kind of services, became increasingly important. It can be regarded as the major part of our developed economies nowadays. The

term service refers to various fields of activities ranging from consulting, education, and legal advice over medical attendance to insurances and financial services, just to name a few [151]. Services can basically be differentiated from goods and can be characterized generally by the following properties:

- **Intangibility**: The provision of services may require physical objects but services as a whole are not physical.
- **Inseparability**: Services lose their value when they are separated into their parts.
- **Perishability**: Services cannot be inventoried. They are consumed at the same moment as they are provided. It is not possible to store services for future usage.
- **Heterogeneity**: Services can be highly customized based on the users' needs. Even though an offered service will not be personalized and its procedures have been standardized, the actual service provision will vary between users and over time [157].

### 3.2.2 Definition of IT Services

In the 1980s the term IT service arose as a reaction to the rising utilization and importance of IT [60]. Up until the 1990s the definitions of the term IT service were relatively identical and concentrated on the IT aspect. Mingay as an example gave the following definition in 1998:

> *An IT service is defined as a set of related functions provided by IT systems to support one or more business areas. These may further break down into software, hardware and communications facilities. An IT service could provide access to a single application, or it could be a complex set of facilities including many applications, as for example a data warehouse [129].*

During the last decade a more holistic view of IT services has become more established and predominates nowadays. A good example for such a definition gives ITIL in version 3 which defines the term as follows:

> *A service provided to one or more customers, by an IT service provider. An IT service is based on the use of information technology and supports the customer's business processes. An IT service is made up from a combination of people, processes and technology and should be defined in a service level agreement [141].*

All definitions have in common that IT services are customer centric. Their purpose is to support the customer's business. Moreover it can be derived from the given definitions that an IT service is not an equivalent term for an IT product. In fact the provision of an IT service can require more than one IT product. Furthermore IT services do not only consist of IT. They use IT as their main component but include also the persons and processes required to provide them.

In contrast to goods, IT services can only be tested and judged by the customer when they have been provided. An earlier assessment is hardly possible as they are consumed at the same time as they are provided. Additionally, IT services differ from goods in the way that their quality also depends partly on the interaction between the customer and the IT service provider because both are able to change aspects of IT services while they are being delivered [94].

### 3.2.3 Types of IT Services

IT is used practically everywhere these days and evolves rapidly. IT services are hence manifold, vary widely, and also change over time [125]. Nonetheless a basic classification of IT services into two different types seems useful:

- **Business services**: These are all the IT services which are visible to the customers and for which the customers pay the IT service provider. They support directly the customer's business processes. Such services include e.g. accounting, planning of advertising, production planning, business intelligence, and order creation.
- **Infrastructure services**: These IT services are not directly used by the customers and they are normally not visible to the customers but they are required by the IT service provider in order to enable the provision of business services. Network or communication services often fall into this category [139].

## 3.3 IT Service Management

### 3.3.1 Definition

The Office of Government Commerce (OGC) gives a comparatively brief and wide definition for the term ITSM in its current standard framework IT Infrastructure Library Version 3 (ITIL v3):

> *[IT] Service management is a set of specialized organizational capabilities for providing value to customers in the form of [IT] services [141].*

An alternative, likewise brief definition comes from the IT Service Management Forum (itSMF):

> *IT Service Management is the management of all processes that co-operate to ensure the quality of live IT services, according to the levels of service agreed with the customer [95].*

The online portal SearchCIO.com defines the same term in a more detailed way:

> *IT Service Management (ITSM) is a process-based practice intended to align the delivery of information technology (IT) services with needs of the enterprise, emphasizing benefits to customers. ITSM involves a paradigm shift from managing IT as stacks of individual components to focusing on the delivery of end-to-end services using best practice process models [180].*

Another comprehensive definition gives Addy:

> *IT Service Management is the planned and controlled utilization of IT assets (including systems, infrastructure and tools), people, and processes to support the operational needs of the business as efficiently as possible whilst ensuring that the organization has the ability to quickly and effectively react to unplanned events, changing circumstances and new business requirements as well as continuously evaluating its processes and performance in order to identify and implement opportunities for improvement [3].*

With the exception of Addy's definition, all definitions regard the provision of IT services as the core of the ITSM. Addy does not mention the term IT service but only IT assets, people, and processes. This can be regarded as an indicator that he regards IT services just as assistance to manage IT in a way that it supports the business operations. Another difference between the definitions can be identified in the alignment of the ITSM or its primary objective. Some regard the support of the business requirements as the primary objective, others the concentration on the fulfillment of the agreed service level agreements (SLAs).

### 3.3.2 Conflicts within IT Service Management

Obviously, ITSM organizations operate in differing environments, can follow different goals, and try to reach them on different ways. As a result, ITSM organizations can differ a lot but they all face the same decisions concerning the general alignment of their ITSM. Figure 3.1 presents these universal dimensions of alignment which apply to practically all ITSM organizations [140].


**Figure 3.1** – Conflicts within IT Service Management

The internal view concentrates on the way how IT services are delivered. It is directed on the management of the used systems and technologies. The external view focuses on the fulfillment of the business requirements and the correct delivery of the IT services as agreed with the users. The alignment to only one of the both views will not be sufficient. Both views can be in conflict but are not necessarily and can complement each other [7], [140].

Another conflict exists between stability and responsiveness. The focus on stability tries to ensure stable running IT services. Changes of IT services due to changing business requirements raise the risk of appearing disruptions and failures. This focus on stability insists on extensive security measures to be in place. These reduce the risk of disruptions and failures but raise the barriers to overcome and extend the time span before changes are implemented. This has a direct, opposite effect on the responsiveness of an ITSM organization [120], [140].

Conflicts arise also in the decision how reactive or proactive the ITSM should be. A purely reactive ITSM organization acts only on initiative of the users. Normally, the ITSM organization has far more IT knowledge than the users and is able to give the users advice how to design the IT services and is able to foresee requirements which can be implemented before users even request them in order to increase their satisfaction with the IT services. In addition, in most cases users want a proactive ITSM which offers them an active cooperation. On the other hand, the proactiveness has the disadvantage that it leads to increasing efforts because the more proactive an ITSM organization becomes, the more the risk is raised that unused features are implemented or other activities are undertaken which do not produce visible results [140].

Maybe the most classic conflict in all kind of IT organizations is the conflict between quality and costs. Quality can help to reduce costs in a long-term perspective up to a certain quality level. However, high quality levels will be in conflict with the costs as the required efforts for further quality improvements will lead to exponentially raising costs. In a short-term perspective both positions are always in conflict [140].

Naturally, ITSM organizations choose reasonably different alignments depending on their particular circumstances. It is not recommended for most ITSM organizations to decide for one of the extreme ends of any dimension. It is normally better to find suitable, balanced positions ranging somewhere in the middle between the extreme ends [120], [140].

### 3.3.3 Closely Related Management Areas

Like most management areas, ITSM has points of intersection with other management areas. Besides the classical points of intersection with general management areas like for example finance [123], it is closely related to the following management areas:

- **Information Management**: This area of management is concerned with the question how an organization gathers and uses information. It is often mixed up with the management of ICT but it has actually a wider focus which includes ICT. Nonetheless ICT is of high importance for information management because it is used for the storage, processing,

and transmission of most information [79]. Derived from the definitions of ITSM in section 3.3.1, ITSM contains the management of ICT and thus overlaps with information management. Additionally, there is also a relation between information management and knowledge management as shown in section 2.3.2.

- **IT Governance**: As a part of GRC, IT governance is concerned with the assurance of a desirable behavior related to the usage of ICT. The ITSM has to be able to support the present and future strategies and goals from business. Therefore, it specifies the responsibilities, accountabilities, and mechanisms of control [197], [194]. IT governance also covers the management of risks related with the usage of ICT [67]. While ITSM concentrates on an efficient and effective provision of IT services, IT governance focuses on the general ability to fulfill the demands of business. [194].

- **Quality Management**: The activities of quality planning, assurance, control, and improvement constitute quality management whereas quality is the ability of a product or service to satisfy the needs of its users [101], [155]. ITSM applies the practices of quality management for the provision of IT services which fulfill the requirements of business. Hence, ITSM contains quality management activities [161].

### 3.3.4 IT Service Management Processes

ITSM organizations have to provide appropriate IT services which have to be available to the users. As a result, they have to manage a number of operational areas [3], [140]. These areas do not necessarily require formally defined processes but if there are no defined processes people will stick to the operational sequences they perceive as suitable. These will differ between individuals and a constant IT service quality will be hard to achieve. Therefore, all major ITSM frameworks recommend defined processes. Below, the objectives of the main, operative ITSM processes are presented [137].

- **Incident management**: An incident is an interruption or quality reduction of an IT service outside its specification as defined in the SLA. Incident management re-establishes the normal provision of the IT service with ideally minimal impacts for the users and the organization [94], [121], [140].

- **Problem management**: A problem is the root cause of actual or possible incidents. As a consequence, problem management is closely related to incident management. It provides the incident management with workarounds and problem fixes but its actual objective is to resolve the problems which cause the incidents [94], [127], [140], [196].

- **Configuration management**: ITSM organizations manage actively the components of their IT systems (called configuration items (CIs)) up to a certain level of detail. The configuration management identifies and monitors the CIs to provide information about the CIs and the relations between them [94], [120], [142].

- **Change management**: Not every requested change (called request for change (RFC)) leads to improved IT services. The objective of the change management is to handle RFCs efficiently and to prevent negative impacts on IT services through changes. Furthermore, it has the objective to ensure the traceability of changes and the reasons why these RFCs have been accepted or rejected [94], [120], [142].
- **Release management**: It manages the installation and distribution of changes to productive systems. For a release, one or more changes are combined to one release. Release management stands at the end of the change management process. In analogy with change management, release management has the objective to ensure the traceability of the releases [94], [122], [142]. In this thesis, it is not considered as a separate process but within the change management process.

In addition, there are service requests which are mostly minor administrative tasks like e.g. resetting passwords, installing additional applications on workstations, purchasing equipment, or answering questions. They are somewhere between incidents and changes. They cannot be classified as incidents because they are not related to an interruption or quality reduction of an IT service. In addition, they are no changes because service requests contain either no changes or only minor changes with such a low risk and frequent nature what the change management process would be exaggerated. Service requests vary widely and likewise the required activities for their fulfillment. Hence, there is no general service request process but many [140].

## 3.4 IT Service Management Frameworks

### 3.4.1 IT Infrastructure Library (ITIL)

In the late 1980's the British government started to develop an ITSM framework to reduce its IT spendings. In the 1990's this framework became popular in larger companies and government agencies. Since then it spread continuously, supported by other frameworks which were developed basing on ITIL. Over time, ITIL was updated and newer versions were published. The most current version is ITIL v3 which was published in 2007 [137], [3]. An update of this version has been published by the end of July, 2011 [183].

ITIL v3 consists of the ITIL core which provides general applicable guidance and complementary publications with additional guidance to specific organizations and technologies. The ITIL core consists of five books which focus on different specific aspects of ITSM. These books can be read and applied alone but unfold their full potential only in combination because they are linked with each other. Together, they form a lifecycle which is displayed in figure 3.2 and has the purpose of fostering a continual improvement of the ITSM of an organization [140].

The five books cover the following aspects:

- **Service Strategy** gives guidance on how to align the ITSM with the chosen strategy and how to manage IT services from a strategic and global perspective [141].

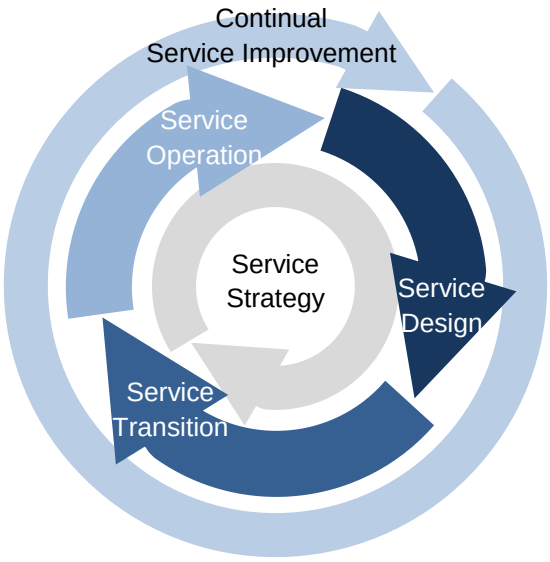


**Figure 3.2** – ITIL v3 Lifecycle [140]

- **Service Design** addresses the design of new or significantly changed IT services. It helps to manage the impact of changes and new IT services on IT architecture and landscape as well as on business and on ITSM with its tools, measurements, and metrics [139].
- **Service Transition** assists in the management of changes and their transfer into productive systems. It emphasizes particularly on the management of the complexity of modern IT, the assessment of risk, and the prevention of IT service failures and disruptions [142].
- **Service Operation** focuses on the delivery of the IT services to the users at the agreed SLAs. Central aspects of this book are the maintenance of the used technologies and the handling of support [140].
- **Continual Service Improvement** provides assistance for a continual readjustment of the IT services to the changing requirements resulting from changes in business [138].

The older version, IT Infrastructure Library Version 2 (ITIL v2) is still of importance nowadays because ITIL v3 is not a substitute of ITIL v2 but rather an extended and revised version. Many organizations have implemented the recommendations from ITIL v2. Besides these revisions and additions, the major improvement of ITIL v3 is its new consolidated structure [22]. Regardless of the version, aligning the ITSM to ITIL has the following advantages:

- **Common language**: ITIL introduces a common language with a defined terminology which simplifies communication within and outside the organization. This can be regarded as its major benefit.

- **Flexibility**: The definition of the framework is relatively vague what allows a flexible interpretation and implementation which is still in alignment with ITIL.
- **Good starting point**: It possesses a good coverage of ITSM and contains no definitely superfluous parts. Furthermore it is widely accepted. That makes it a good foundation for ITSM organizations on which they can build upon.
- **Traceability**: Individual activities like e.g. incidents can be traced with the help of supporting IT systems. That makes it possible to identify the persons accountable for individual activities and their underlying reasons for the taken decisions [3].

On the other hand it has also disadvantages:

- **Bureaucracy**: With its origin in governmental agencies, ITIL has a relatively bureaucratic approach. It tends to lead to an oversized administrative superstructure.
- **False confidence in universal remedy**: Unsurprisingly, the alignment to ITIL is not the solution for all problems which can arise in ITSM. Often people think everything will be in its correct place after the introduction of ITIL or they rely on ITIL in situations when its recommendations are not appropriate.
- **Misallocation of resources**: Aligning an organization to ITIL requires high efforts. The necessary consultancy, training, and certification can lead to high spendings. Furthermore it consumes much time of the internal resources. There is a risk that the introduction of ITIL becomes a goal for itself and that it distracts the attention from the real goals and problems.
- **Not the optimum**: ITIL calls itself either *best practices* or *good practices* depending on the version [136], [141]. As good or best practices are widely used they are industry standard and somehow average. There is no doubt that further optimizations of the ITSM beyond ITIL are possible. To be aligned with ITIL is good but it is not the optimum [3].

### 3.4.2 Control Objectives for Information and Related Technology (CobiT)

Control Objectives for Information and Related Technology (CobiT) is actually not an ITSM framework but an IT governance framework which overlaps widely with the area of ITSM. It focuses less on the actual execution but more on its control. The first version of CobiT was published by the Information Systems Audit and Control Association (ISACA) in 1996 [21]. Its most current version is 4.1 which was published in 2007. CobiT, like ITIL, provides a set of good practices. Figure 3.3 outlines the basic CobiT principle which tries to guarantee the alignment of the ITSM to the business requirements [92]. CobiT itself summarizes its basic principle as follows:

> *IT resources are managed by IT processes to achieve IT goals that respond to the business requirements [92].*

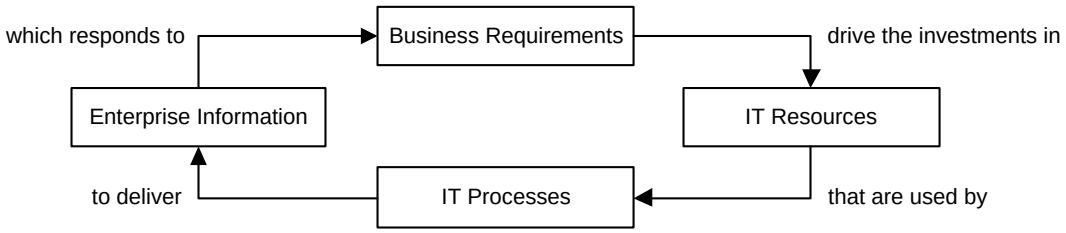


**Figure 3.3** – CobiT Principle [92]

Depending on the business requirements, an organization has to invest in IT resources which need to be managed and controlled in order to provide the IT services as required by the business. In this framework, this is done by the usage of a structured set of processes. CobiT's purpose is to be applied by ITSM organizations and auditors to provide guidance to ITSM and business management. Figure 3.4 gives an impression what is covered by this framework [92].

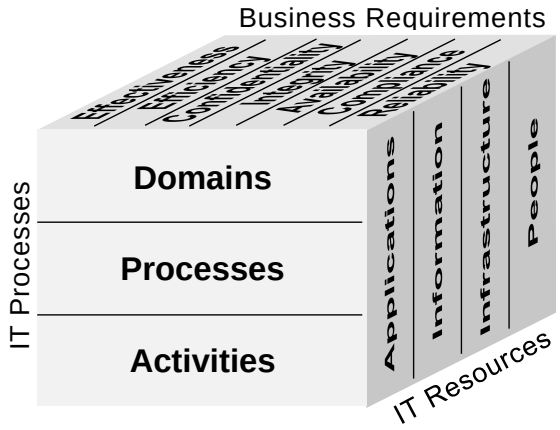


**Figure 3.4** – CobiT Cube [92]

ITSM organizations do not have to choose between CobiT or ITIL. They can be combined because CobiT is more specialized in IT controls and metrics whereas ITIL concentrates on the ITSM processes [172].

### 3.4.3 ISO/IEC Standard 20000

The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) have released ISO/IEC 20000 in 2005 and updated it in 2011 [90]. It is actually not an ITSM framework but an ITSM standard. It replaces the older BS 15000 standard released by the British Standards Institution (BSI). Its purpose is to ensure that an organization is capable to deliver IT services in an acceptable quality. Organizations can get certified to

ISO/IEC 20000 to prove their capabilities and their quality regarding the provision of IT services [96]. Thereby it fills a gap because organizations cannot get certified to IT frameworks, only individuals can [143].

ISO/IEC 20000 can be used for certification but is of no assistance in the question how to organize the ITSM processes. Therefore it recommends the implementation of an ITSM framework. Organizations are free to choose the ITSM framework, from which they think it suits them best. The standard claims to be independent of any framework [96]. Addy doubts this independence of frameworks. In his opinion the standard is tailored to ITIL what can be explained through the close relationship between the organizations which are responsible for ITIL and the ISO/IEC 20000 standard [3].

### 3.4.4 Other IT Service Management Frameworks

Some of the largest IT companies have developed their own ITSM frameworks. As one of them, Microsoft released the first version of its so-called Microsoft Operations Framework (MOF) in 1999. The current version is 4.0 which was released in 2008. The purpose of this framework is to provide guidance for the management of IT services during their entire life cycle [124].

MOF bases on the same principles as ITIL but describes in contrast how these principles can actually be put into practice. For this purpose, MOF is more structured than ITIL and gives highly detailed recommendations for daily work activities. While ITIL has to be adapted to be adopted, an organization can directly follow MOF's recommendations. It focuses on people, processes, management, and technology. In these contexts, it places particular emphasis on the organization of teams and the management of IT related risks [19].

As the framework is published by Microsoft, it assumes the usage of Microsoft's products and technologies. Generally, MOF is also applicable for organizations which use other tools than those from Microsoft but the framework is aligned with Microsoft's tools and products. It is hence most beneficial when an organization uses Microsoft's tools and products. Additionally, Microsoft provides detailed information on the use of their specific products with MOF what represents a major part of the framework's value [19].

Likewise, IBM developed its own ITSM frameworks. The current one is the IBM Process Reference Model for IT (PRM-IT) in version 3 which was released in 2008. It supersedes its predecessors IBM Systems Management Solution Lifecycle and IBM IT Process Model. It is supported by an online knowledge base about ITSM processes called IBM Tivoli Unified Process (ITUP) [189]. PRM-IT regards itself as a framework for the complete IT management and is also aligned to ITIL. It puts particular emphasis on the management of the stakeholders of the IT services and the ITSM organization as it is written from the perspective of a Chief Information Officer (CIO) [86]. IBM provides extensive resources for the usage of this framework with mainly their own products. Again, this framework is also best applied when products are used which have been provided by the framework's producer itself [87].

Another IT company which has developed its own ITSM framework is Hewlett-Packard (HP). Its framework is called HP IT Service Management Reference Model (HP ITSM) and was released

for the first time in 1997. Its current version 3.0 was published in 2003 [165]. HP ITSM is strongly aligned to ITIL and contains HP's experience, especially with its own products [77], [165]. It tries to delimit itself from ITIL but adds only minor extensions [80].

### 3.4.5 Combinations of Frameworks

As indicated in the previous sections, the ITSM frameworks do not necessarily exclude each other. Many of them can be combined because of their different focuses. For their combination, plenty of research has taken place on how to combine or map them [93], [128], [19].

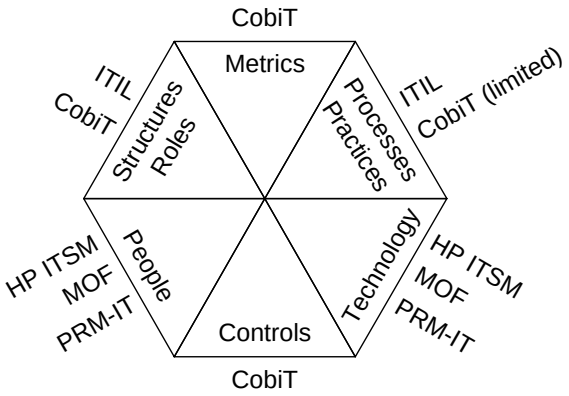


**Figure 3.5** – ITSM Frameworks [165]

Figure 3.5 presents different areas of an ITSM organization and assigns the ITSM frameworks to these areas. This gives an overview of these frameworks, shows their main purposes of application, and indicates how they can be combined [165].

CHAPTER 4

# Proposals for Knowledge Management within IT Service Management

## 4.1 Overview

This chapter presents proposals for knowledge management approaches which support the ITSM processes and analyses their advantages and disadvantages. It starts with the presentation of specific knowledge management approaches for the area of ITSM. These are taken from the ITSM frameworks presented in section 3.3.4 and are complemented by a knowledge management methodology called Knowledge Centered Support (KCS) that has been developed especially for the area of IT support. Traditional or longer existing knowledge management activities are covered by those specific approaches. The grade of coverage differs individually but the traditional knowledge management activities are basically covered.

Generally applicable approaches can also be applied for ITSM organizations besides those ITSM-specific approaches. As the underlying frameworks and methodologies are mostly best practices[1] they do not cover the latest developments and experiences. Most recently, knowledge management benefited especially from the emergence of social web technologies in organizations as they enable new forms of interactions within organizations [31], [102], [112], [116]. This development can be summarized under the term enterprise 2.0 [116]. The knowledge management approaches derived from enterprise 2.0 are presented subsequently in section 4.4. Generally, all areas of knowledge management can benefit from ICT [12]. The following chapter 5 evaluates which of the approaches seem suited for the area of ITSM.

[1] For the meaning of the term *best practices* compare section 3.4.1

## 4.2 Specific Proposals from IT Service Management Frameworks

### 4.2.1 IT Infrastructure Library (ITIL)

In version 2, ITIL contains only scattered recommendations for single knowledge management activities like the maintenance of a known error database but has no holistic knowledge management approach [137]. This has changed in version 3 that tries to combine these scattered recommendations into one specific knowledge management process [138], [198]. ITIL's process description differs from the definitions given in section 2.4.3. In ITIL, a process is defined as:

> *A structured set of activities designed to accomplish a specific objective. A process takes one or more defined inputs and turns them into defined outputs. A process may include any of the roles, responsibilities, tools and management controls required to reliably deliver the outputs. A process may define policies, standards, guidelines, activities, and work instructions if they are needed. [141].*

In contrast to this mentioned multitude of possible directives, ITIL v3 describes only briefly its knowledge management process which bases on the extended knowledge hierarchy with the levels data, information, knowledge, and wisdom as described in section 2.2.2. In ITIL's opinion, knowledge management consists of the strategic identification of relevant knowledge and the planning of its acquisition and maintenance. Furthermore it states that knowledge needs to be transferred what requires a variety of methods [142].

The centerpiece of ITIL's knowledge management from a technical perspective is the service knowledge management system (SKMS) which is an extended configuration management database (CMDB) [198]. While a CMDB stores information about CIs which are actively managed IT components [142], a SKMS is a far broader concept which stores practically all kind of information or knowledge [138]. Figure 4.1 illustrates the idea behind the SKMS. It functions as a central repository which combines all data sources and allows a consolidated access to all data. Based on this central repository, there are individual views for the specific tasks in the presentation layer. This layer is supported by a knowledge processing layer which contains facilities for knowledge querying, reporting, modeling, and monitoring [142].

As a logical consequence, the SKMS takes inputs from most other ITIL processes and provides output to practically all others. The primary aim of the knowledge management is seen in the provision of the required input for processes to enable qualified decisions [142]. From the viewpoint of the knowledge hierarchy, the SKMS and thus ITIL's knowledge management process concentrates more on information than actual knowledge.

Generally, ITIL states that knowledge transfer is a task that should not be underestimated. ITIL assumes rather unwilling individuals which have to be motivated in order to devote attention to the distributed knowledge. The classical learning methods, which include training and documentation, are not sufficient for this purpose. These learning methods have to be completed by

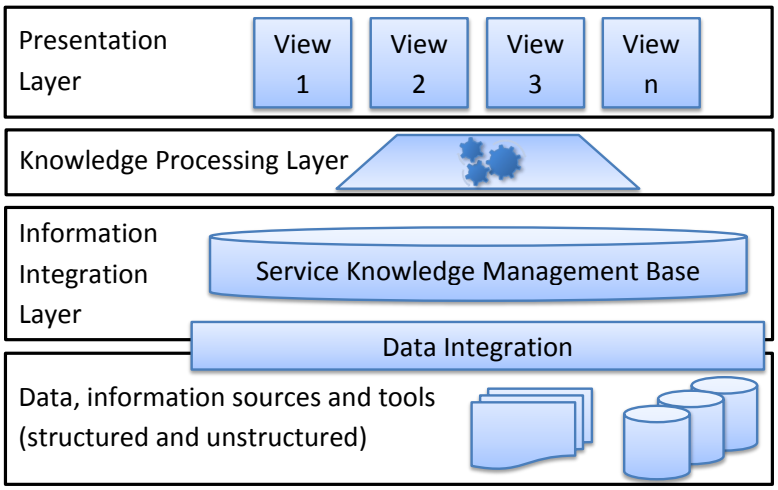


**Figure 4.1** – ITIL Service Knowledge Management System [142]

newer ones like forums, blogs, or newsletters which will be discussed independently from ITIL in section 4.4 [142].

ITIL's knowledge management approach has the following advantages:

- **Pre-definable knowledge requirements**: ITIL's approach is well suited for ITSM processes with precisely definable knowledge requirements. This applies to configuration management and partly change management.
- **Performance assessment**: Measuring the performance is straightforward as knowledge requirements are specified in advance. As far as suitable metrics are gathered, it is possible to assess whether the requirements have been met.
- **Process approach**: Defining knowledge management as a process is helpful for its institutionalization within an organization. Responsibilities and accountabilities can be assigned to roles or individuals.

On the other hand, it also has disadvantages:

- **Management superstructure**: As already described in section 3.4.1, ITIL generally tends to be bureaucratic. Its knowledge management process with the tasks of identifying required knowledge, planning its acquisition or creation, and its ubiquitous performance measurements entails the same risk, namely that it is possibly preoccupied mostly with itself.
- **Unrealistic assumption of complete integration**: On the one hand, different areas often require the same explicit knowledge but on the other hand they also require different explicit knowledge. As an example, incident management needs short guides tailored

for their requirements in order to enable a fast response. The idea behind the SKMS (to create one central repository) sounds tempting but it is questionable whether it is generally advisable considering cost-benefit ratios [51].

In addition, ITIL v3 mentions further, independent knowledge management activities within individual ITSM processes. These activities are not always mentioned explicitly as knowledge management activities but often only implicitly. In the end, however, these recommendations correspond to the approach of a process oriented knowledge management as described in section 2.4.3. Selected recommendations are described below:

- **Standard changes** are established procedures for specific types of RFCs. They consist of pre-defined steps and do not require an authorization by the change manager. Classical examples for standard changes are routine application modifications or usual hardware maintenance tasks [142]. Their main aim is to increase the efficiency of change management [74] but they also contribute to an efficient knowledge management. The formalization and documentation of these proven procedures represent an externalization and preservation of knowledge. Performing certain types of RFCs becomes less dependent from certain individuals. Moreover, the quality of these standard changes becomes more homogeneous.
- **Fulfillment procedures** are established procedures for specific types of service requests and consist of pre-defined steps [140]. Like standard changes, they represent an externalization and preservation of knowledge.
- **Post implementation reviews** are reviews which take place when the implementation of non-trivial changes has been completed. They determine whether a change is successful and whether things can be done better in future. Primarily, they are intended as a quality management measure but they are also a knowledge management measure because they institutionalize and guarantee an exchange of knowledge between individuals. This exchange leads to a continual service improvement [138]. Post implementation reviews validate according to ITIL whether
  - a change has met its goals.
  - the release of the change was successful.
  - the users are satisfied.
  - it has been implemented with the planned resources and on time [142].

### 4.2.2 Control Objectives for Information and Related Technology (CobiT)

CobiT contains mainly controls and metrics and gives only brief recommendations for possible activities. Even though knowledge management is not mentioned particularly in the framework, CobiT covers single aspects of knowledge management. It places emphasis on the transfer of required knowledge for the maintenance, operation, support, and usage of IT services after their

go-live. Thereby it deals with the provision of knowledge required by the users in order to use the IT services effectively and efficiently. Furthermore, it is also concerned with the supply of appropriate knowledge to the individuals from the ITSM organization which are responsible for the delivery, maintenance, and support of the provided IT services [92].

The controls and metrics which CobiT proposes for the transfer of knowledge concentrate mainly on the existence and quality of training and documentation. In this point it differs significantly from ITIL which regards the classical learning methods alone as not sufficient [142]. A little bit aside of these is the control of the number of incidents which are caused by insufficient knowledge of users or differently stated which are caused by deficient documentation or training.

In addition, CobiT mentions knowledge controls and metrics for managing human resources with regard to knowledge but this can be regarded rather as competence management than as knowledge management (compare section 2.3.2) [92].

### 4.2.3 ISO/IEC Standard 20000

ISO/IEC 20000 does not contain a specific knowledge management because it focuses on the fundamental requirements for a reliable, customer-oriented ITSM. On an operational level, it demands the same processes as ITIL proposes [96], [104] and its requirements are practically fulfilled by the recommendations from ITIL. In many cases, ITIL gives even more elaborated recommendations than required by ISO/IEC 20000. A major difference is that ISO/IEC 20000 demands only a CMDB and does not mention anything like the SKMS proposed by ITIL [48]. Apart from that it also recommends:

- Performing post implementation reviews in change management.
- Providing workarounds and fixes by the problem management for the incident management what can be considered as a basic knowledge base (KB).
- Capturing all incidents with all related, useful information [96].

### 4.2.4 Other IT Service Management Frameworks

MOF does not contain a specific knowledge management but it covers implicitly some knowledge management activities on an operational level [128], [19]. First of all, it recommends to specify so-called knowledge management policies. They should cover the GRC requirements and contain instructions for data protection, privacy, and lifecycle management. These policies consist according to MOF mainly of encryption requirements, backup guidelines, and a collection of regulations about obligatory minimum and maximum data storage periods [126].

More important for this thesis are MOF's knowledge management recommendations for the incident and problem management which are closely related to each other from a knowledge

management perspective in this framework. The quality of the incident management depends mainly on the quality of the KB, the experiences of the individuals within incident management, and their capabilities. MOF's incident management process contains several activities related to knowledge management which are listed below [121]. They give guidance on knowledge preservation, transfer, and usage.

- **Searching applicable KB articles**: MOF recommends to ease up the search as far as possible, namely the provision of ideally one single search interface for all kind of KB articles. Moreover, enriching the KB with metadata helps to get better search results. Tracking the usage and usefulness of KB articles assists to continually improve the KB. KB articles with a low usefulness can be enhanced or deleted. KB articles with a high usage can possibly be published directly in the self-help portal.
- **Sending KB articles to users**: This task is not just done with the simple forwarding of a KB article. Before sending, it has to be evaluated whether the knowledge base article is appropriate for the user. If not, the KB article has to be adopted for the user. In most cases, it is better to send a link instead of a copy of a KB article because KB articles can possibly be updated or become obsolete. If a user has received a copy and faces the same problem a second time he will use a possibly outdated version. After sending the KB article it is recommended to ask whether the user has actually received the links. This question allows it to offer the user additional help for the application of the KB article, when he needs any.
- **Linking incidents with the applied KB articles**: On the one hand, the linkage of requests with KB articles helps to track the usefulness of KB articles. On the other hand, it assists in the handling of individual incidents and problems. This linkage makes transparent what has already been tried [121].

Furthermore, MOF recommends post implementation reviews at the end of the change management process like ITIL but gives more detailed guidance on them. They contain the following parts according to MOF [120]:

- Validation of its technical success
- Validation of its business success
- Audit of the correct maintenance of the affected CIs in the CMDB
- Validation of its communication
- Validation of its documentation [120]

All five of them are supposed to determine whether the change has been successfully implemented. They are hence a quality management measure. These parts lead to the creation and transfer of knowledge, especially when activities are identified which could have gone better.

This knowledge can be applied for a continual improvement. The latter three parts have the same effect but also control the knowledge management itself. They validate whether the required knowledge was successfully created, transferred, and distributed for the reviewed changes. This is a direct form of knowledge management control. Apart from that, MOF mentions measures for control mechanisms only in passing. As a consequence, it is of no assistance for the selection of suitable KPIs.

IBM's PRM-IT contains a knowledge management whose purpose is acquiring, creating, maintaining, transferring, and institutionalizing knowledge in order to allow individuals an effective execution of their tasks [86]. Detailed knowledge management recommendations are given in ITUP. It contains a detailed knowledge management process since its latest version (7.14) [88]. Knowledge management is regarded as an administrative process which contains strategic and operative tasks [86].

On the strategic level, the process is concerned with the specification of the actual knowledge management and its relationships to other processes. Parts of this specification are policies, standards, process definitions, measurements, controls, and similar artefacts. The resulting knowledge management from this specification is periodically evaluated in order to support a continual improvement [86].

On the operative level, it focuses strongly on the knowledge manager role. In addition, it suggests the roles knowledge analyst and subject matter expert. Subject matter experts have knowledge of a specific domain and knowledge analysts are responsible for a specific domain. They are responsible for the domain-specific input whereas the knowledge manager is responsible for the daily, general management tasks inside the knowledge management. The operative tasks of the proposed knowledge management process are summarized below [86].

- **Identification of required knowledge**: The identification of required knowledge happens actively and passively by the knowledge manager. For the active identification, he investigates required, but not available knowledge. For the passive identification, he collects knowledge requests from other individuals and reviews them.
- **Acquisition and maintenance of knowledge**: Subsequent to the identification, the knowledge manager reviews the knowledge gaps and searches for knowledge sources. These can be developing new knowledge, harvesting existing, but unstructured knowledge, and purchasing external knowledge.
- **Evaluation and structuring of knowledge**: New knowledge submissions are examined whether they meet the quality guidelines. Submissions with minor quality deficiencies are send for revision. Submissions which meet the quality guidelines are finally brought into structure and stored by the knowledge manager.
- **Monitoring of the knowledge management**: This task monitors the efficiency and effectivity of the knowledge management and looks for possible improvements. Therefore, the knowledge manager collects feedback, analyses process measurements, assesses the level of process execution, and researches the most recent knowledge management trends [86].

Incident management is related with knowledge management in ITUP but it extends barely ITIL's knowledge management contributions for this area. During the solution of incidents, the KB is searched for fixes, known errors, workarounds, and previous incidents, which may assist to resolve a new incident. If workarounds are developed during incident management they will be stored in the KB. Besides that, incidents are related to CIs and all relevant information is stored for an efficient, further handling of the incidents and their possible reuse [86].

The same is valid for problem management: The KB is searched for applicable knowledge. When useful or necessary, KB articles for known errors are created and new RFCs will be opened and linked with the problems [86].

Change management and configuration management are described in detail in ITUP but they do not contribute further guidance beyond ITIL from a knowledge management's point of view [86]. Unsurprisingly, the majority of the proposed KPIs for knowledge management are concerned with incident and problem management [86]. The proposed KPIs are in particular:

- Average time required to solve incidents
- Percentage of errors caused by users
- Percentage of incidents and problems caused by lack of knowledge
- Average number of KB accesses
- Number of individual KB article accesses
- Total size of KB [86]

In contrast to ITIL and PRM-IT, HP ITSM contains no explicit knowledge management process [77]. As noticed in section 3.4.4 it does not extend ITIL considerably and thus is not of any assistance for any knowledge management within ITSM.

## 4.3 Specific Proposals from Knowledge Centered Support (KCS)

KCS is a knowledge management methodology for the field of IT support whereas IT support can be regarded as an important part of every ITSM. It covers the processes of incident and problem management. The development of KCS started in 1992 and it is published by the Consortium for Service Innovation (CSI) whose members are mostly IT companies. Eminent members are for example Cisco, Microsoft, and Oracle. The most current version of the methodology is 5.0 which was published in 2011 [23], [62].

The methodology assumes that knowledge will never be entirely accurate or complete and that it is better validated a posteriori through its practical application than a priori by reviewing experts. In this way KCS tries to avoid unnecessary efforts for the creation and review of knowledge that will not be accessed. Instead of the traditional writing of KB articles detached of the handling

of incidents and problems, KCS tries to conserve the knowledge which is generated as a by-product during the handling of incidents and problems. Individuals will create new KB articles during the incident and problem management process if they cannot find existing ones. Furthermore, if they find incomplete or incorrect KB articles during their search they will extend or correct them directly. In doing so, the knowledge content is created as a by-product of the resolution of incidents and problems. The KB evolves autonomously depending on the demand and its actual usage. It is created from the collective experience of all participating individuals. Because of that, KCS rewards on one side and requires on the other side general collaboration, common sharing of knowledge, and a continual revision of the KB. To achieve these goals, the methodology contains two loops as shown in figure 4.2 [62].

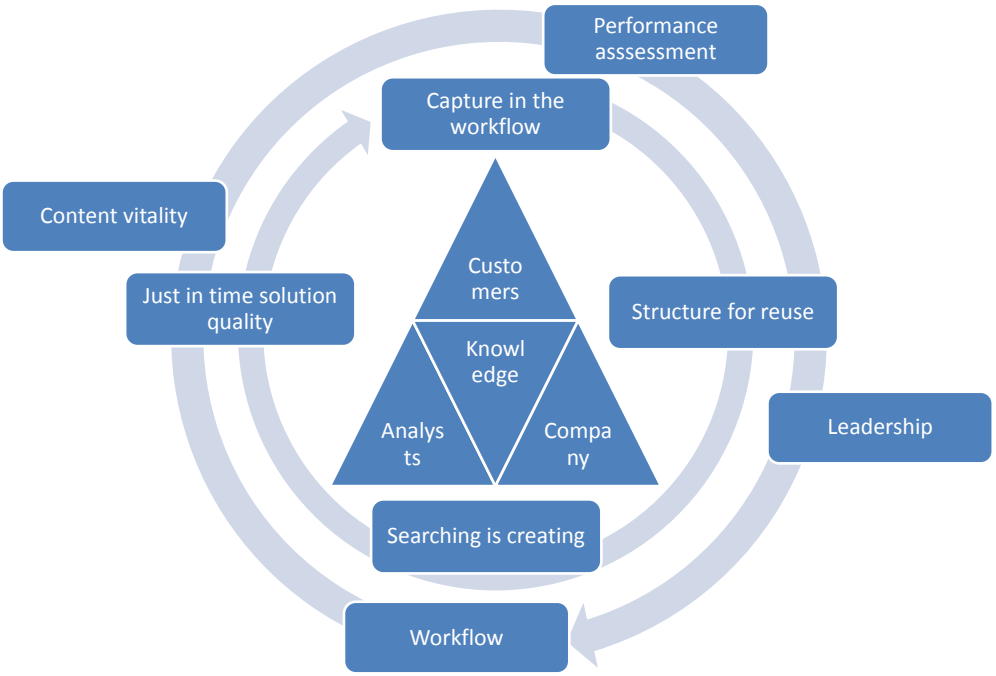


**Figure 4.2** – KCS Loops [61]

A triangle is located in the middle of figure 4.2. It represents the created knowledge in form of KB articles which ideally integrate the experiences of all key stakeholders of IT support: customers, users, support analysts, and the company. This triangle is surrounded by the inner loop, called solve loop. This loop contains the practices which directly create, maintain, and use the KB articles. The solve loop is positioned at the level of resolving single incidents and problems. It does not specify how to resolve incidents and problems but how to create, maintain, and use the gained or required knowledge during the handling of incidents and problems.

- **Capture in the workflow**: It is intended to store all knowledge which emerges anyway in the incident and problem management. This practice contains the storage of inter alia

the resolution of the incident, the keywords being searched in a self-support-portal before a user opened a new incident and the keywords being searched by support analysts in the KB. The information given by the users is also stored even when it is technically inaccurate because it gives valuable information about the users' environment and eases up future searches.

- **Structure for reuse**: KCS defines a structure for KB articles. This structure ensures a certain consistency within the knowledge base and enables individuals to obtain a quick overview of a single KB article. The methodology does not require complete sentences. Simple phrases or text segments are sufficient as long as they represent complete thoughts. The intention is to phrase everything with as little effort as absolutely necessary but as complete that it can be easily understood.

- **Searching is creating**: Particular emphasis in this methodology is placed on the act of searching. It helps to find KB articles on exactly the same or similar issues. Even when a found KB article does not address directly the issue, it can help through the provision of another perspective on the issue. When helpful KB articles are found they can be linked in order to conserve that linkage for later viewers. External documents or resources from external sources can be linked to KB articles likewise because the handling of incidents and problems requires searches in external systems or the internet in many cases. Last but not least, the words being unsuccessfully searched contain valuable knowledge as they can be related to the finally found knowledge base articles.

- **Just-in-time solution quality**: When IT support comes into first contact with a certain issue, the KB article on it is written down for the first time. Many issues occur only once and normally it can hardly be predicted which issues occur more often. Reviewing all newly written KB articles is thus inefficient as many of them will never be accessed again. Therefore reviews of KB articles happen in time when they are reused. Ratings and successful reuses of KB articles are stored. Depending on the number of reuses and the rating, anyone can decide how much he trusts a single KB article. If someone finds errors or inconsistencies in a KB article he will ideally correct it or at least have the responsibility to flag it as incorrect. These constant reviews guarantee that the still required KB articles are up to date [62].

The outer loop is called evolve loop and is positioned on the organizational level. Its aim is to facilitate organizational learning and to enable improvements [62]. It is composed of the following practices:

- **Leadership**: KCS requires acceptance by all types of stakeholders and motivated individuals in order to be successful implemented. For this purpose, it gives guidance for numerous issues in the area of leadership and communication.

- **Workflow**: This practice supports the solve loop by guidance on how to integrate the knowledge management tool with the incident management tool and other external tools.

- **Content vitality**: KCS provides a number of techniques which help to increase the health of the content. They give advice on the structure of KB articles, how to manage the lifecycles of KB articles and their quality, how to develop a KB standard for individual organizations, and how to increase the reuse rates of KB articles.
- **Performance assessment**: Traditional management practices aim more on competition than collaboration between individuals. Their performance measures are thus only limitedly suitable for this methodology. In order to alleviate this, KCS recommends more appropriate performance measures [62].

KCS mentions a wide range of possible KPIs for different purposes. They partially overlap with the KPIs proposed by the ITSM frameworks. A selection of the most important ones is presented below [62]:

- Ratio of reused KB articles to new KB articles
- Total size of KB
- Ratio of new to known incidents
- Average time required to solve new and known incidents
- Percentage of KB articles which are consumable by users
- Percentage of users who use self-support first
- Percentage of self-support success

Compared to the other approaches which separate the knowledge creation from the incident and problem management more strictly, KCS brings the following advantages:

- **Enhanced collaboration**: Individuals are forced to collaborate what leads to a positive impact on the general organizational culture. Collaboration in other areas will also profit by it. From a knowledge management's point of view, the high collaboration is valuable because it affects the areas of socialization and combination of the SECI model which both often get little attention (see section 2.4.1). Actually, the methodology affects all four areas. It also considers explicitly or implicitly all areas from the building blocks model (see section 2.4.2).
- **Efficient knowledge management**: The control what knowledge to create or maintain happens largely autonomously. Misallocation of resources by the creation or maintenance of unnecessary KB articles is reduced to a minimum. In a way, it also takes the recommendations of the process oriented knowledge management (see section 2.4.3) into account.
- **High responsiveness**: KCS can quickly react on occurring incidents and problems because formal reviews are not required and knowledge gets published immediately.

On the other hand, KCS has some disadvantages as well:

- **Limited performance measurement**: Although, the methodology offers approaches for performance measures, the performance of individuals is nonetheless hard to measure because of the highly collaborative approach with shared responsibilities.
- **Major shift of organization**: The highly collaborative approach requires additionally a major shift of the organizational culture what even KCS admits itself [62].
- **Narrow focus**: KCS has a narrow focus on IT support. The methodology does not provide help for other areas of ITSM like configuration or change management.
- **Purely reactive**: The methodology is purely reactive. It does not contain activities for the proactive creation and maintenance of KB articles for issues which can be foreseen e.g. by software changes. In practice, it should be easy to add such activities to the methodology.

## 4.4 General Proposals from Recent Technological Innovations

### 4.4.1 Intranet

In the broadest sense, the term intranet refers to a computer network which uses common internet technologies but which is only available within an organization [145]. In a narrower sense, it refers only to an intranet portal that is an internal website which unifies the access to many sources of knowledge [20]. Intranets started to become popular during the mid-nineties [11], [109].

Intranets contain much knowledge and are able to support knowledge management extensively. All four areas of the SECI model (see section 2.4.1) can be supported [168]. Hence, they can be used for a wide variety of knowledge management activities.

Intranets can contain a wide range of applications [27], [132]. These range from classical webpages directly coded in Hypertext Markup Language (HTML), over content management systems (CMSs) and document management systems (DMSs) to enterprise content management (ECM) platforms. Intranet technology is a prerequisite for the other enterprise 2.0 tools, viz. blogs, forums, and wikis which are described in the following sections. They base on the same technologies and are ideally integrated within the intranet portal. Current intranet applications enable already a user participation (the basic idea of web 2.0) and often possess already integrated enterprise 2.0 tools [106], [160].

The use of sophisticated intranet applications can ease the search for knowledge. They have the ability to combine a variety of different types of knowledge sources in one general full-text search. In addition, they can provide joint navigation structures. Moreover, the creation and maintenance of explicit knowledge can be eased by enhanced collaboration capabilities and an automatic versioning especially in comparison to classic network drives which have only

a limited version control and normally do not enable the simultaneous edition of documents. Information security can be ensured by an existing user access management [75], [192]. Intranet applications are most beneficial when they are introduced to the greatest possible extent and are used intuitively by most individuals as first point of search for knowledge [108].

These benefits cannot be achieved automatically only by the introduction of a sophisticated intranet application. In comparison to classic network drives, the structure of intranets is less fixed what leads to the problem that individuals often do not know where to store certain knowledge. Furthermore, permissions are normally granted more restrictively than in classic network drives because the user access management is easier to use. Granting permissions does not require an administrator but can be done by normal users who are allowed to grant permissions for certain parts. For this reason, initial permissions for new users are normally less extensive because they can easily be granted subsequently whenever necessary. The combination of limited permissions and an unorganized structure can lead to the situation that individuals are not aware whether specific knowledge exists. When the efforts to find the desired knowledge are too high and if it is not certain whether the search will be successful, individuals tend to act or decide without the consideration of all theoretically available knowledge [5], [114] [195].

To prevent these risks, it is recommended to grant permissions as far as possible. In practice intranets are often too much access controlled [83]. The possible level depends on the type of the organization. The ITSM of an organization which produces high-technology military goods as an example will have a higher confidentiality than the ITSM of a food manufacturer [8].

### 4.4.2 Blogs

Blogs are an online publication of an individual or a group consisting of a number of articles. The articles are presented in a reverse chronological order. Readers can normally add comments. In this way, direct feedback is enabled. Blogs arose in the 1990's and were first used as simple, publicly available diaries. Over time, they have become more popular and specific software has been developed for blogs which makes them easy-to-use. They can be used for publications about the author or a specific topic. It is possible to publish blogs publicly on the internet or just inside the intranet of an organization. They are a possible approach for the transfer and sharing of knowledge [173].

While external blogs aim at a mostly unknown audience, the readers of internal blogs are mostly known. Hence, internal blogs can be compared with e-mails which are sent to a larger number of receivers [131]. In comparison to e-mails, publishing articles in blogs contains a higher risk that some individuals do not read them. Individuals can ignore blogs easily, meaning that they do not read them at all or rather sporadically. Whereas it can be assumed that all receivers of an e-mail read at least the message subject [164]. Technologies like Really Simple Syndication (RSS) and Atom Syndication Format (Atom) enable a subscription of blogs which inform the reader when new articles are available and minimize the effort to look for new blog articles [166]. Users need a so-called feed reader in order to subscribe blogs. Such feed readers exist as stand-alone software but are also integrated in many web browsers and e-mail clients [111], [164].

Blogs differentiate from emails in further characteristics. While every single email can be send to an individual set of receivers, it is not possible to control the receivers of an individual blog article [131]. On the other hand, receivers can forward emails what limits the control of information for the author of the email as well. Another benefit of blogs is that articles are also available to individuals who just have joined the organization and normally do not have access to emails sent in the past.

Receivers of emails are more or less forced to read them or at least to decide after judging the subject header whether to read them. The high number of send and received emails leads to an email overload [199], [54]. Blogs can help to reduce this overload. Reading blogs is generally voluntary and the activity of reading can more easily take place at convenient times [131], [187].

Reading external blogs is a possible source for the acquisition of new knowledge like e.g. reading professional journals. Newly published blog articles do not correspond to a certain change, incident, or problem. Likewise, internal blog articles can but do not necessarily correspond to a certain change, incident, or problem as well. Hence, the activity of reading blogs refuses to become an inherent part of the ITSM processes. Nonetheless, the initiated knowledge transfer increases the knowledge of the organization and thus improves indirectly the execution of IT services and leads presumably to better or faster outputs. Additionally, a continual service improvement is promoted by sharing experiences.

The motivation to write blog articles differs enormously between individuals. Blogs tend to encourage the motivation of knowledge sharing because they respond well to the desire of social recognition through their author-centric approach [84].

As blogs have aims, their success is ideally measured indirectly by the measurement of their aims. In practice, often it may not be feasible because of other influencing factors which influence these aims much more than the blogs. A direct control of their success is generally more promising. The knowledge manager should regularly control the number of accesses of the blogs and individual articles. He should also figure out regularly whether the readers find the blog articles helpful.

### 4.4.3 Forums

Forums are software applications for discussions between individuals. Their origins date back to 1986 [164]. They have in common, that all users can read and post messages which are basically visible to all other users. These messages are organized in threads whereas threads refer to specific discussions. They display the messages either in a strictly chronological order or as a threaded, tree-like discussion. Threads are normally categorized by sub-forums for different topics what enables to browse the forum [31]. Alternatively, forums can be searched by a full-text search [144].

Besides administrators, forums know three types of users: guests, registered users, and moderators. Guests can normally only read threads and messages. If they want to post a message or start a thread they will have to register. Moderators monitor the discussions. They have the

ability to move messages to other threads, edit messages from other users, or delete them if necessary [164]. Many software applications allow limiting the access to sub-forums on a user group or user level [47].

In the area of ITSM, the most obvious purpose of internal forums is to help when incidents or problems occur. Other individuals may know the answer and could provide their knowledge. Regardless of its possible benefits: internal forums present a risk for the incident management because individuals are tempted to bypass the defined incident management process. Individuals may start a thread in a forum instead of opening an incident in the incident management software. As a result, the ITSM organization loses control over these incidents. It cannot be ensured that these incidents are handled in time [43].

The usage of external forums can integrate external knowledge into the ITSM organization. Those forums can be used within incident and problem management. In the first instance, they can be used passively, namely relevant forums can be searched. The more widespread a software is the more probable is it that matching information can be found for a specific incident or problem. Compared to knowledge bases from software vendors, forums are less reliable but they are often more comprehensive.

In problem management, they can also be used actively. New threads can be started for problems. Depending on the activity in the forum, responses can take some time. They are an alternative to the classical escalation of problems towards the software vendor but require much consideration about information security. Parts of the information have to be omitted or anonymized. Some problems are not suitable to be posted in a public forum at all.

### 4.4.4 Wikis

The origin of wikis reach back to 1995 when the first wiki was developed [110]. Due to the success of Wikipedia many other wikis have been started [71]. The technology behind the wikis has evolved rapidly in the same speed [173]. More than 100 different wiki software applications have been developed until today [26] which have several basic principles in common:

- Collaborative approach: Wikis encourage the collaborative work on articles and rely on the assumption that groups are often wiser than the wisest individuals in them [146], [175].
- Simplified user roles: Except one or a small number of administrators, all users can have the same user role. They all have the same permissions what allows anybody to fully edit any article or to freely create new articles [173].
- Syntax: Most wikis offer a formatting syntax in which users can format their articles [173]. This syntax is basically identical for all wikis. Some of them offer an additional graphical editing interface (What you see is what you get. (WYSIWYG)) [9].
- Version control: Wikis contain a version control which saves article histories. It can be tracked how articles have evolved or which individuals have contributed to an article.

Different versions can be viewed or compared with each other as well as previous versions can easily be restored [173].

Wikis can be used in two different ways: On the one hand, they can be used publicly on the internet, like e.g. Wikipedia. On the other hand, they can be used by closed groups, e.g. organizations or project teams. The latter are referred to as enterprise wikis and have some fundamental differences which are explained subsequently [66].

- **Abuse** Vandalism, edit wars[2], and similar forms of abuse pose only a problem in public wikis where users can stay anonymous [173]. These phenomena are not experienced in enterprise wikis because the users are known or can easily be tracked. When individuals use enterprise wikis in an inadequate way they can be contacted directly [83].
- **Access** is fundamentally different. While the access to articles is usually unrestricted in public wikis, it often has to be restricted in organizations due to a possible confidentiality of parts of the information. Different groups of users have access to different articles [83].

A proper motivation of individuals is essential for the success of any wiki. Wikis are socio-technical systems as they combine technical and social aspects. Besides the technical platform, they require participating individuals and appropriate social mechanisms in place. During a study on the usage of wikis in an organization, Schütt experienced that individuals can have inhibitions to modify articles of others [167]. This questions the general, practical usefulness of wikis as a tool for collaborative work inside an organization. Nevertheless, individuals will contribute more if they can identify themselves with a wiki. The identification with a wiki will be high if the individuals understand and support its purpose. Therefore, wikis can be used best for projects or special, delimited purposes.

Knowledge has to be found when it is required. Hence, it should be as easy as possible for individuals to find the knowledge which the wikis contain [83]. As a result, wikis are ideally integrated in the intranet. Individuals should notice their existence when they browse the intranet. In addition, the specific wiki articles should be found by the general full-text search of the intranet when they contain the respective search words.

[2] A situation is called edit war when two or more users repeatedly and mutually undo the changes of the respective other users [105]

CHAPTER 5

# Evaluation of the Proposals

## 5.1 Overview

In the previous chapter, knowledge management proposals were made for the area of ITSM. Some of these proposals assume different organizational principles and cultures. This seems like a contradiction or inconsistency at first sight but individuals are not limited to one role [117]. Actually, they can take different roles depending on the situation so that approaches with different organizational backgrounds can be combined but the further they are away from each other, the more complicated it will be for the individuals to change roles.

This chapter evaluates the usefulness of these proposals for the ITSM. To start with, it evaluates which proposals are suited best for the operational processes in ITSM. In addition, proposals are evaluated which are not directly related to ITSM processes.

It is assumed that there is a knowledge manager who is responsible for the operational knowledge management tasks. Generally, a knowledge manager is not explicitly necessary. The tasks and responsibilities, which are assigned to the knowledge manager in this thesis, can generally also be assigned to other roles or individuals.

## 5.2 Incident Management

ITIL's approach does not suit well the needs of incident management from a knowledge management's point of view. It tends to cause a relative high bureaucratic superstructure for the maintenance of the KB which is used within incident management. Besides the high effort, it demotivates individuals to participate actively in the maintenance of the KB and leads to a relatively low speed of reaction. This may be acceptable for change and configuration management, where the reduction of inadequate or deficient changes outweigh the benefits from a higher speed

of reaction. In contrast, incident management has to react fast and the impact of an inadequate solution of single incidents is generally low. KCS can potentially fill this gap but its implementation requires a major cultural change for most organizations. KCS can be implemented as proposed by the methodology when such a change of the organizational culture is certainly achievable. But if it seems uncertain, a mixture between ITIL and KCS will be more suitable. For most organizations, this necessary change seems uncertain. As mentioned in section 4.3, even KCS itself places particular emphasis on this issue. Hence, this thesis concentrates on a generally practicable approach: a mixture between ITIL and KCS.

The individuals in incident (and in problem) management have ideally the same rights as in KCS. The direct publication of created or updated KB articles is allowed for most types of KB articles. A basic rule of thumb can be stated: As long as the readers are experienced individuals inside the ITSM organization, it can be expected that they are able to recognize wrong information. A mandatory review is thus not necessary. Nonetheless, a knowledge manager should occasionally conduct reviews of new KB articles and updates in order to ensure the compliance with the guidelines and a certain level of quality.

The situation differs for self-support KB articles. When they are inadequate or defective, they can potentially have a high, negative impact because they are also read by users with low ICT knowledge who cannot recognize useless, wrong, or even harmful information. In most cases, users will only be unable to successfully apply the KB article what decreases the satisfaction of the users. In certain cases, poor KB articles can possibly worsen the problem. They can even lead to the loss of data or open security breaches. For these reasons, a knowledge manager has to review compulsorily such KB articles and updates before they can be published. In addition, the knowledge manager decides on a case to case basis whether additional reviews are necessary by subject matter experts.

The incident management process as proposed by ITIL can stay basically the same. It only has to be extended by some minor additional tasks for an efficient knowledge management. These additional tasks are:

- **Updating KB articles**: When individuals notice errors, lacking information, inappropriate, or outdated KB articles during their search in the KB, they should directly update them whenever possible. If they are not able to update a KB article directly they will have to flag it as inappropriate.
- **Flagging KB articles**: KB articles can be flagged when they are inappropriate, outdated, or need to be updated for some other reason. These observations can be submitted by email or via a phone call but preferably by a dedicated function within the used incident and problem management software application. The knowledge manager will be informed about flagged KB articles and will initiate further steps.
- **Rating KB articles**: When individuals read and apply KB articles they should rate them. A general rating on a scale from one to five is sufficient for this purpose. Submitting a rating should be as easy as possible for the users. Ideally, it requires only one click.

- **Adding additional keywords**: When individuals search for KB articles they should be able to add additional keywords to them. Adding additional keywords helps to find KB articles in future searches. It is completely voluntary. When individuals find it appropriate to add additional keywords it should not be prevented.
- **Recommending KB articles**: When individuals create or find incidents or problems which they regard as suited to become KB articles, they can recommend them. The knowledge manager will process these recommendations and initiate further steps.
- **Writing KB articles**: In addition to recommendations for KB articles, individuals should be able to add new KB articles to the KB. Creating and writing these new KB articles should not require much effort because it is not known how often they will be reused. Hence, these KB articles should be rather brief. They can summarize made experiences or refer to useful external sources of knowledge which have been found during the handling of incidents or problems.

These tasks ensure the maintenance and continual improvement of the KB. Furthermore, they preserve newly acquired or created knowledge. The additional tasks do not change the incident management process workflow (compare appendix B.1) but are done within the following activities:

- Initial diagnosis
- Investigation and diagnosis
- Resolution and recovery

In addition, incidents have to be categorized according to their type for an efficient work assignment inside the ITSM organization. A very basic categorization would be for example software, hardware, or network. In combination with the information about the affected IT services, the categorization allows to assign incidents to individuals who are capable to resolve the incident. For this purpose, a taxonomy with fixed categories is suited.

ICT evolves quickly. New terms and categories will hence arise over time. The more detailed a taxonomy is, the more often the insertion of new categories will be necessary to keep the taxonomy up-to-date. Subsequent insertions of new categories tend to increase the complexity and disorder of the taxonomy. The more complex and disordered a taxonomy becomes, the more inadequate will it be applied. Furthermore, a detailed categorization is not required for the assignment of incidents. Instead, a relatively coarse categorization will be sufficient for a correct assignment in most cases.

There should be the possibility to use folksonomies in the KB to improve the search results. This means that every individual should be able to tag any KB article with any keyword that he finds appropriate [115]. The system will support this task if it suggests automatically possible keywords. These keywords can for example be derived from search keywords recently used by the user.

## 5.3 Problem Management

The findings from incident management apply similarly to the problem management. ITIL's problem management process can also be recommended largely unchanged. Likewise, it has to be extended by the same additional tasks as the incident management process which are presented in the previous section. Within the problem management process workflow (compare appendix B.2), they are part of the following activities:

- Investigation and diagnosis
- Create known error record
- Resolution

Incident and problem management should use and maintain the same KB. In addition, they should be categorized by the same taxonomy. In comparison to the incident management process, updating and writing new knowledge base articles is not optional but mandatory when the KB does not contain the new knowledge gained during the diagnosis and resolution of the problem.

In addition, it should be checked whether a problem can be put in relation with a change. If so, such a problem-causing change could eventually be caused by missing knowledge. The individuals, who implemented the change, are perhaps not even aware of their missing knowledge. Summarized, occurring problems can reveal knowledge gaps. When the problem or its identified cause is not especially serious, the implementation of the workaround or fix for this problem should just be assigned to the originally responsible individual for the problem-causing change. He will remember the change, recognize what went wrong, and gain new knowledge. Finger-wagging is ideally avoided as much as possible in order to prevent demotivation. However, when the problem or its identified cause is serious, it has to be discussed between the involved individuals. This initiates a transfer of knowledge and support a continual improvement.

## 5.4 Configuration Management

ITIL's approach suits the needs of configuration management from a knowledge management perspective. As mentioned, a full SKMS is too complex and costly in most cases. In compliance with the other examined ITSM frameworks and ISO/IEC 20000, a CMDB has to be established and maintained. In doing so, the level of detail has to be balanced between its benefits and the necessary effort for its maintenance.

IT services and their underlying applications can be very extensive, like enterprise resource planning (ERP) applications. In order to achieve an appropriate expressiveness, the definition of CIs seems advisable down to software application versions and modules. In some cases, it might even be useful to maintain submodules for extensive modules. The maintenance of

these modules does not require any mentionable effort but can provide valuable knowledge in combination with change management. As CIs, IT services are not further divided. Hardware is likewise stored in the CMDB on a relatively high level, for example clients, servers, printers, and network devices but no peripherals. Depending on the type of a certain ITSM organization the level of the configuration management can vary. The maintenance of peripherals would e.g. be relevant if the ITSM organization had to comply with very high security standards [99]. Summarized, the CMDB contains CIs in general for:

- IT services
- Hardware assets
- Software applications
- Software application modules
- Software application versions

Unquestionably, these CIs have to be connected with each other, e.g. which software applications run in which versions on which clients or which software applications and hardware assets are used by which IT services. This explicit knowledge in the CMDB assists the operational provision of IT Services. Incidents, problems, and RFCs can be related to CIs. The CIs provide additional information for the risk assessment and implementation of RFCs. Moreover, they can help to identify areas for quality improvements and supports a continual improvement.

ITIL's configuration management process can be recommended from a knowledge management perspective because it ensures a reliable maintenance of the CMDB as well as its continual adaptation and improvement. That is sufficient. A particular distribution of the knowledge within an ITSM organization is not required because the communication of noteworthy changes is covered by the change management process.

## 5.5 Change Management

ITIL's recommendations for change management are basically sufficient from a knowledge management perspective. RFCs should always be connected with the affected CIs and briefly express their purpose. Depending on their size and their possible impact, RFCs should contain a more or less extensive description of their underlying reasons, business requirements, technical requirements, implementation plans, and accompanying risks. These provide the responsible individuals with the knowledge that they require to make reliable decisions whether certain RFCs should be implemented. Furthermore, they allow to trace how decisions have been taken what generally helps to satisfy GRC requirements. The change manager defines preferably the desired extent of these descriptions. This extent should satisfy the requirements of a reliable change management but keep the necessary efforts reasonable.

Standard changes as recommended by ITIL are an effective method for the explication of knowledge. The level of the knowledge explication can be simply measured by the total number of pre-defined standard changes models which are actually applied. How far standard changes increase the efficiency of change management can be measured best by the level of applied standard changes in relation to the average completion time of all changes.

Particular emphasis should be placed on post implementation reviews as they support the creation of knowledge, its transfer, learning, and a continual improvement. These reviews are proposed by all ITSM frameworks. MOF gives particularly good guidance about their conduction. It recommends various parts which post implementation reviews should contain (compare section 4.2.4). The part of the validation of the documentation is actually conducted of two parts. One part checks whether the change itself has been documented reasonably. The other part validates whether existing user and technical documentation have been updated. To ensure this, the parts of post implementation reviews are defined more granularly:

- Validation of its business success
- Validation of its technical success
- Validation of its communication
- Audit of the correct maintenance of the affected CIs in the CMDB
- Audit of the correct maintenance of the affected user documentation
- Audit of the correct maintenance of the affected technical documentation
- Validation of the correct documentation of the change itself
- Validation of its implementation within the planned time and resources

Most important is the validation of the business success because the goal of any IT service is to support the business. Therefore, it has been put at the first place. The validation of the technical success is also of indispensable importance. The other parts follow. Their importance can differ depending on the type of the change. Furthermore, not all of these parts apply to all changes, e.g. error fixes or hardware maintenance normally do not entail a change of user documentation. The validation of its implementation within the planned time and resources has been added. It is not a part in MOF but in ITIL. It is not covered by the other parts and leads to a creation and transfer of knowledge in the same way as the validation of the business and technical success.

Primarily responsible for these post implementation reviews is the change manager who decides who participates in post implementation reviews [142]. If there is a knowledge manager it will be useful to invite him sometimes because some parts of these reviews validate directly parts of the knowledge management. It is not necessary that he participates in all reviews. It is sufficient when he gives advice on what has to be considered from time to time. Furthermore, he has to ensure that the appropriate attention to the knowledge management aspects is actually paid. A

problem can be as an example the maintenance of the technical and user documentation which obviously requires some effort. The effort for a complete documentation is often not desired and eventually in some cases not feasible at all [57], [148]. The knowledge manager has to assist in the mediation in order to find an appropriate level of documentation.

## 5.6 Process-independent Proposals

The implementation of a sophisticated intranet application is recommended. It should generally be used as the first place for the storage and publication of documentation. It is also suited for collaboration when different individuals work on the same document to combine their knowledge. Other existing solutions like document management on networks drives should be replaced by the intranet. Current, sophisticated intranet applications offer a wide variety of possibilities which easily overexert many users. To be applied effectively and efficiently, an elaborate usage and active management is required. There should be one or more individuals who are responsible for the management of its usage and maintenance. These tasks can be assigned for example to a knowledge manager. They include basic administration of the intranet application, searching for knowledge duplicates, assistance for restructuring when structures become confusing, and user support especially when individuals have questions how to use the intranet or how to store the knowledge. The responsible individual(s) should also actively start initiatives for the improvement of the intranet application or its usage when such demands are noticed.

Internal blogs can be recommended for a better communication inside the ITSM organization. Even though they can be used only for a small part of the entire communication, they have numerous advantages as described in section 4.4.2. Most important is that they can reduce the email overload through mass emails. Moreover, their knowledge is accessible to new individuals in contrast to past emails.

As described in section 4.4.3, internal forums contain a serious risk for the adherence of the incident management process. Using forums is thus not recommended. Reading external forums is a valuable source for knowledge. Participating in external forums may only be an absolute exception when the required knowledge cannot be acquired in any other way. In these rare cases, the publication of confidential information has to be prevented in any case. Information has to be edited before its publication in external forums. No relation to the ITSM organization should be recognizable by other readers of the forum. To decrease such risks, a work instruction can be considered which demands the consent of the superior for any participation in external forums for work related issues.

A forced introduction of enterprise wikis contains the risk that their introduction fails because of insufficient participation. Their success relies heavily on the motivation of the participants which is not guaranteed. The risk of a failed introduction is high but when individuals want to start a wiki for a specific project on their own initiative it should not be prohibited. Their motivation will be substantially higher through their own initiative. In addition, the organization can gain valuable experiences whether this type of collaboration is suited for the organization. If yes it could lead to an increased use of wikis in future and be an act of continual improvement.

The introduction of additional wikis or an extended usage of existing ones will encounter a higher motivation through the positive experiences the organization has made. However, in order to achieve their full benefits, particular emphasis has to be put on their integration with other systems in order to prevent that wikis become isolated data pools. Ideally, wikis can be found easily within the intranet and are preferably integrated in its full-text search.

The ultimate aim of ITIL's SKMS proposal, viz. to create a fully integrated, all-embracing SKMS, seems utopic. Nonetheless, it points in a desirable direction. Primarily, a consolidation of IT systems should be aspired. In cases, in which a consolidation is not feasible or useful, IT systems should be integrated with each other whenever the ratio between costs and benefits is positive.

The definition of pre-defined fulfillment procedures and standard changes as recommended by ITIL is an effective method for the explication of knowledge. The level of knowledge explication can be simply measured by the total number of pre-defined standard changes models which are actually applied. How far standard changes increase the efficiency of the change management can be measured best by the level of applied standard changes in relation to the average completion time of all changes.

All recommended proposals have to consider the fact they have to be introduced into existing organizations with their established structures, grown cultures, and specific circumstances. The proposals cannot be introduced without consideration but have to be adapted for every specific case. A dedicated role system as an example may be superfluous for small ITSM organizations while it may be crucial for large ITSM organizations. More emphasis on this topic is put in chapter 8 for the specific case IS.

CHAPTER 6

# Situation Analysis of DeLaval Information Services

## 6.1 Overview

The aim of the situation analysis is to identify the specific conditions for the adaptation of the generally recommended knowledge management proposals for the specific case of IS. The findings are used to ensure that the knowledge management proposals are adapted in a way that they fit to the IS strategy and take the given circumstances into account.

For this purpose, existing documentation was evaluated, slides from presentations were studied, and qualitative interviews took place with various employees from IS. Most interviews were conducted with pre-defined questions which had been sent to the interview partners a couple of days in advance to allow them a preparation. Some interviews took place more spontaneously when the opportunity arose. These interviews were accompanied by uncounted informal discussions which helped to complete the picture of DeLaval and IS.

In addition, a workshop was hold on the subject knowledge management with chosen attendees from IS and some local DeLaval IT departments. After a short introduction of knowledge management, the attendees discussed the following three questions within the group.

- Are there instances where you have to search a (too) long period of time for information you need to do your job?
- What ready for use knowledge that we already have locally stored would help you most?
- Where do you feel that knowledge management activities can have the biggest impact?

## 6.2 DeLaval

### 6.2.1 Company History

DeLaval was founded as AB Separator in Sweden in 1883. The name of the company changed repeatedly over time to its present name DeLaval which refers to the original founder of the company: Gustav de Laval. He was an inventor who made significant contributions, among others, to the design of dairy machinery. In 1991 the company was purchased by the likewise Swedish Tetra Pak. This was followed by the formation of the Tetra Laval Group and the sale of those parts of the company which were not related to dairy farming. The Tetra Laval Group today includes the companies Tetra Pak, DeLaval, and Siedel. DeLaval concentrates fully on the dairy farming market and is the market leader in this segment [35], [40].

### 6.2.2 Mission and Vision

Companies often possess defined visions and missions. They are used as strategic instruments to guide all activities towards desired goals or into a desired direction. A vision generally refers to a desired, challenging but realistic goal whereas a mission refers to a specific way of behavior [14], [169]. The vision of DeLaval is to be always the first choice for dairy farmers:

> *Whenever dairy farmers have a need they should think first of DeLaval. We aim to always be there, always available, always working on their behalf [37].*

Its mission is split into three interrelated promises. They focus mainly on offering technological advanced products and solutions for the complete dairy farming market:

> *We drive progress in milk production.*
>
> *We aim to be at the cutting edge of the industry, to pre-empt farmers' needs through superior resources, technical expertise and service second to none.*
>
> *We will focus our attention on dairy farming as a whole and each individual farmer, whatever the size of their business and whatever environment they are working in [37].*

DeLaval is a manufacturer of dairy farming products and solutions not only for cows but also for buffaloes, goats, and sheep. It develops, produces, and sells all kind of products related to this area, supporting all sizes of dairy farms, with a livestock ranging from 1 to 50.000 animals. Hence, the product portfolio is widespread and ranges from simple commodities to high-tech automatic milking systems[1]. Additionally to the self-manufactured products it also provides

[1] The current product portfolio is listed in the product catalog of spring 2011. The catalog can be found online: `http://viewer.zmags.com/publication/02b388ec`.

complementary services and sells third-party products in order to offer a complete product portfolio for dairy farmers [45], [36].

### 6.2.3 General Figures and Locations

DeLaval is the smallest of the three companies within the Tetra Laval Group. Siedel is slightly larger and Tetra Pak is around ten times the size but compared to most other companies DeLaval can be regarded as a relatively large company. The company has locations on six continents, occupies about 4.100 employees and generated lately a turnover of 805 million € in 2009/2010 and 845 million € in 2010/2011. The company sells its products in over 100 different countries and has more than one million customers. The figures 6.1 and 6.2 show the countries in which DeLaval sells its products and where it is located [36], [181], [182].

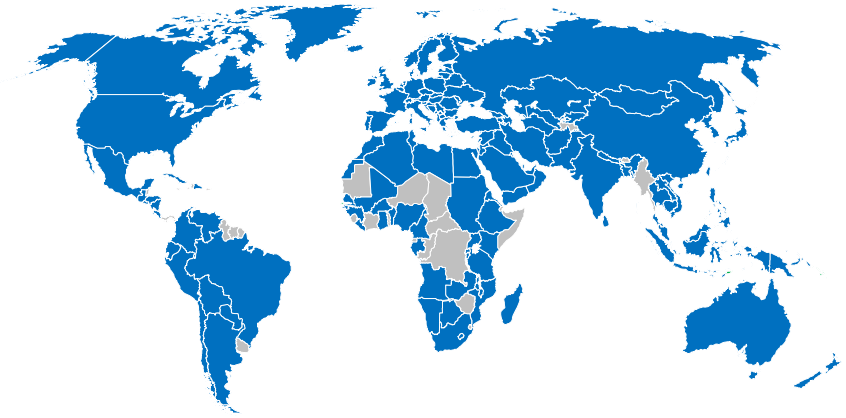

**Figure 6.1** – Markets Covered by DeLaval [181]

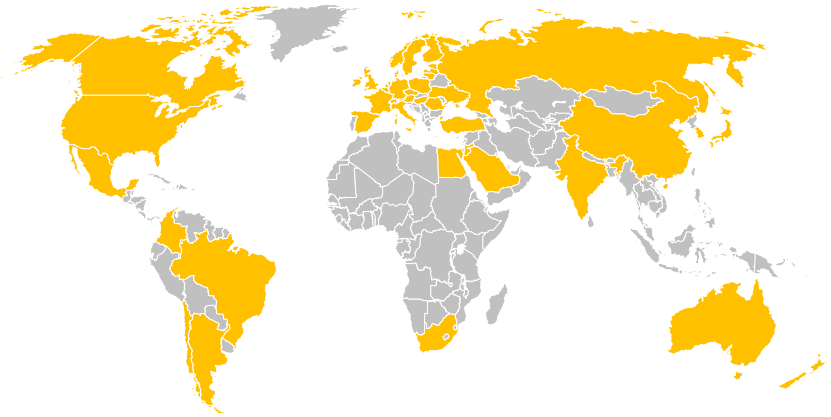

**Figure 6.2** – Locations of DeLaval [38]

### 6.2.4 Company Culture

DeLaval has defined four core values which guide the activities of the company and its employees:

> *We share a passion for dairy farming.*
>
> *Our people are empowered to assume responsibility.*
>
> *We are professionals earning our customer's trust through our commitment and reliability.*
>
> *We believe in partnership built on mutual trust and benefit [37].*

Furthermore, as main influence factors for the specific culture of DeLaval can be regarded that it is a global oriented, but Swedish corporate group with its headquarters in Sweden. It has a long tradition as it was founded in 1883 [39]. The Tetra Laval Group is not publicly traded and is completely owned by the family Rausing [56].

Swedish business life is characterized by a desire for a wide consensus accepted by as many individuals as possible. In practice, this leads to long decision processes which provide all involved parties time to think about the subject and the opportunity to express their opinion. On the one hand this culture promotes decisions which are thought through, widely accepted, and which consider many aspects. On the other hand it requires a relatively long time and a relatively high effort to make decisions [176]. In addition, Swedish companies are also characterized by a high social responsibility. They pay much attention to environment protection, employee-friendly working environments, long-term oriented employment relationships, prevention of corruption, and other social aspects compared to companies from other countries [177].

DeLaval produces several pharmaceuticals and thus has to comply with the GRC requirements which are necessary for any business activity in the pharmaceutical sector. Namely it has to comply with the guidelines from ICH Pharmaceutical Quality System (ICH Q10) which are a legal requirement. These guidelines have been developed by the International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) and include the application of the Good Manufacturing Practice (GMP) guidelines. ICH Q10 and GMP themselves are mainly related with the production processes, less with the ICT which supports these production processes [52]. For this reason exists a guideline called Good Automated Manufacturing Practice (GAMP). It defines criteria which the provided IT services and the underlying ITSM organization have to fulfill. It is mainly concerned with quality management and demands as an example that changes have to be verifiably tested and reviewed before their implementation [91].

## 6.3 DeLaval Information Services

### 6.3.1 Responsibilities of the Department

As a department, IS helps DeLaval achieving the company's mission and fulfilling its vision. Therefore, IS has its own vision how it wants to help. The structure of this vision follows the structure of DeLaval's vision:

> *Information Services (IS) is the preferred partner for all local and global IT services as well as consultancy in DeLaval [42]*

IS provides the commercial IT services for DeLaval worldwide with the exception of locally used systems and physical on site support in places where IS is not present. The IT systems used to manage the DeLaval equipment on the farm and the embedded IT systems are not under the responsibility of IS.

For the provision of the IT services, IS cooperates with external partners and the local IT departments. The size of the local IT departments differs from country to country and from location to location. In some cases the local IT department is represented by one person who takes care of IT besides his main task and who has a limited IT knowledge. In other cases the local IT consists of a couple of IT specialists with an obviously higher IT knowledge. The first point of contact for the end users is their respective local IT department. When necessary it redirects the request to IS.

### 6.3.2 General Figures and Locations

The employees of IS are distributed over four different DeLaval locations as shown in table 6.1. These four locations are also major business hubs for DeLaval and establishing a major IS presence there has been a logical step. The tasks and responsibilities are structured mainly independently of the physical locations of the employees. There is an extensive exchange between the employees of the different locations both by using ICT and by traveling to one of the other locations to enable meetings in person. Figure 6.3 displays the four different IS locations on the map that shows all countries in which DeLaval is located.

Some development activities for the IT services are outsourced. Currently, 12 named individuals support IS in ERP development off-shore. These resources are provided by a company from India. IS is also supported by a company from Latvia which provides 5 unnamed persons for web development activities.

### 6.3.3 Department Culture

Culturally, IS is influenced by the general culture of the company. The daily work inside the department is more characterized by finding solutions in a common dialogue than by decisions

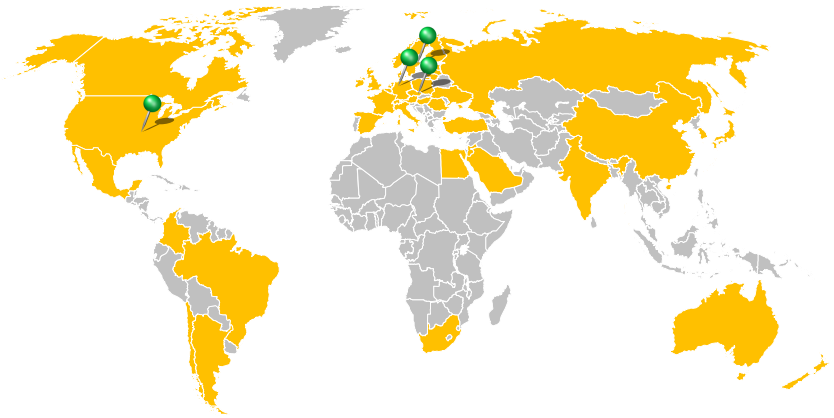

**Figure 6.3** – Locations of DeLaval Information Services [38]

| Type | Country | City | Time Zone | Employees [2] |
|---|---|---|---|---|
| In-house | Germany | Glinde | GMT +1:00 hours | 47 |
| In-house | Sweden | Tumba | GMT +1:00 hours | 36 |
| In-house | USA | Kansas City | GMT –6:00 hours | 10 |
| In-house | Poland | Wroclaw | GMT +1:00 hours | 6 |
| In-house Total | | | | 99 |
| Off-shore | India | Pune | GMT +5:30 hours | 12 |
| Near-shore | Latvia | Riga | GMT +2:00 hours | 5 |
| Total | | | | 116 |

**Table 6.1** – Locations of DeLaval Information Services

made by a single person. Its hierarchy is flat and contains relatively many positions for specialists for a certain task or area.

Furthermore, the department has a well balanced mix between new employees and others with a relatively long period of employment for DeLaval. The age of the employees is mixed between all ages. The majority (ca. 60%) of the employees is between 40 and 52 years old. A larger number of individuals has gained an enormous quantity of implicit knowledge about DeLaval, IS, and the provided IT services during their professional work. This knowledge is mostly implicit and exists only partly in an explicit form. Some have worked for DeLaval and IS for a long time and will retire in the medium term. This long employment with DeLaval and IS can be explained by the long history of the company and the Swedish company culture which helps and enables employees to work a long period of time for the same company and to develop within the company. The staff consists mainly of male personnel as it is still common in the IT

[2] Employees as at: September 1, 2011.

industry [18], [34], [202].

From the experiences made during the creation of this thesis, it can be said that the department is characterized by a highly collaborative behavior. People take time on short notice when colleagues have questions or need input. A number of colleagues also offered active help. This was a great support for this thesis and it can be imagined that this is also of great help for other projects and during daily operations.

Aspects from GRC have already been considered widely throughout the delivered IT services but they are also becoming increasingly important for the internal organization of IS and its processes. The main aspects derived from GRC are traceability and the segregation of duties for the internal organization. With this background, reorganization has taken place recently. The new organization is orientated on the lifecycle of IT services, supports a better segregation of duties, and serves as a base for improved quality securing activities. A certain similarity with the recommendations of the ITIL framework is unmistakable [141].

Subsequently to this reorganization, IS intends to implement defined processes for the most important areas of its ITSM beginning with the areas of incident, problem, change, configuration, and knowledge management. The first steps have already been taken. The ITIL framework was once more chosen as a starting point. The first two processes have been formally defined for incident and change management based on ITIL. They have already been implemented at the beginning of 2011 [44]. Their process workflows can be found in appendix A.

The process for a general configuration management is currently under development. Today, there are only some limited initiatives in place which have different purposes and use different data pools. They do not provide complete or matching information. IS' configuration management process will base on ITIL as far as possible and will be adapted as far as necessary [44]. As soon as its implementation will have been completed, the definition of a problem management process will be started. Particular emphasis is put on the knowledge management process which will be defined within this thesis.

Another used methodology within the department is Practical Project Steering (PPS). It is a project management methodology with Scandinavian roots that has been invented by Tieto. It is used by IS for its projects. PPS can be applied for differently sized projects and understands itself as a complete model. It focuses on business aspects but covers additionally managerial and productional aspects. It can be combined with other project methodologies like Rational Unified Process (RUP) or Projects in Controlled Environments (PRINCE2) for the management and production level of projects [186], [185].

Until this day a number of activities are done more or less by single individuals what works well through their high qualification. Many of them have been for a long time in the company and possess a rich experience and an extensive expertise. However, the quality of provided IT services depends mainly on the quality of individuals. This will be alleviated by the reorganization and through appropriate processes that ensure success on an additional level. In some way, they draw an additional safety net. Nonetheless, a high level of experience and qualified staff will remain the key of IS' success.

### 6.3.4 Provided IT Services

Table 6.2 gives an overview of the 20 IT services provided by IS. Most of these IT services have been named by their underlying main software application.

| **Infrastructure & Collaboration Services** | **Finance & Reporting Services** |
|---|---|
| • Software Provisioning[3]<br>• Messaging<br>• Global Network<br>• Telephony<br>• Hosting | • ERP 1[3]<br>• Archive[3]<br>• ERP 4[3]<br>• Data Warehouse (DW)[3] |
| **Sales & Marketing Services** | **Sourcing, Manufacturing & Logistics Services** |
| • Customer Relationship Management (CRM)[3]<br>• Customer Database[3]<br>• Quotation 1[3]<br>• Dealer Web Service<br>• Quotation 2[3]<br>• Technical Product Documentation[3] | • Demand Planning[3]<br>• Customs[3]<br>• Supply Chain Management (SCM)[3]<br>• ERP 2[3]<br>• ERP 3[3] |

**Table 6.2** – IT Services Provided by DeLaval Information Services

The IT services are categorized internally in four different areas with similar IT services. All categories refer to a certain field of business and contain the provision of applications required by this field of business with the exception of the category Infrastructure. This category contains the general IT services used by the whole company. Especially to mention is the IT service called Hosting. It contains the provision of numerous applications which are not completely supported by IS but which are only hosted. Most of them are only used by a limited number of users. IS ensures that these applications are up and running but does not provide application-specific support.

The allowed resolution times for incidents and service requests are defined in the SLAs. They differ depending on the specific IT service and the type of the incident or service request. Service requests are categorized by their type. Incidents are categorized in different levels depending on their impact and urgency. Their allowed resolution times range from a four-hour resolution time 24 hours a day, 7 days a week (24/7) concerning highest level incidents in some of the IT services to best effort resolution times concerning lowest level incidents in other IT services. The by-far largest number of incidents and service requests have an allowed resolution time of a few business days. Based on these times 90% of the service requests have to be completed

[3] The name of this IT service is a actually the name of the software application used for this IT service. Instead of their actual names, this thesis uses the main purpose of these IT applications as a name.

within the allowed time. Likewise, 90% of each of the different types of incidents have to be resolved within the defined time. Internally, IS aspires a level of 95%.

### 6.3.5 Figures of IT Service Management

Several figures of the ITSM influence the latter adaptation of the knowledge management for IS in chapter 7. The difference between the number of 500 and 100,000 incidents per year can easily be imagined, for example. In addition, the elicitation of these figures will help IS to measure the success of its new knowledge management.

Comprehensive data should be available from the incident management because of its implemented, defined ITSM process but the currently used incident management software tracks solely basic data. This is one of the reasons why IS decided to introduce a new software for this area. However, the available data provides information about the fulfillment of the allowed resolution times for incidents and service requests as described in section 6.3.4. Figure 6.4 presents the general level of fulfillment for the year 2010.

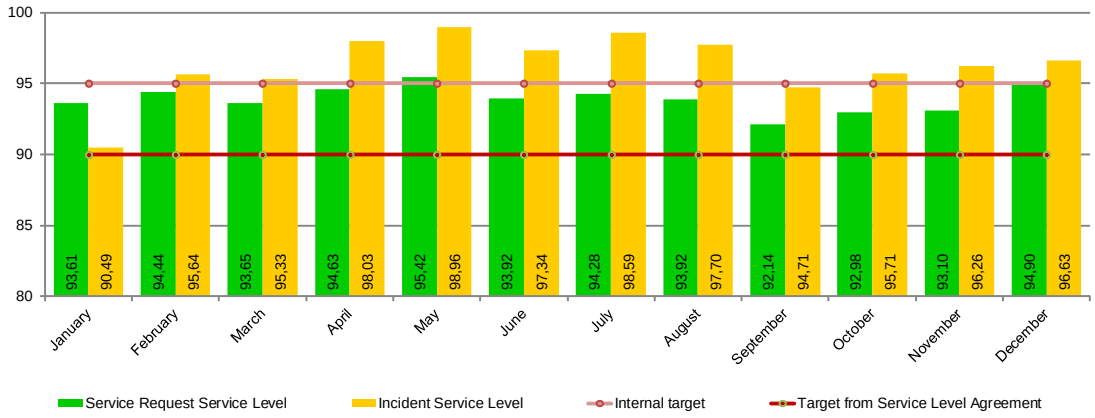


**Figure 6.4** – Service Request Service Level, 2010

Figure 6.5 shows the number of incidents and service requests by IT service. They are spread very unevenly between the different IT services. About half of the requests results from just two IT services, viz. Software Provisioning and ERP 1, followed by a number of IT services with still significant numbers. As indicated before, the largest part of the incidents form lower level incidents. The distribution between the different incident priorities is presented in figure 6.6, including their respectively achieved service levels. It contains also the different service request types.

Of interest is also the information how many incidents have been resolved directly during the first contact with the user, namely the number of first call resolutions [64], [188]. Figure 6.7 displays the number of first call resolutions in comparison to the total number of incidents.

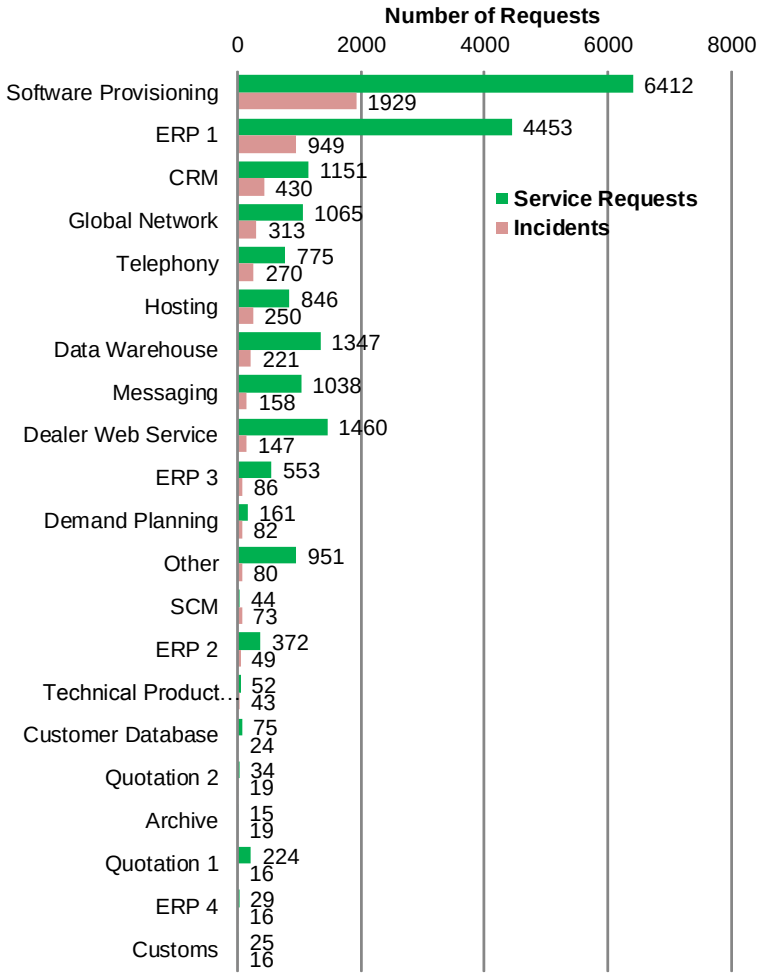


**Figure 6.5** – Incidents and Service Requests by IT Service, 2010

For the problem management, the result from the search for figures is modest. IS does not track data for this area. It is for example not known how many problems have been identified and solved in total or how long did it take to solve these problems in average. This lack of figures is the result of the absence of a defined problem management process.

More detailed data is available for the change management. In 2010, 2,165 new RFCs were opened in total. Figure 6.8 shows their impact. More than 90% of the RFCs were minor RFCs with small impact and risk. Less than 2% were major RFCs with high impact or risk. The majority of the RFCs have been approved as figure 6.9 displays. Furthermore, the RFCs can be classified by the applied change model. Most changes were normal changes. Only 75 RFCs used a pre-defined RFC model. In addition, there were two emergency RFCs with an accelerated approval procedure for exceptionally urgent cases.

The RFCs were distributed on nearly all IT services in 2010 but not evenly between them.

Almost 50% of all RFCs relate to the IT service ERP 1 and just 4 IT services subsume 75% of the RFCs. Figure 6.11 gives an impression of this distribution. It has to be stated that this distribution is limited in its significance because not all IT services apply the change management process to the same extent.

### 6.3.6 Knowledge Management

Obviously, there exists already tacit and explicit knowledge at IS but this knowledge is not managed actively at the moment. It has been decided to change this. Besides an analysis of the subject through this thesis, a new full-time position for a knowledge manager has been created. Current and new projects have to consider knowledge management aspects. This applies particularly to the current introduction of a new ITSM application.

The Swedish company culture, which searches for compromises, produces a beneficial organizational culture from a knowledge management perspective. For this purpose, meetings are held regularly in which different arguments and viewpoints are exchanged. This enables a distribution and combination of knowledge. Furthermore, responsibilities are clearly defined on the one hand but slightly overlapping on the other hand. Individuals have to interact and exchange and combine their knowledge in order to make decisions, exactly as recommended by Nonaka [133]. Nonetheless, some issues have been identified during the situation analysis which possess particular potential for improvements from a knowledge management perspective:

- The knowledge, which is created in incident and problem management, is barely preserved. It is not preserved systematically and is often lost after its direct application. These are e.g. known errors, existing workarounds, and fixes. This can be explained by the lack of a formally specified problem management process as well as that there is no appropriate KB which would be the preferred place to store this kind of knowledge. In contrast, incidents are tracked systematically and it is tried to preserve the knowledge within incident management. It is mandatory to describe incidents and their solution but many of them contain only rudimentary information. An extreme example is *'Error in ERP 1'* as description and *'Done'* as solution. While the description of incidents is often only a bit too brief, but mostly reasonably, it is relatively common that the solution is just described as 'done'. The knowledge how to solve such an incident has not been preserved. The next time IS faces such an incident it cannot reuse this knowledge but has to acquire it once more.
- The non-existence of a CMDB has already been identified. A CMDB is being introduced along with the introduction of the new ITSM application. This is important because a CMDB is a source of knowledge for many ITSM processes [142] and is hence essential for knowledge management and in addition also for the further alignment of IS to ITIL.
- Several, basic fulfillment procedures exist in a textual form and are applied for the most often occurring types of service requests.

- Existing documentation concentrates generally on the most important needs at IS. This leads regularly to issues after the go-live of projects when they are transferred to the service operation. Although there is always a handover meeting that gives service operation an overview about the new functionality, service operation desires regularly more documentation.

## 6.4 Assessment of Current Situation

IS finds itself in a transformation process towards a more service-oriented department. The process of transformation has already begun but it is not finished yet. Some aspects are already service-oriented, some are partly service-oriented and partly application-oriented, and some are still application-oriented. An example which shows this transition very well is the IT service catalogue. In general, there are different approaches how services can be defined and named [3]. IS has chosen the most application-oriented approach but there are intentions to change the IT service names and definitions to a more business-centric approach.

Another aim of IS is to standardize its most important processes. The process definitions do not need to be aligned completely to ITIL but ITIL is seen as a good starting point which helps to find useful and practicable process definitions. An increased segregation of duties leads to a raising demand for defined processes because it has to be assured that all persons know their responsibilities and that the workflows remain smooth and fast. It also leads to a demand for an increased exchange and transfer of information and knowledge.

The relatively low usage of pre-defined change models and the high number of minor RFCs indicates that there is potential for a further standardization of the change management, especially through a more extended use of pre-defined change models or so-called standard changes.

The comparison of the figures 6.5 and 6.11 indicates that the IT services with the most RFCs tend to cause the most incidents. For many IT services, the number of RFCs correlates with the number of incidents but there are also exceptions: the IT service Telephony had just one RFCs but caused 270 incidents. In addition, the IT service Software Provisioning caused disproportionately many incidents in proportion to its RFCs. Research states that it is relatively common in the IT area that a significant number of the incidents and problems are caused by changes [130], [65] but other factors influence also the number of incidents. These factors are inter alia the different complexities of IT services, their number of users, and the extent they are used. In addition, the change management process is not applied to the same extent for all IT services at IS.

On the one hand, RFCs can be caused by incidents because incidents result from problems which often require a change to be fixed. On the other hand, RFCs can lead to problems which cause incidents when not all aspects have been considered during their implementation. It is questioned inside IS whether there are correlations between the number of RFCs and the number of incidents or whether these numbers depend more on the specific nature of the different IT services. IS does not track whether RFCs originate from problems or from changed business requirements.

Furthermore, it does not track the origin of problems what would require a problem management process in place. Tracking this information would help to draw a clearer picture. It could be used for a continual improvement because it allows to identify areas for improvement. In the best case, it confirms that IS implements its changes free from any defects. Any further reduction of incidents and problems is primarily located in the area of quality management but knowledge management can assist well as shown in chapter 4.

In incident management, IS has achieved its external service level but not its higher internal aim. The number of first call resolutions seems to be relatively low. If this number can be raised the service level will increase as well. In addition, first call resolutions require only little time and increase the efficiency of the ITSM. Knowledge management can help e.g. through the creation and maintenance of a KB. Hence, the expectation of more first call resolutions justifies efforts for knowledge management activities. They have not solely the ability to increase IS' service level but also to increase its efficiency.

The specification of more fulfillment procedures would also help to increase IS' efficiency. Viewed from a pure knowledge externalization perspective, it does not make any difference whether they are stored as a textual description or as implemented workflows in software applications. Nonetheless, the actual usage of the knowledge is eased and ensured when they exist as implemented workflows in software applications. The new ITSM application of the IS enables such workflow definitions for service requests. Hence, this is also a possible area for an improvement of IS' ITSM.

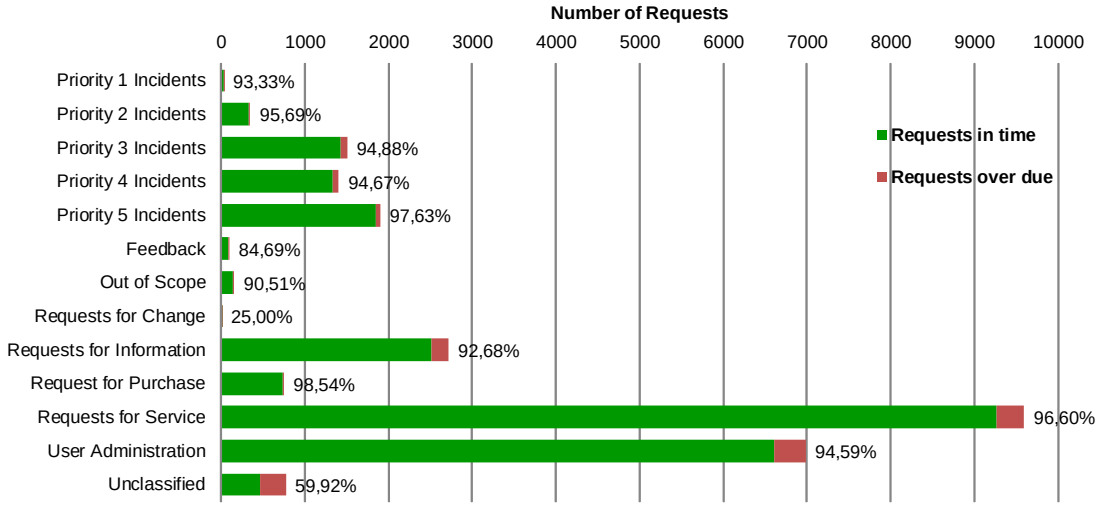


**Figure 6.6** – Service Levels by Request Types, 2010

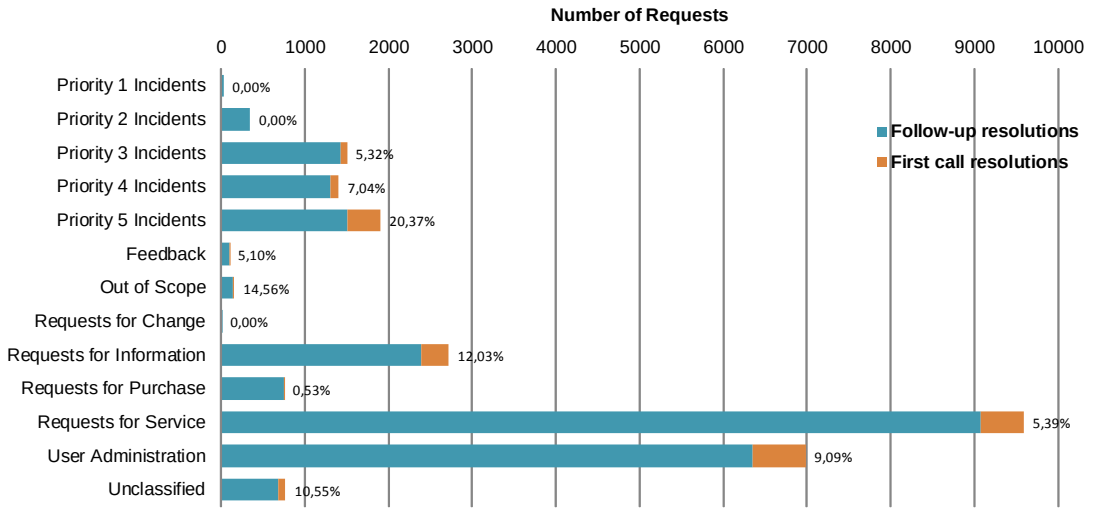


**Figure 6.7** – First Call Resolution Rates by Request Types, 2010

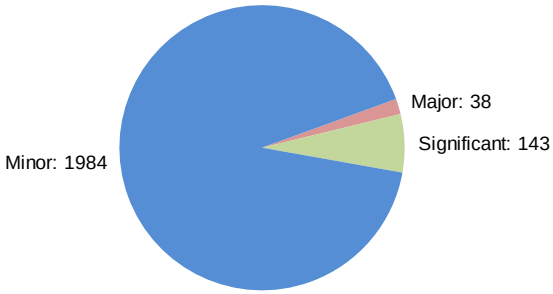


**Figure 6.8** – Requests for Change by Type, 2010

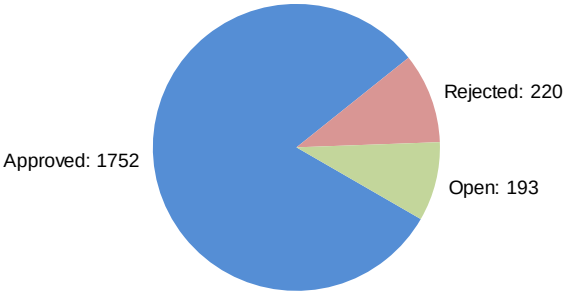


**Figure 6.9** – Requests for Change by Approval, 2010

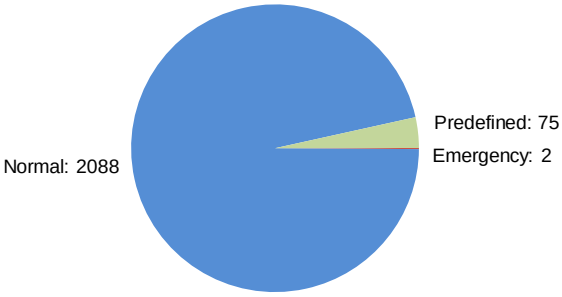


**Figure 6.10** – Request for Change by Change Model, 2010

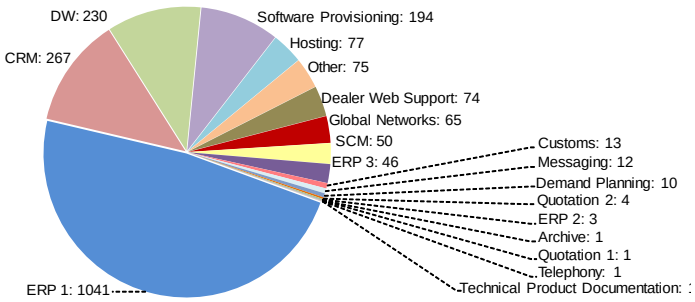


**Figure 6.11** – Request for Change by IT Service, 2010

CHAPTER 7

# Adaptation of the Proposals for DeLaval Information Services

## 7.1 Overview

Enterprise 2.0 leads from a fixed hierarchical control to a more autonomous self-control of teams in which managers rather moderate than lead [24], [178]. This corresponds well to the Swedish organizational culture as presented in section 6.2.4. On the other hand, DeLaval is a relatively large organization with a long history and grown organizational structures and hierarchies. People tend to stick to their roles and responsibilities. The enterprise 2.0 approach tends to reduce these clear responsibilities. A too far self-controlled approach for knowledge management activities would lead inevitably to conflicts within the organization. Moreover, clear roles and responsibilities are necessary up to a certain level due to GRC requirements. Hence, the proposals have to be modified in a way that they assign clear responsibilities, that they enable a traceability of activities, and that they allow a certain level of control. Furthermore, it has to be taken into account that a formal problem management process is not yet introduced.

## 7.2 Incident and Problem Management

### 7.2.1 Incident Management

IS has defined its own incident management process which is aligned to ITIL as described in section 7 and appendix A.1. Its activities differ slightly from the ones in ITIL but these differences do not influence the knowledge management. IS' incident management process has to be extended likewise by the proposed, additional tasks for knowledge management which

are described in section 5.2. They have to be added to the following activities of IS' incident management process:

- Initial support
- Investigation and diagnosis (1st level support)
- Resolution and recovery (1st level support)
- Investigation and diagnosis (2nd level support)
- Resolution and recovery (2nd level support)

The more time is spend on an incident, the more knowledge will be created generally and the more important it is to preserve the newly gained knowledge in the KB. While it should be optional to update the KB during initial support it should be highly encouraged during 1st level support and mandatory during 2nd level support. A detailed definition how to log incidents and how to maintain the KB is given in section 7.2.3.

For the categorization of incidents, a taxonomy should be defined by the incident manager with a small number of categories. Ideally, they do not overlap and provide a full coverage. It is better to omit some categories in case of doubt because fewer categories allow an easier and more correct classification of incidents as long as they provide a full coverage. When it becomes obvious that a category is really missing it can be added without effort subsequently. The same categorization should be applied in problem management and throughout the whole KB.

The success of the proposed knowledge management activities can be measured for incident management by the following KPIs:

- Incident service level (namely the percentage of incidents resolved within the defined times by the SLAs).
- Average time required for resolution of incidents.
- Percentage of first call resolutions.
- Percentage of self-support resolutions.
- Number of self-support resolutions.
- Percentage of incidents which are resolved using a KB article or an already existing incident record.

It is important to capture the incidents which are resolved by the users themselves using the offered self-support. If the extent of self-support KB articles is raised, less incidents will be reported to IS. The remaining incidents, which are still reported to IS, are normally more complex than the incidents which the users can resolve themselves by self-service. If the self-support resolutions were not captured, the average time for the incident resolution would raise and the statistically measured incident service level would drop.

### 7.2.2 Problem Management

The introduction of a formally specified problem management process can be recommended for the IS. It will enable a continual improvement of the problem management if specified as proposed. The proposed activities for the maintenance of the KB will help to preserve the knowledge that is gained during the handling of problems. Section 5.3 gives further details. Section 7.2.3 contains a detailed definition how to log problems.

### 7.2.3 Knowledge Base Article Guidelines

This section gives guidance how KB articles have to be written. Incident and problem records form also implicitly a part of the KB. For this reason, they are likewise regarded as KB articles in this section.

It is not necessary that internal KB articles consist of grammatically complete sentences. Parts of sentences or short phrases are sufficient as long as they express complete thoughts which can be understood easily. External KB articles for self-support have to be written in grammatically complete sentences in order to be considered and trusted by the users. Users will apply the published KB articles for self-support only if they have confidence in them. Naturally, elaborated KB articles lead to a higher confidence than loose collections of phrases. In addition, IT professionals must have in mind that external KB articles have to be understood also by users with restricted ICT knowledge. This cannot be taken for granted when IT professionals write such articles.

Internal KB articles are written exclusively in English because it is the primary language within IS. Another language is not appropriate because the department operates in different countries with different first languages and it can be assumed that all individuals within IS understand English well. They work in a multi-national company and ICT terminology is mainly English anyhow. In contrast to understanding, not all individuals will be able to write perfect English but this does not pose a problem. It is not required to write grammatically complete and elaborate sentences in most cases. As already indicated, short phrases are sufficient for internal KB articles which form the majority of the KB.

External KB articles for self-support are primarily written in English because it can be assumed that English is the most widely understood language within DeLaval. Not all DeLaval employees will be able to understand English KB articles but a considerable audience can be reached with minimal effort. It can be considered to translate KB articles which are of great interest for many users. Influence on this decision has not only the effort for the initial translation of the KB articles but also the continuous effort to keep the translated KB articles up-to-date whenever the original KB articles are updated. Translated and original KB articles should be linked with each other. When a KB article is updated, the update of the translated articles can be triggered. Despite the high effort, it may be beneficial to translate some KB articles for everyday types of requests, like for example how to setup a remote connection. The distribution of KB articles should be like in figure 7.1 for an efficient ITSM.

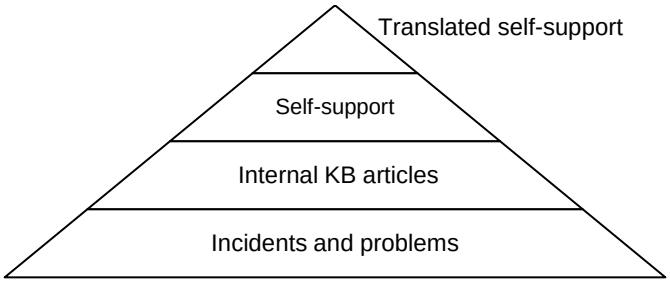


**Figure 7.1** – Knowledge Base Hierarchy

Whenever possible, KB articles should not duplicate existing knowledge. It is generally better to give a short description or summary and then link to the already existing knowledge, like e.g. a document in the intranet or internet. Such a linkage is not suitable when the source of knowledge cannot be accessed by all possible readers. In this case the knowledge has to be duplicated. Duplicating the knowledge can also be appropriate when it is an often read KB article and when the original source of knowledge does not alter frequently.

All KB articles have to be assigned to an IT service. Theoretically, some KB articles could be usefully assigned to more than one IT service but the IT services of IS are very distinct. Hence, KB articles which are related to more than one incident are a small minority. Moreover, there are KB articles which can not be assigned to an IT service. These should be assigned actively to a value *not applicable (n/a)* in order to distinguish them from KB articles with a missing assignment to any IT service.

Besides these general requirements, there are different requirements for the various types of KB articles. These requirements are described in the following:

- **Incidents**: Every reported incident has to be logged as an individual incident record. These records are primarily used to manage the incidents. As an automatic by-product, they also form an integral part of the KB since these records contain valuable knowledge. Some points must always be recorded for incidents:
  - a title which summarizes the incident in few words.
  - a short description of the incident from the perspective of the support analyst. The actual incident has to be evident from this description. The statement that an error occurred is not sufficient, better is a description of the error or the actual error message.
  - the name, email, and phone number of the incident owner (the individual who reported the incident).
  - the impact and urgency of the incident which define in combination with the SLA the priority of the incident.
  - the status of the incident.

  - a short description how the incident was solved. It is not sufficient to state that the incident was solved. It has to be stated what had to be done to solve it.
  - links to KB articles or external documents if they were used to solve the incident.
  - links to affected CIs if appropriate.
  - a link to the underlying problem when the incident was caused by one.
  - a short description of the incident from the perspective of the user when the incident cannot be resolved directly. It is only necessary to add the description of the user when it differs from the description of the support analyst. The description of the user does not have to be technically correct.
  - a list or summary of the already performed steps when the incident cannot be resolved directly. This contains a short description of the performed steps including links to applied KB articles or external sources of knowledge even when they did not help to solve the incident. The next support analyst will know what has been tried already.
  - open tasks if there are any.

- **Problems**: Every identified problem has to be logged as an individual problem record. Like incident records, they contain valuable knowledge. For this reason, they also become implicitly a part of the KB. Problem records have to contain:
  - a title which summarizes the problem in few words.
  - a short description of the problem in phrases from the perspective of the support analyst.
  - the status of the problem.
  - a short description how the problem was solved.
  - links to KB articles or external sources of knowledge when they helped to solve the problem.
  - links to affected CIs if appropriate.
  - open tasks if there are any.

- **Frequently Asked Questions**: A structured list of common questions with their answers is called frequently asked questions (FAQ) [76]. They contain:
  - a title or category which describes the type of FAQ.
  - a list of question/answer pairs. Questions are written in one brief sentence. The answers are written more detailed but they should not be longer than two paragraphs. Providing links to more detailed documents is better instead.
  - optionally an introduction which describes the type of FAQ.
  - optionally subheadings or subcategories if there are many question/answer pairs.

- **Known Error Messages**: Occurring errors which are known can be stored in the KB [140]. They contain:
  - a title which describes the known error.
  - the exact error message or its description.
  - optionally additional information if it seems appropriate.
  - links to further, more detailed sources of knowledge.
- **Resolutions**: They describe how a specific problem can be fixed [140]. In many cases, it will be sufficient to maintain solely the problem record. A separate KB article will be appropriate for the resolution if the underlying problem tends to reoccur more often or if the description of the solution is longer than a couple of phrases. This type of KB articles is either known as patch or issue resolution in IS' new ITSM application [59]. Patch can be chosen when a software patch has to be installed for the solution. Issue resolution has to be chosen in any other case. Resolutions consist of:
  - a title which describes the resolution.
  - a short description of the underlying problem.
  - a short description how the patch can be applied.
  - links to KB articles or external sources of knowledge for further details.
- **Workarounds**: They do not describe how a problem can be solved but how users can continue working despite the problem [140]. This type of KB article is also known as issue resolution in IS' new ITSM application [59]. Workarounds contain:
  - a title which describes the workaround. It has to indicate unambiguously that this KB article is not a resolution but a workaround. The title contains ideally the word workaround.
  - a short description of the underlying problem.
  - a short description of the workaround and its limitations.
  - a description how the workaround can be applied. When an external source of knowledge already exists it is linked instead of the description.
- **How-tos**: Such KB articles describe how a certain task can practically be accomplished [119]. In IS' new ITSM application, there is no KB article type called how-to [59]. Such KB articles are preferably stored as documents. They consist of:
  - a title which describes the how-to. It contains either the words *'how to'* or some similar phrase which expresses clearly the type of the document.
  - a short description of the purpose of this how-to.
  - optionally a link to an external source of knowledge or a comprehensive description of the how-to.

- **References**: This kind of KB article refers to an external source of knowledge for example a user documentation of a software application. A reference does not only contain the reference itself but:
  - a title which describes the reference.
  - a short description of the referenced knowledge.
  - a link to the referenced knowledge.
- **Documents**: Normally, it is better to link a document. References have the risk that a link becomes outdated but they will be up-to-date when the referenced source of knowledge is updated. Only when the referenced source of knowledge is not accessible by all intended readers the document can be copied to the KB. Such document KB articles consist of:
  - a title which describes the document.
  - a short description of the document.
  - the document itself.

### 7.2.4 Knowledge Management Processes

The KB is used in incident and problem management. These management areas accomplish or trigger the maintenance of the KB to a large extent. Simple maintenance activities do not require a specific process but are simply done during the handling of incidents and problems. Such a simple activity is e.g. rating a KB article. Besides these simple activities, KB articles have to be created and updated what can be more complex. Therefore, a specific knowledge management process for the maintenance of the KB is appropriate.

Figure 7.2 presents this process. It defines how new KB articles can be written and how existing ones can be updated. It contains a sub-process for KB articles that require an extended approval. This sub-process is displayed in figure 7.3. The application of the knowledge is specified in the incident and problem management processes.

The knowledge management process is comparatively simple. The knowledge manager identifies one or more individuals, which are capable to review reliably the KB article, and asks them for reviews. The KB article can only be approved when all reviewers approve it. If a reviewer has no time for a review or does not answer in an appropriate time the knowledge manager will have to decide whether the KB article can be published without this review. Furthermore, it has to be ensured that no confidential knowledge is published. Only a limited number of KB articles have to be reviewed in such an extensive way. The KB articles, which have to be reviewed compulsorily, are mainly external articles and articles of inexperienced authors or authors who did not meet the quality guidelines in the past. The majority of the KB articles can be published directly by the author of the article. Nonetheless, a minor number of these directly published KB articles should be reviewed subsequently by the knowledge manager to ensure a continuing high quality of the KB. Most suitable for subsequent reviews are recently published KB articles which are likely not to comply with the guidelines and some random samples. If a KB article

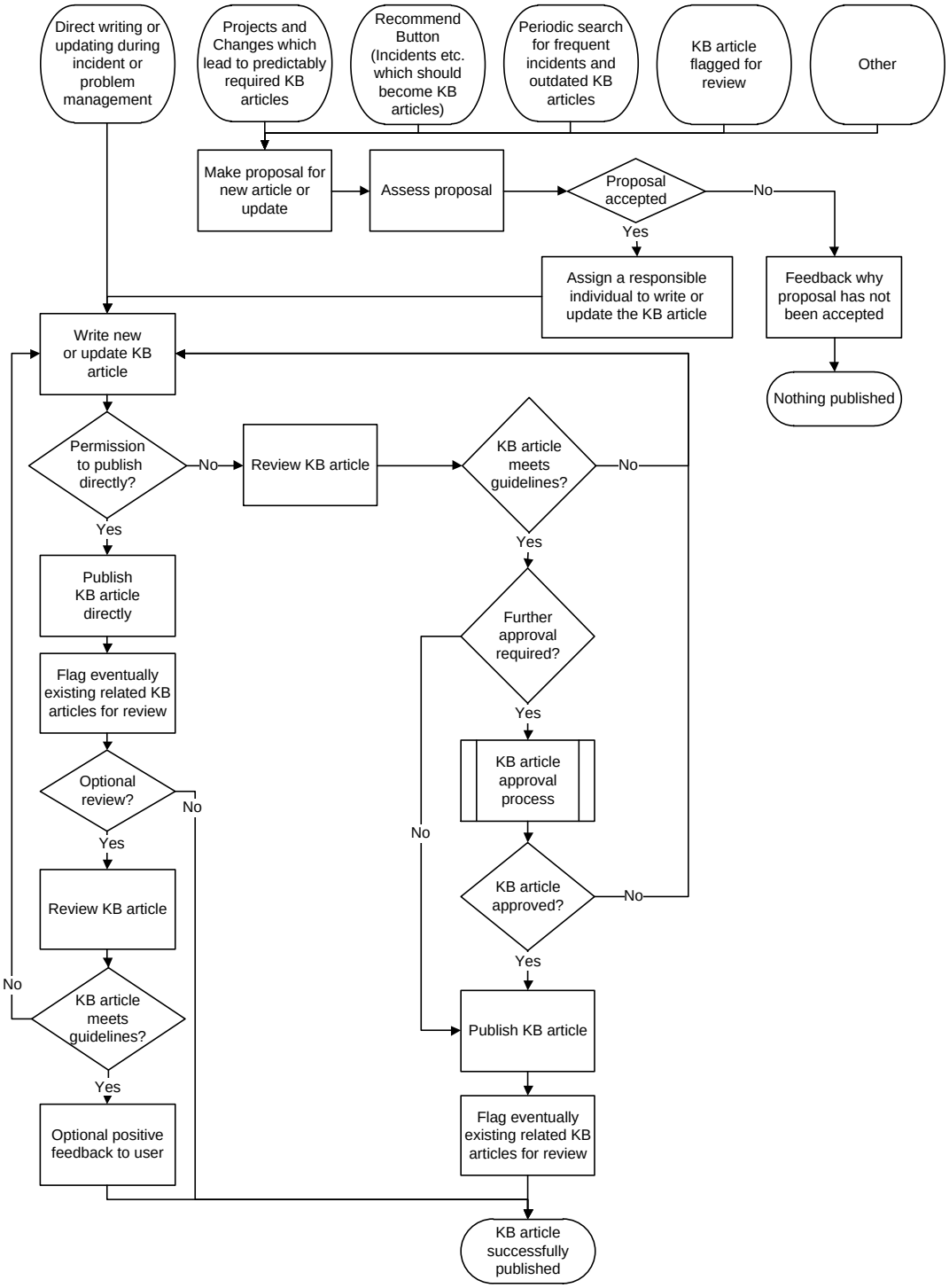


**Figure 7.2** – Process Flow for the Maintenance of the Knowledge Base

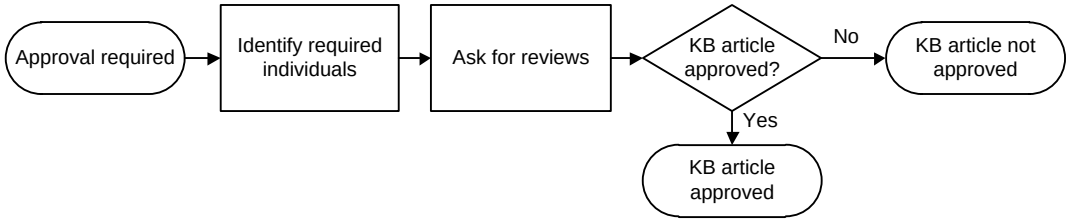


**Figure 7.3** – Process Flow for the Approval of Knowledge Base Articles

does not meet the guidelines, the knowledge manager will ask the author to update it. When there are only minor deviations from the guidelines, like grammatical errors or an inappropriate formatting of the text, the knowledge manager can decide to correct the KB article himself and just to inform the author. If a KB article is exceptionally well written, he will give positive feedback for motivational reasons.

In order to implement these processes at IS or any other organization, it is necessary to specify who is responsible, accountable, consulted, and informed (RACI) for the individual activities. The responsible individual (or position) is the one who actually accomplishes the activity. Accountable is the individual who possesses the authority over the activity. Consulted are all individuals who have to be consulted during an activity. Informed are all individuals who have to be informed during or after an activity. This assignment is often presented in a so-called RACI matrix. In order to save space, responsible is abbreviated traditionally by a capital R, accountable by A, consulted by C, and informed by I [89], [97]. The tables 7.1 and 7.2 display the RACI matrices for the proposed process for the management of the KB and its sub-process for the approval of KB articles.

The efficiency and effectiveness of the proposed knowledge base processes can be measured with the proposed KPIs in section 7.2.1. For the continual improvement of the knowledge base process are far more KPIs of interest:

- Number of knowledge base articles.
- Number of new knowledge base articles.
- Percentage of reused knowledge base articles.
- Average rating of reused knowledge base articles.
- Percentage of positive reviews of knowledge base articles.
- Number of self-support knowledge base articles.
- Percentage of accessed self-support knowledge base articles.
- Percentage of successfully applied self-support knowledge base articles.

| | Knowledge Manager | Subject Matter Expert | Requestor |
|---|---|---|---|
| Make proposal for new KB article or update | AI | | R |
| Assess proposal | RA | | I |
| Assign a responsible individual to write or update the KB article | RA | C | |
| Write new or update KB article | A | R | |
| Publish KB article directly | A | R | I |
| Review KB article | RA | I | |
| Publish KB article | RA | | I |
| Flag eventually existing related KB articles for review | RA | R | |
| Feedback why proposal has not been accepted | RA | | I |
| Optional positive feedback to user | RA | I | |

**Table 7.1** – RACI Matrix for the Maintenance of the Knowledge Base

| | Knowledge Manager | Subject Matter Expert | Knowledge Analyst |
|---|---|---|---|
| Identify required individuals | RA | | |
| Ask for reviews | RA | C | C |

**Table 7.2** – RACI Matrix for the Approval of Knowledge Base Articles

- Percentage of users who try to solve their incidents themselves via self-support before contacting the IS help desk.
- Percentage of individuals within IS who actively participate in the maintenance of the KB.

Measuring just a single KPI can cause a misallocation of resources. Measuring solely the total number of KB articles motivates individual to create as many KB articles as possible. Many KB articles would possess a doubtful usefulness because they would have been created just in order to increase the total number of KB articles. Measuring only the percentage, whether knowledge base articles are actually used, would discourage individuals to create articles whenever they are not completely sure whether a certain KB article will actually be accessed. The result would be a very small KB which would only contain the most fundamental knowledge. The measurement of all recommended KPIs ensures that the behavior of the individuals is not redirected into a non-desired direction. They assure that misallocations of resources are prevented and that the required activities are actually done as intended. Furthermore, it is essential for the process that

new KB articles are written within the agreed time and that reviews are conducted within the defined response times. The adherence of these periods has to be measured as well.

## 7.3 Configuration Management

IS is going to introduce a configuration management which is aligned to ITIL. The intended configuration management process does not differ significantly from ITIL's recommendations. The associated CMDB will be part of the new ITSM application that is also used by incident and change management. The maintenance of both hardware and software in the CMDB is an important source of knowledge for IS' incident and change management. It is intended to create a CMDB which contains the recommended CIs for:

- IT services
- Hardware assets
- Software applications
- Software application modules
- Software application versions

Required documents in the CMDB should rather be linked than duplicated when they already exist elsewhere. The corresponding findings from incident management (compare section 7.2.1) apply also for the configuration management. Additional KPIs are not required for knowledge management as long as it is ensured that the CMDB is correctly maintained. Regularly conducted audits of the CMDB are appropriate for this purpose.

## 7.4 Change Management

Post implementation reviews can be applied for IS as proposed in section 5.5. They should also be applied for projects because a potential for improvement has been identified at IS for the documentation and communication of projects when they are transferred to service operation after their go-live. As post implementation reviews include a validation of the documentation and communication of changes and projects, their conduction leaves individuals more sensitive for this issue. Furthermore, they can help to evaluate the success of any measures which are taken to improve documentation and communication of changes and projects. They are an effective measure to continually improve change management.

As mentioned in section 6.4, the definition of more standard changes can be recommended for the IS. They are described in 4.2.1. The responsibility for this task lies primarily with the change manager as well. The success of the post implementation reviews is hard to quantify.

Nonetheless, there are some possible KPIs which help to indicate their success and which assist to control the orderly execution of these reviews:

- Percentage of actually conducted post implementation reviews for standard changes.
- Percentage of actually conducted post implementation reviews for normal changes.
- Percentage of found issues in post implementation reviews for standard changes.
- Percentage of found issues in post implementation reviews for normal changes.
- Percentage of found issues when the knowledge manager takes part (in comparison with the percentage of found issues in all post implementation reviews).

## 7.5 Process-independent Proposals

### 7.5.1 Blogs

IS has already created an intranet page for internal blogs by the end of 2010. It is directly accessible from IS' intranet site which is a subpage of the DeLaval intranet. Its main aim is to improve communication. Initially, three blogs were created, called Directors' Cut, Client Team, and Configuration Management. Their introduction was not successful due to a too unambitious introduction with generally missing support. Only two blog articles had been published at all from its start until mid of 2011 [41]. Regardless of this half-hearted attempt, the usage of internal blogs can be recommended for IS and should be taken up again. More guidance on a successful introduction of blogs is given in section 8.7.

As IS offers IT services only for DeLaval it makes sense to publish the blogs maximal on the level of DeLaval. The desired readers of the blogs can be found completely inside the organization. A public blog would bring no additional benefits and would only add the risk that confidential information is made publicly available. Hence, the location of the blogs within the department's intranet is already ideal.

There is already a blog for announcements called *Directors' Cut* which is not used except for one published article. This blog could be used. It shall only be used in the intended way. The two other blogs without articles can be deleted or disabled until actual articles are available for publication.

In order to support the distribution of new knowledge, the latest articles from the KB can be published via a blog, called standard resolutions blog. This blog publishes regularly a selection of the latest KB articles and links them if technically feasible to the actual KB articles. This helps to spread new knowledge fast. The effort for the blog is minimal because the new KB articles have just to be selected, copied, and if necessary slightly edited for the publication via blog. These tasks can be performed by the knowledge manager.

It is estimated that the standard solutions blog contributes to an increased rate of first call resolutions, a reduced average solution time, and a reduced average time spent on incidents. A measurement of the success of this blog by these figures is problematic because they are even stronger influenced by others factors like the quality and extent of self-support, the quality and size of the KB, or possible staff fluctuation. More promising is hence a direct control of its success. The knowledge manager should regularly control the number of accesses of this and the other blogs and of individual articles. He should also conduct regularly whether the readers find the blog articles helpful. For this purpose, informal interviews are sufficient.

The actual success of the blogs can be hardly quantified for IS because of the small number of potential readers within IS. More appropriate are regularly conducted, short, and informal interviews with the intended readers of the blogs. Nonetheless, two KPIs can be captured which basically indicate the success of the individual blogs:

- The number of new blog articles per period.
- The average number of distinct readers per blog article.

When one of the KPIs is lower than expected, the underlying reasons have to be investigated. If necessary, appropriate measures have to be taken.

Further blogs should be added depending on demands. The knowledge manager should actively look for such demands and assist in the set-up and maintenance of these blogs.

### 7.5.2 Intranet

One of the most common intranet applications is already in use at IS. As determined in the situation analysis, there are possibilities to extend its usage in order to create a general first point for the storage and search for knowledge within IS, especially for documentation, guidelines, lists, minutes, presentations, and similar artefacts. According to this definition, the intranet would be the preferred place for the storage of the KB within incident and problem management. In this case, the KB would be separated from the incident and problem records what would complicate the search for knowledge and decrease its accessibility during the handling of incidents and problems. For this reason, it is better to use a KB which is integrated in the ITSM application for incident and problem management. When documents are of interest for the KB, which exist already in the intranet, they should not be duplicated but linked.

The accessibility of knowledge within the intranet should be as high as possible but there are reasons which require a restricted access to parts of the knowledge, e.g. from GRC requirements. In general, knowledge respective information can be classified as either public, internal, confidential, or secret. This is a typical classification for information confidentiality [162] which is also common at IS. This means for the intranet that the level of confidentiality has to be evaluated before any content is published in the intranet. The level of confidentiality should be stored with the content. Public and internal are the lowest levels. Such information should be generally

accessible within IS by default. Internal is appropriate as default level because it ensures on the one hand that no information is disclosed to any third party when its confidentiality has not been evaluated properly. On the other hand, this level ensures the maximal accessibility of the information within IS.

Confidential information should be made available to all individuals who can have access to this information. Secret is the highest confidentiality level. In contrast to confidential information, access to secret information may only be granted to individuals who actually require this information. Furthermore, it should always be evaluated whether the storage of certain, secret information in the intranet is actually necessary and appropriate.

As a result, access restrictions are reduced down to the required minimum at IS. Searches for knowledge will be more often successful and it will be more transparent for individuals whether the desired knowledge exists at all when they cannot find it.

As already mentioned, the recent, rapid development of knowledge management was particularly driven by the new possibilities which arose from technological innovations especially in the area of ICT. As this trend is on-going, it can hence be recommended to regularly update the intranet application to its latest version. These updates enable the usage of the most recent technologies which allow an improved and more efficient knowledge management. If these possibilities are used, a continually improvement of the knowledge management will be the result.

### 7.5.3 Documentation

From the experiences made during the situation analysis, it seems that a targeted increase of the level of documentation can lead to a higher efficiency in ITSM as outlined in section 6.4. Less surprising, it is not advisable to document anything and everything for an end in itself. Only documentation should be created and maintained when it will be reused or is mandatory by requirements from GRC. IS' configuration, incident, and problem management will raise their level of documentation through the proposed knowledge management methods. The current change management provides already a level of documentation which is mostly sufficient from a knowledge management perspective. Only its application and standardization should be extended as described in section 7.4 to be completely sufficient.

Beneficial for the operative ITSM processes would be an enhanced project documentation which aims at the transfer of knowledge to the IT service operation. With this documentation, incident and problem management would possess more knowledge that would them allow to react faster and to become more efficient. Especially, problem management could benefit because the investigation and diagnosis is eased and quickened for problems which are related with recently implemented projects.

Post implementation reviews have the ability to put attention on the actual documentation demands, especially when they are not satisfied. They assist to direct the available resources to documentation activities which are highly beneficial. They help to adjust the level of documentation in order to find a balance between the efforts and benefits of documentation.

The general level of documentation is finally a decision of higher management which has to balance the possible benefits from documentation with the required efforts, the available resources, and other activities which are also beneficial or have to be accomplished. Knowledge management can support by giving guidance and developing documentation guidelines which aim to ensure that the achievable documentation provides the greatest possible benefit.

CHAPTER 8

# Steps for the Introduction of the Proposals at DeLaval Information Services

## 8.1 Overview

This chapter is concerned with the introduction of the knowledge management proposals at the IS department. It points out activities which are required or helpful for a successful introduction. Although these recommendations are specific for IS, they possess mostly a general validity.

Particular emphasis is placed on the fact that individuals find it generally difficult to use new applications when they have to use them from scratch and without guidance. This can lead to reservations against the new applications or even to their refusal. In this case, a failure of the introduction becomes more likely. This risk can be reduced by the existence of an initial structure filled with data or at least sample data. This helps individuals to find their way how to use the application. The structure should be well chosen but does not have to be perfect because it can and will be altered during the usage of the application depending on the user requirements [116].

For any successful introduction of organizational change, accountabilities and responsibilities have to be adopted to the new circumstances [13], [149]. This applies also to the introduction of the knowledge management proposals. The assignment of responsibilities is discussed in the previous chapters, especially in chapter 7. As already mentioned, IS has decided to create a new full-time position for a knowledge knowledge manager who will be responsible for the majority of the proposed knowledge management activities.

As for any organizational change, the knowledge manager will definitely need the support of higher management for a successful knowledge management introduction. The individuals

within the organization have to be convinced about its general advantages and their own benefits in order to actively support the intended change [174].

## 8.2 Incident Management

To ease up the usage of the new incident management system, the incident records from the old system are preferably transferred into the new system. Besides these incidents, it is even more important that the KB is filled initially with a number of useful examples for all types of KB articles. Ideal candidates for these initial KB articles are existing but not centrally stored documents. They can be collected and transferred into the KB. Individuals can be asked for their locally stored documents.

Especially in the starting phase, the knowledge manager has to motivate individuals to maintain and use the KB in the desired way, to assist individuals when they need guidance or have questions, and to direct the development of the KB into the desired direction.

Until the introduction of a formally specified problem management process, incident management has to accomplish the maintenance of the KB alone. This means, that it has to take care about some parts of the KB maintenance which are normally maintained by the problem management process. It is not necessary to create problem records but the incident management process has to be extended in a way that it ensures the maintenance of KB articles for known error messages, workarounds, and resolutions.

## 8.3 Problem Management

The introduction of a formal problem management process should be one of the next steps after the introduction of the new ITSM application for the incident management. The main benefit of such a formally specified problem management process is that knowledge can be gathered for all IT services what helps to find possible areas for improvement. This enables a continual improvement.

A suitable problem management process has to be developed for IS. It should base on ITIL and contain the proposed, additional activities for knowledge management from section 5.3. These are in summary: a stronger emphasis on the continual maintenance of the KB and a thoroughgoing linkage of problems and RFCs. With the introduction of the problem management process, the maintenance of the KB will change. For the first time, problem records will become part of the KB. Incident management will no longer have to maintain error messages, workarounds, and resolutions. They will be maintained primarily during the problem management process from now on.

## 8.4 Configuration Management

The IS is going to introduce a configuration management that will fulfill the requirements of the knowledge management. The centerpiece of any configuration management, the CMDB will enfold its full potential if it is always complete, correct, and up-to-date. This requires a continual maintenance of the CMDB what involves on-going efforts from numerous individuals. The actual fulfillment of all necessary tasks for the maintenance of the CMDB can be assured best when all individuals fulfill their tasks actively and in a collaborative manner. Therefore, it has to be ensured that the configuration management process is accepted by all individuals and that they realize the benefits from a complete, correct, and up-to-date CMDB. These benefits have to be communicated, ideally personally. After the introduction, success stories have to be published within IS to continually keep up the motivation.

## 8.5 Change Management

A change management process has already been introduced which fulfills the requirements of knowledge management. The process is not applied throughout all areas currently but should be applied ideally for all areas. Hence, the actual application of the process should be extended. Furthermore, additional types of changes should be identified which are suited for the definition and application of standard changes. These tasks are preferably accomplished by the change manager.

The change manager is also responsible for the conduction of post implementation reviews. The benefits from these reviews have to be communicated during these reviews to individuals who are not aware of their aims and benefits. The knowledge manager should encourage the conduction of post implementation reviews and take part sometimes. Once in a while, a success story can be published within IS to continually keep up the motivation.

## 8.6 Intranet

An extensive intranet application is already implemented and used. As described, it is recommended to use the intranet as far as possible. Steps to increase knowledge sharing via an increased usage of the intranet include the following ones:

- Data can be integrated or transfered to the intranet which is currently only available on network drives.
- New projects manage their documents only via the intranet.
- It has to be ensured that all employees are aware of the possibilities of the intranet. They should also know how it can be used effectively to successfully enhance collaboration.

- Knowledge work is hard to enforce. If people are prevented from an efficient knowledge work they will skip it. Issues which prevent the usage of the intranet have to be reduced.
  - If there are areas with a non-satisfying usability it should be evaluated whether it can be increased with reasonable efforts. Usability should be generally high, especially for often used functionalities.
  - Clear navigation structures have to be created. Ideally, individuals should find the information they require without the assistance of somebody else who has to show them where to find it.
  - Permissions should be granted by default as far as possible. It slows down or even lets people cancel the search for knowledge when access to knowledge is restricted. Especially when individuals are not sure where they can find it of if they have to ask different others for help or permissions.

The knowledge manager should be responsible for the identification of areas for improvement, the collection and assessment of ideas for improvement, and the development of possible ideas for improvement.

## 8.7 Blogs

As described in section 7.5.1, it has already been tried half-heartedly to introduce blogs without success. The blogs started without any content except a default starting article and without serious support by the introducers. This has to be changed for a second start. The readers have to be convinced that it is beneficial to read these blogs. If the blogs are read regularly, users will also be more motivated to publish blog articles. For a second start it has to be guaranteed that:

- more than one blog is available.
- every blog contains one article which explains the purpose of the blog and least one other, real article.
- clear responsibilities are assigned which ensure that new blog articles will actually be published.

Afterwards, an email announcement can be made. In addition, the start of the blogs can be promoted informally on the office corridors. The reading rate can be sustainable kept high if the individuals integrate the blog in their preferred software. For this purpose a technical guide should be provided how they can integrate the blogs in Outlook, common browsers, or other software applications. A link to this guide is best displayed well visibly in the menu of the blog. A possibility to subscribe to blogs by email would support the long-term number of readers as well because it offers another way to follow the blogs. This feature should be offered when it is available in the used software or feasible to add with reasonable efforts. Besides these technical

considerations, it is most important for a high long-term reading rate to continually provide new content of interest.

CHAPTER 9

# Conclusion

## 9.1 Summary

My experience was that many persons interpreted knowledge management mainly as the explication and preservation of knowledge. Actually, these are only two of the many parts of knowledge management that requires also the other parts to be effectively applied. The single preservation of knowledge would be pointless without its distribution and utilization as an example. Probst's and Nonaka's knowledge management concepts illustrate this fact clearly. Furthermore, knowledge domains differ as all kinds of organizations face ordered and unordered situations. As a consequence, there are different requirements for knowledge management depending on the situation which hardly can be fulfilled by one single knowledge management approach. More appropriate are several approaches which are able to satisfy all the different needs of a specific organization.

ITIL's recommendations as de facto ITSM standard and raised GRC requirements lead to a stronger separation of tasks within ITSM organizations. This separation requires an increased collaboration between different individuals for an effective and efficient ITSM. Knowledge has to be preserved for its usage by others and has to flow efficiently between individuals. This demands an active management of knowledge in order to ensure an appropriate provision of knowledge to all individuals.

The term knowledge management can be found in ITSM frameworks only since 2007 when ITIL started to take up the general trend towards an active management of knowledge within organizations. ITIL proposes to consolidate all sources of knowledge in one central repository. This approach tends in a desirable direction but its final aim seems utopic. Even though it is holistic from a technical perspective, it is not holistic from an organizational, management, or socio-technical point of view and covers only partial aspects of knowledge management. Moreover, the majority of its explicit knowledge management recommendations are rather concerned

with the management of information than with the management of knowledge. When ITIL is concerned with actual knowledge, it gives little guidance but it rather only points out areas which should be managed. Apart from that, ITIL contains a number of activities within ITSM which also can be regarded implicitly as knowledge management recommendations besides their actual primary aim. More detailed guidance is given on these implicit proposals by the other ITSM frameworks which look at the same activities from different perspectives. All of these implicit proposals have a strong focus on the externalization and preservation of knowledge. However, ITIL does not satisfy the requirements of the variety of activities and methods which are subsumed under the term knowledge management. Especially acquisition and transfer of knowledge are barely covered.

IBM's ITUP extends ITIL with a more holistic knowledge management approach that covers more areas of knowledge management. For this purpose, it contains a dedicated knowledge management process that recommends a number of operative and strategic knowledge management activities. It is far more suited but nonetheless it also does not cover all areas of knowledge management. KCS provides a widely self-controlling knowledge management approach that covers exclusively single aspects of the ITSM, viz. incident and problem management. Its self-controlled approach is elaborated but requires an organizational culture which cannot be taken for granted. Its major issue is that it bases widely on a kind of forced collaboration with indistinct responsibilities and accountabilities.

Collaboration and the desire to share knowledge are likewise the base of the new technologies which are subsumed under the term enterprise 2.0. These technologies allow new forms of collaboration which are able to improve knowledge management. In contrast to KCS, most of these technologies allow the definition of clearer responsibilities and accountabilities which make them more suitable for traditional organizations. While the underlying technologies are widely used and accepted in the world wide web, organizations just started to adopt them. Likewise, the ITSM frameworks have not adopted these technologies yet.

## 9.2 Limitations

In this thesis, the knowledge management proposals are applied on an internal ITSM organization, namely the IS department. It is part of a larger organization and its IT services are solely provided for the larger organization what is an usual structure for ITSM organizations. However, ITSM organizations can differ widely. In addition to these internal ITSM organizations, there are also many ITSM organizations which provide their IT services to different external organizations or a huge number of individual users. Hence, it is not feasible to propose a general knowledge management which considers all imaginable peculiarities of any ITSM organization. Nonetheless, the recommendations from this thesis apply basically for all kind of ITSM organizations. If IT services are used by a huge number of individuals, the proposed knowledge management activities will be even more important for an effective and efficient ITSM.

This thesis outlines how the success of the proposals can be measured. An actual measurement was not feasible because the proposals are intended to be introduced after the completion of this

thesis. A prototypical measurement on a small scale would have been of limited use because the proposed knowledge management will achieve its full potential only if it is fully applied and after some time. However, performing these measurements should be started as soon as possible. They should preferably be started before the actual introduction of the knowledge management methods but at least with its introduction. These early started measurements enable a quantification of the effects of the taken methods. Apart from that, the main benefit of these measurements is the ability to finely adjust the taken methods in order to continually optimize the knowledge management and the supported ITSM processes.

## 9.3 Future Enhancements

The proposed knowledge management methods reflect the current state of the art and support a continual improvement of the knowledge management itself and the ITSM processes. Despite this given support, the actual continual improvement does not come by itself but involves the individuals of the ITSM organization who have to actively use the offered assistance by the proposed knowledge management methods.

As already mentioned, the ITSM frameworks started to contemplate about knowledge management relatively recently. Their recommendations aim mostly in the right direction but they are not holistic and some recommendations seem to be unrealistic. There is hence a potential for ITSM frameworks to give improved knowledge management recommendations in future versions.

Many knowledge management methods can hardly be introduced in a top-to-bottom approach but require an active participation by motivated individuals. If knowledge management activities involve a comparatively high expenditure of time, individuals will be less motivated to accomplish these activities. Software possesses an outstanding potential to either increase or reduce these efforts. Differently stated: to ease or complicate the necessary activities for knowledge management, especially for the explication, preservation, and transfer of knowledge. A good software usability seems to be one of the major success criteria of any knowledge management measure together with the motivation of the participating individuals and the support of higher management. Improving the assistance by software is an area where many future enhancements are possible.

Much knowledge is created as a by-product during the daily work which is directly lost after its application because its preservation would require too much manual effort. To give just one trivial example: when a support analyst searches for a helpful knowledge source on the internet for the currently processed incident, he has to make a number of mouse clicks or keystrokes to store the link of the knowledge source with the currently processed incident. Imaginable is a function in the browser which allows to store this link with just one mouse click or keystroke. The easier it is and the less time it consumes, the more often will individuals explicate, preserve, and share their knowledge.

# Acronyms

| | |
|---|---|
| 24/7 | 24 hours a day, 7 days a week |
| Atom | Atom Syndication Format |
| BCG | Boston Consulting Group |
| BSI | British Standards Institution |
| CI | Configuration item |
| CIO | Chief Information Officer |
| CMDB | Configuration management database |
| CMM | Capability Maturity Model |
| CMS | Content management system |
| CobiT | Control Objectives for Information and Related Technology |
| CRM | Customer relationship management |
| CSI | Consortium for Service Innovation |
| DMS | Document management system |
| DW | Data warehouse |
| ECM | Enterprise content management |
| ERP | Enterprise resource planning |
| FAQ | Frequently asked questions |
| GAMP | Good Automated Manufacturing Practice |
| GMP | Good Manufacturing Practice |
| GMT | Greenwich Mean Time |
| GRC | Governance, risk & compliance |
| HP | Hewlett-Packard |
| HP ITSM | HP IT Service Management Reference Model |
| HR | Human relations management |

| | |
|---|---|
| HTML | Hypertext Markup Language |
| ICH | International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use |
| ICH Q10 | ICH Pharmaceutical Quality System |
| ICT | Information and communications technology |
| IEC | International Electrotechnical Commission |
| IS | DeLaval Information Services |
| ISACA | Information Systems Audit and Control Association |
| ISO | International Organization for Standardization |
| IT | Information technology |
| ITIL | IT Infrastructure Library |
| ITIL v2 | IT Infrastructure Library Version 2 |
| ITIL v3 | IT Infrastructure Library Version 3 |
| ITSM | IT service management |
| itSMF | IT Service Management Forum |
| ITUP | IBM Tivoli Unified Process |
| KB | Knowledge base |
| KCS | Knowledge Centered Support |
| KMMM | Knowledge Management Maturity Model |
| KPI | Key performance indicator |
| MOF | Microsoft Operations Framework |
| n/a | Not applicable |
| OGC | Office of Government Commerce |
| PPS | Practical Project Steering |
| PRINCE2 | Projects in Controlled Environments |
| PRM-IT | IBM Process Reference Model for IT |
| RACI | Responsible, accountable, consulted, and informed |
| RFC | Request for change |
| RSS | Really Simple Syndication |
| RUP | Rational Unified Process |
| SCM | Supply chain management |
| SKMS | Service knowledge management system |
| SLA | Service Level Agreement |
| WYSIWYG | What you see is what you get. |

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APPENDIX A

# DeLaval Information Services

## A.1 Incident Management Process

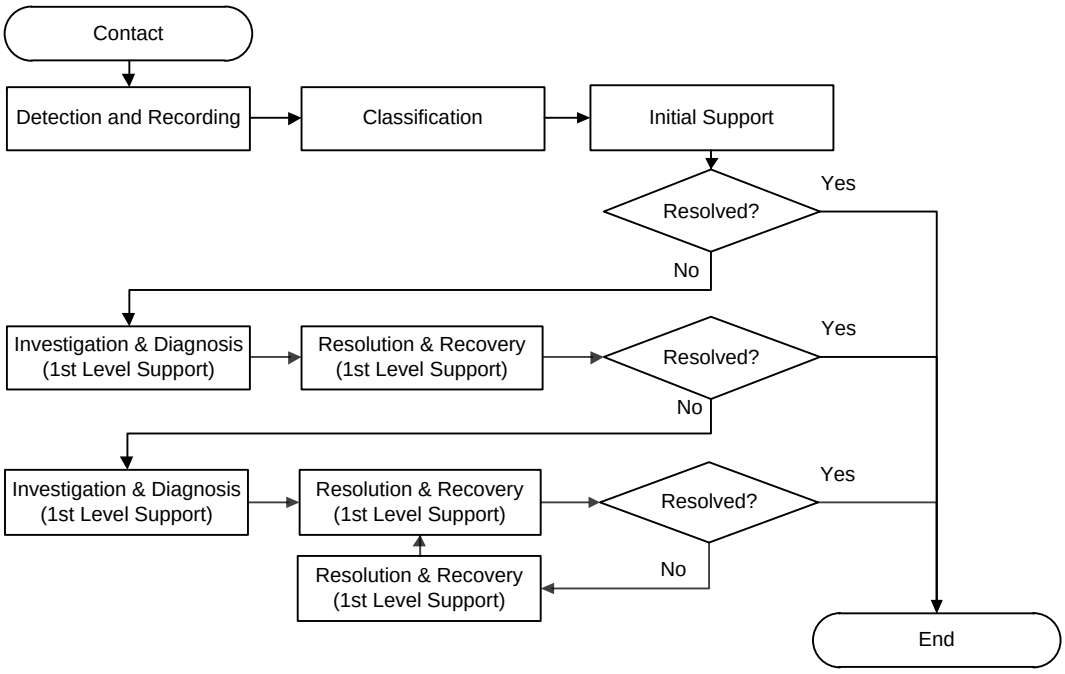


**Figure A.1** – Incident Management Process Flow [44]

## A.2 Change Management Process

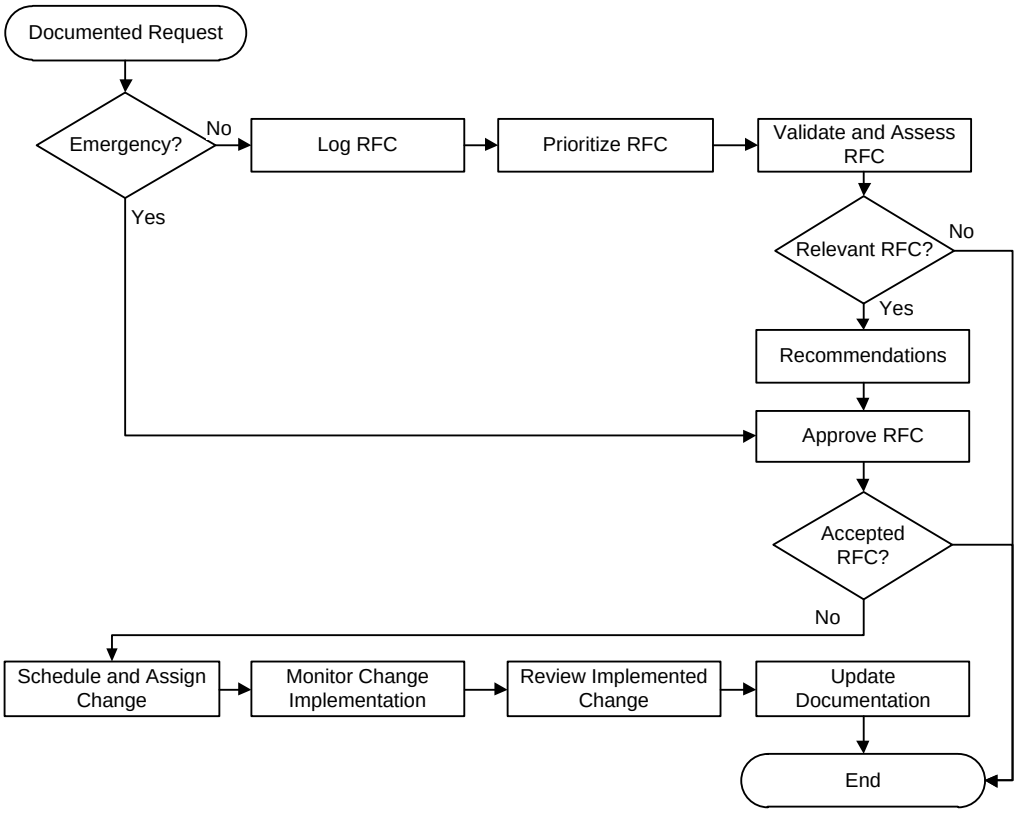


**Figure A.2** – Change Management Process Flow [44]

APPENDIX B

# IT Infrastructure Library (ITIL)

## B.1 Incident Management Process

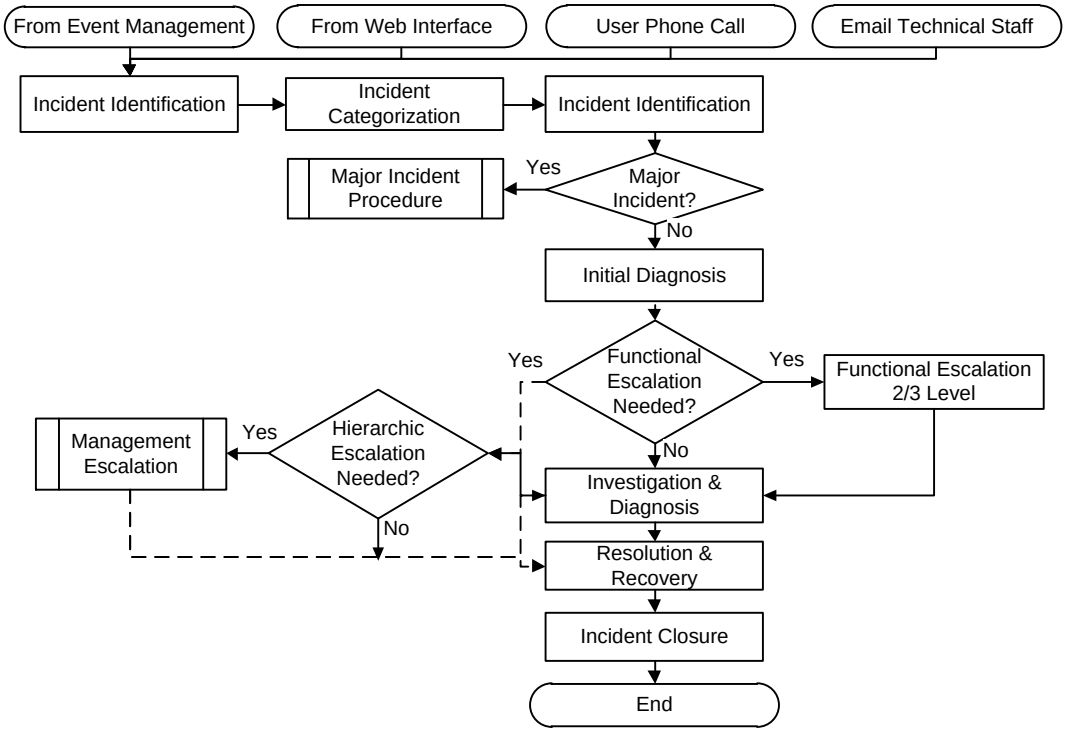


**Figure B.1** – Incident Management Process Flow [140]

## B.2 Problem Management Process

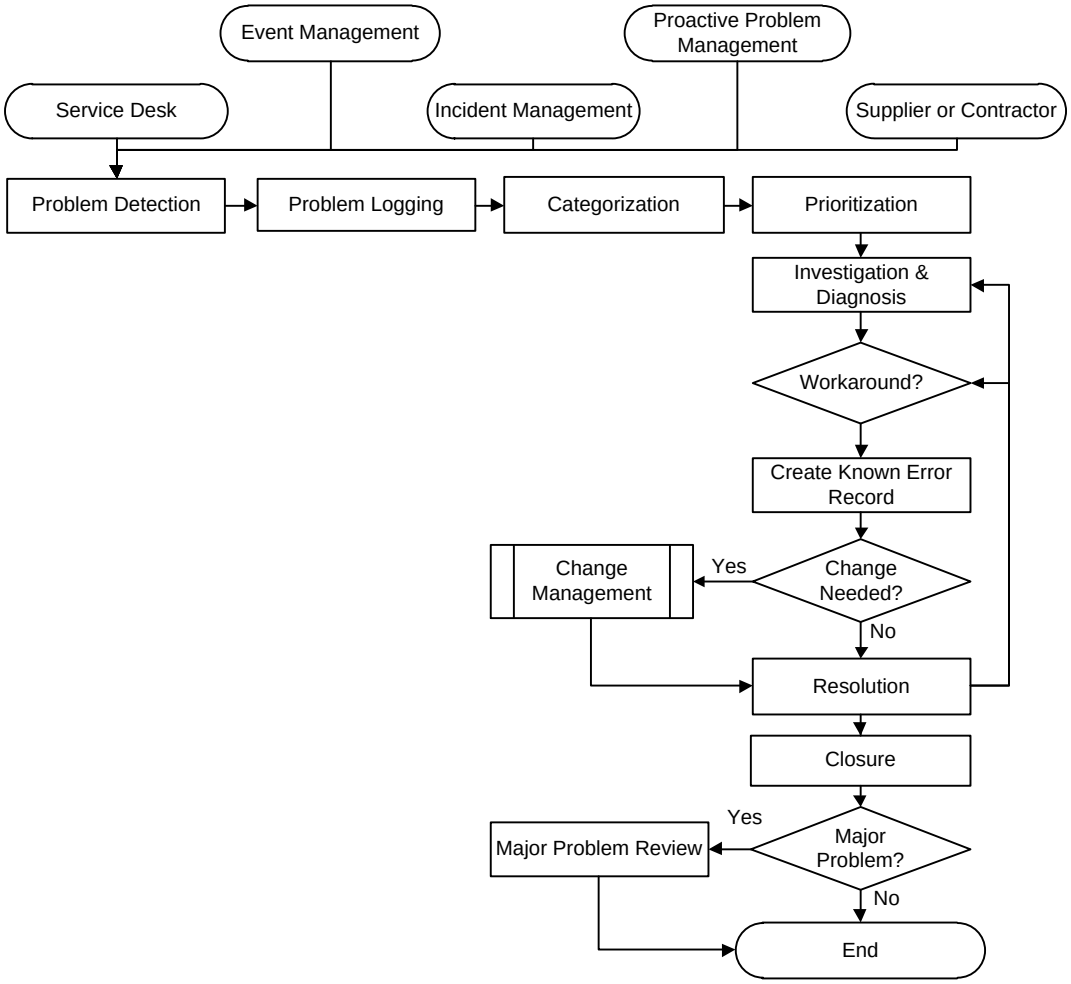


**Figure B.2** – Problem Management Process Flow [140]

## B.3 Change Management Process

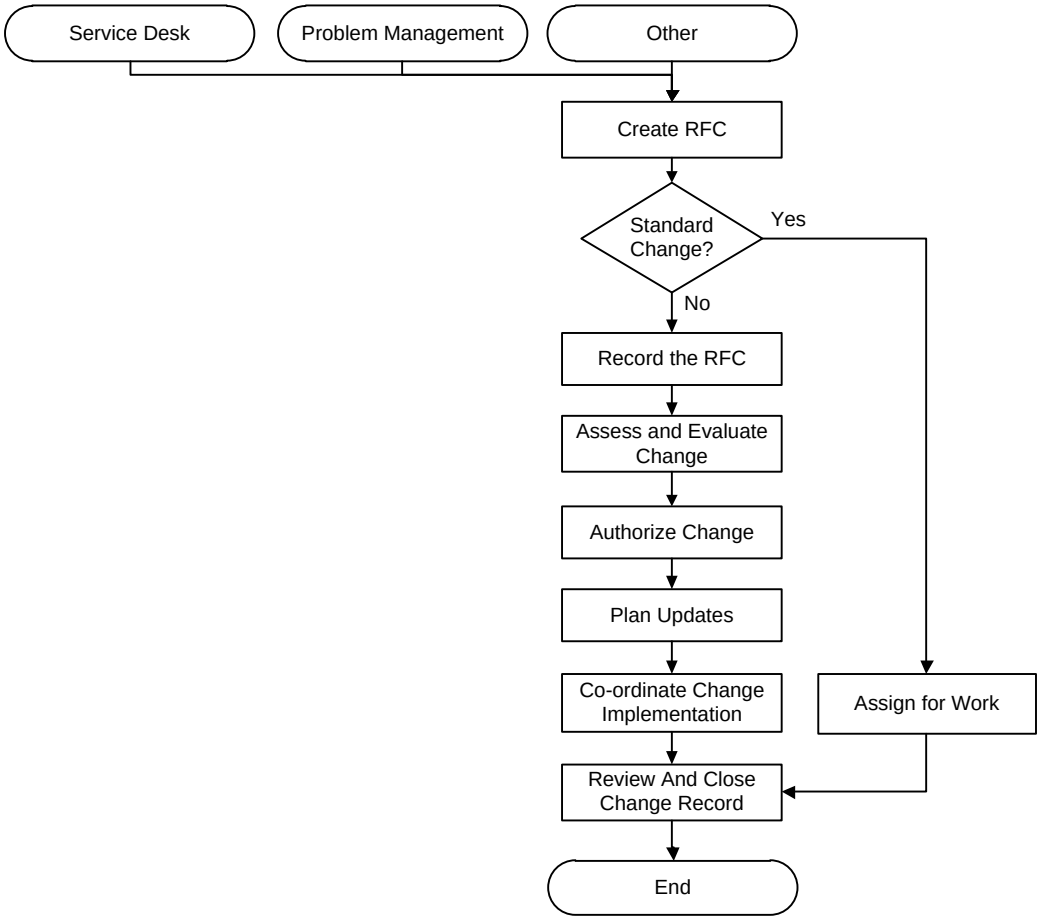


**Figure B.3** – (Normal) Change Management Process Flow [142]

## B.4 Configuration Management Process

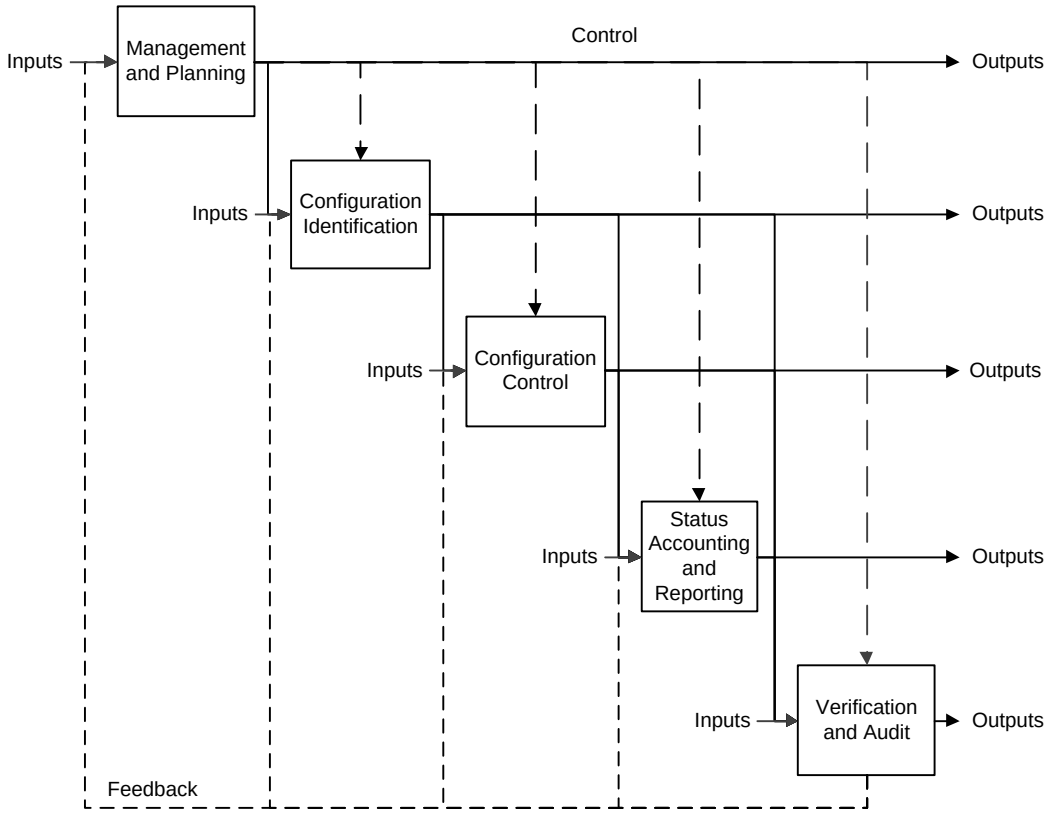


**Figure B.4** – Configuration Management Process Flow [142]