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Developing the IT Knowledge Management Process for a Case Company

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Author(s) Title Number of Pages Date	Olavi Sorvari Developing the IT Knowledge Management Process for a Case Company 49 pages + 2 appendices 8 May 2017
Degree	Bachelor of Engineering
Degree Programme	Industrial Management
Specialisation option	International ICT Business
Instructor(s)	Jarmo Jätyri, Senior Executive, Sofigate Nina Hellman, Lecturer

The topic of this thesis is the development of an IT knowledge management process for a case company. The case company is a global public company operating in the manufacturing industry. The company's efforts in improving the quality of their IT operations lead to this development project mainly because the business challenges, the lack of ownership in the case company's side and the insufficient flow of information were caused by the existing, fully outsourced process.

The development project was conducted according to a defined ITSM project development model and the industry's best practises. Key stakeholders, such as service managers, were involved in the development to bring their expertise and other input for the proposal. The project was communicated regularly for the IT service manager community, thus iteratively testing the relevancy of some of the features.

As the result of this development project, the case company was offered a proposal for a new IT knowledge management process and other related elements such as KPI's, ITSM tool customizations and new knowledge base structure. As the old process had appointed all the responsibilities to the outsourced IT knowledge management team, the new proposal included the whole IT ecosystem in the process.

The new proposal addresses the defined business challenges and supports the company's development in the future by its design. From the proposal, one can pinpoint the features which have the biggest impact on the current state of the IT knowledge management. However, at the time of this thesis, the process was not yet implemented, therefore, the real-life results from the effectiveness of the proposal can only be estimated.

The project was aligned with the initial objectives and the case company was happy with the results.

Keywords	ITSM, knowledge management, process development

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University of Applied Sciences

Tekijä(t)	Olavi Sorvari
Otsikko	Tietämyksenhallintaprosessin kehitys asiakasyritykselle
Sivumäärä	49 sivua + 2 liitettä
Aika	8.5.2017
Tutkinto	Insinööri (AMK)
Koulutusohjelma	Tuotantotalous
Suuntautumisvaihtoehto	Kansainvälinen ICT-liiketoiminta
Ohjaaja(t)	Jarmo Jätyri, Senior Executive, Sofigate Lehtori Nina Hellman

Työn aiheena on tietämyksenhallintaprosessin kehitys asiakasyritykselle. Työ tehtiin suomalaiselle globaalisti toimivalle valmistavan teollisuuden pörssiyritykselle. Yrityksen viimeaikaiset ponnistelut IT-palveluidensa laadun parantamiseksi johtivat työn tarpeen tunnistamiseen. Kohdeyrityksen liiketoimintahaasteena oli tietämyksenhallintaprosessin ulkoistuksen aiheuttama prosessiomistajuuden puute ja tiedonkulun ongelmat, jotka näkyivät muun muassa pidentyneinä häiriöiden ratkaisuaikoina ja tietämyksenhallintaprosessin hitaana ja rajallisena kehitettävyytenä.

Prosessikehitys suoritettiin IT-palvelunhallinnan parhaiden käytänteiden ja prosessikehitysmallin mukaan. Avainasemassa olevat sidosryhmät, kuten esimerkiksi palvelupäälliköt, olivat osallisina kehitykseen tarjoamalla asiantemuksensa tuomaa näkemystä. Projektin aikana sidosryhmille kommunikoitiin jatkuvasti kehityksen kulkua, samalla iteratiivisesti testaten suunnitelmien järkevyyttä.

Kehitysprojektin lopputuloksena kohdeyritykselle toimitettiin ehdotus uudesta tietämyksenhallintaprosessista ja siihen liittyvistä tarpeellisista elementeistä, kuten suorituskykymittareista, IT-palvelunhallintatyökalun vaatimista kustomoinneista ja tietämyskannan rakenteesta. Koska vanha prosessi on täysin ulkoistettu yhdelle IT-toimittajalle, uudessa prosessimäärittelyssä on toimijoina koko IT-ekosysteemi.

Uusi määritelty prosessi ja siihen liittyvä muu aineisto vastaa kohdeyrityksen liiketoimintahaasteisiin ja tukee toiminnallisuuksiltaan yrityksen tulevaa kehitystä. Ehdotetusta prosessista pystytään tunnistamaan ne ominaisuudet, joilla on suurin vaikutus tietämyksenhallintaprosessin nykytilan aiheuttamiin ongelmiin. Tämän kehitystyön aikana prosessia ei otettu käyttöön, joten todelliset vaikutukset kohdeyrityksen toimintoihin jäävät arvioinnin tasolle.

Projektin tuotokset olivat linjassa alkuperäisten tavoitteiden kanssa, ja kohdeyritys oli lopputulokseen tyytyväinen.

| Avainsanat | IT-palvelunhallinta, tietämyksenhallinta, prosessikehitys |

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Terms and abbreviations

ITSM – IT Service Management, a set of activities carried out to plan, design, deliver, operate and control the IT services

ITSM tool – A system supporting defined ITSM processes

SKMS – Service Knowledge Management System, A set of databases and tools managing data, knowledge and information

SIAM – Service Integration and Management, A concept for centralized management of IT service suppliers

IT ecosystem – Organizations own IT and suppliers alike, with a common goal in IT service delivery quality

ITIL – Information Technology Infrastructure Library, a framework of best practices of IT service management

Knowledge article – A written document offering IT related instructions, information about current events or other ITSM process related documents

CMS – Configuration Management System, a set of information, data and tools to support Service Asset and Configuration management process

CMDB – Configuration Management Database, a database where configuration records are stored

1 Introduction

This project was carried out for a large Finnish corporation operating in the manufacturing industry. The purpose was to define a global IT knowledge management process to be implemented during the second half of the year 2017. This report begins with describing the current state of the case company's IT knowledge management. It also covers the conclusions made and the data used to identify the requirements for the future process, theoretical background to develop the proposition, the definition of the new IT knowledge management process, and the potential improvements in the case company's IT enabled by the new process.

1.1 Company and project background

The case company is a large Finnish globally operating corporation with thousands of employees. The IT is critical for the business, as the production, sales, supply chain and other critical areas are highly dependent on the availability and reliability of applications and systems. During the last decades, there has been a strong outsourcing trend in the case company's IT, and currently the company is focusing in improving the overall quality of their global IT services, for the end users and business alike.

The case company's IT ecosystem consists of large international IT suppliers, which have their own responsibilities in the case company's global IT environment. The service desk is outsourced to one global supplier, which is also as the owner of the case company's current IT knowledge management process.

The IT knowledge management process development is a part of the previously mentioned quality improvement focus. The whole IT ecosystem holds vast amount of information that is required to sustain company's IT operations. Service managers, solution managers, specialists and vendors are all participating in creating knowledge. The IT knowledge management process is the key process in utilizing and distributing the information produced and needed by these stakeholders.

The Service Management Office (SMO) is a function managing the multi-vendor IT environment. The SMO is operating in the case company's premises. It is a Service Integration and Management (SIAM) concept implementing function, whose target is to oversee the case company's benefits in the multi-vendor ecosystem and improve quality of the services. The IT knowledge management process will be under SMO's ownership after the new process has been deployed.

The quality improvement focus affects the whole IT ecosystem, its processes, IT suppliers and activities. The case company has invested vast amounts of money in streamlining their current processes, renewing devices and initiating quality development programs of a global scale. IT service management processes have been developed to better serve the whole multi-vendor environment.

1.2 Business challenge

The business challenge the case company faces with their current way of working can be divided into two parts, process ownership and the flow of information.

The case company does not have a defined global IT knowledge management process. Service desk supplier's IT knowledge management process is defined and implemented, but a need to bring process ownership back to the case company is recognized widely for responsibility and quality purposes. Service desk supplier's process roles and responsibilities are also very one-sided, not leaving much room for other actors outside their organization.

As the current process is not owned by the case company, the means to develop and measure the process are not sufficient.

From the case company's IT perspective, the main value in efficient knowledge management is seen in reducing the service managers' time used in re-creating knowledge articles, as the process would contribute in validating existing articles. The availability of useful articles in the key IT service management processes can be seen as the main business impact of knowledge management, as the business processes are highly dependent on the IT.

The current way of working does not support the flow of information in the case company's IT environment. Service managers, solution managers and other case company IT professionals do not have the rights to publish the knowledge articles they have created. Service desk supplier has repeatedly failed to apply existing knowledge articles when resolving incidents and problems, leading to prolonged incident and problem resolution times and impaired resolution quality, thus affecting the case company's business activities.

1.3 Objective, scope and outcome

The objective of this thesis work was to define a new IT knowledge management process for the case company. Through this, the process can be insourced in a way that the process ownership and accountability lies within the case company. Through the insourced process, the case company can use knowledge in a more efficient manner, as the design of the knowledge base and the knowledge article linking to other processes and activities can be influenced as improvements are recognized.

The outcome of this thesis work is a global IT knowledge management process, including process description, roles and responsibilities and the most potential future improvements. KPIs and metrics to ensure process efficiency and quality and the process policy are delivered to the case company, but not included in this thesis

The ITSM Tool functional requirements and customizations are also needed to implement efficient IT knowledge management process, and they are covered in this thesis for their relevant parts.

The improvements in the IT knowledge management as well as process efficiency will be measurable after the new process has been deployed. A high-level definition of these metrics that will show the improvements is a part of this thesis, but unfortunately, the actual data from those measurements will only be available after this project.

2 Working methods and materials

This development project was executed according to process development best practices. In a global company such as the case company, there is a vast amount of data available, which was used in several phases. The following sub-sections describe the approach used in the development, followed by more thorough description of the data available and the viewpoints it enabled.

2.1 Research design

The following figure describes the methodology used in this project from the thesis's perspective. On the left side are the sources of data, in the middle are the steps this thesis followed and on the right can be seen the outcomes of each step.
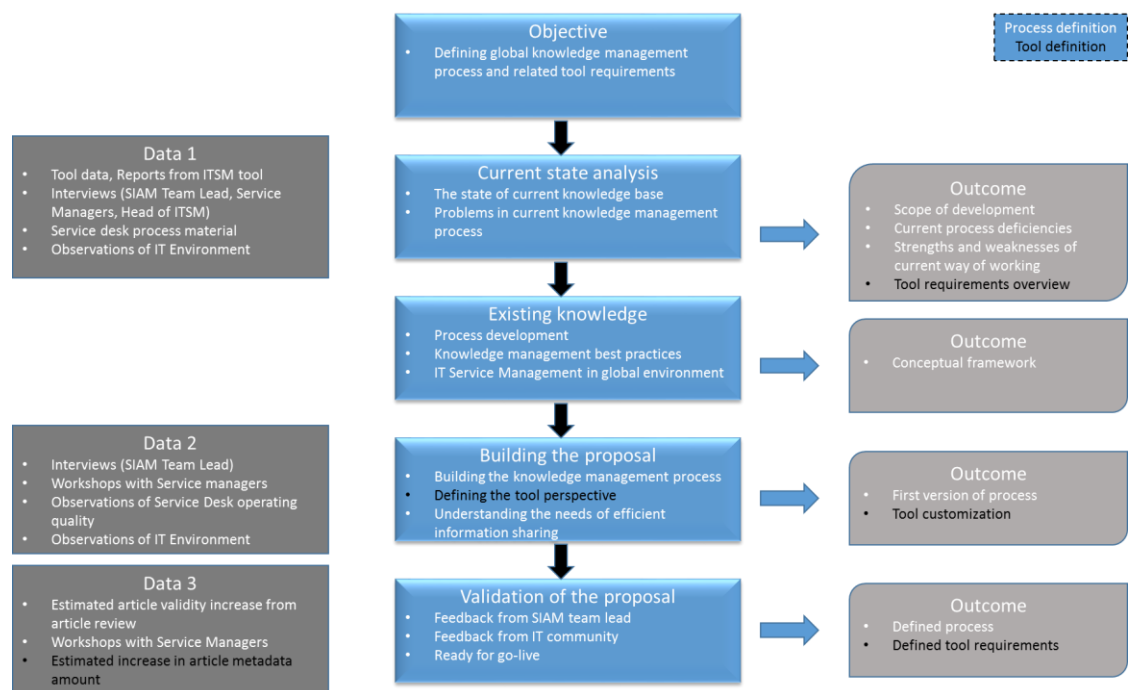

Figure 1.   Research design

As the need for a new IT knowledge management process had been recognized within the case company, this project started by defining the key elements missing in the current way of working, which would be needed for efficient IT knowledge management. This defined the scope of the project. The tool requirements were taken into consideration

from the very beginning. The data used in the first phases were obtained from the ITSM-tool-based reports, interviewing key personnel, researching the service desk supplier's material describing the current process and from participation as an observer in the case company's IT ecosystems daily operations and meetings.

The process development continued through researching general knowledge management, IT knowledge management and process development best practices to create a conceptual framework which would be used in defining the process.

Building the proposal required more thorough workshops with the case company's subject matter experts, such as service managers. Data also included some service desk metrics in order to build a clearer picture of the current state and the elements needed to reach the desired target state.

Finally, the new IT knowledge management process will be implemented to the case company. The real-life process data was not available for this project, but by comparing the current state and the predicted target state enabled by enhanced article metadata and knowledge base re-structuring, the benefits are possible to be estimated in a reasonably accurate level. Also interviews with service managers are to be conducted to ensure satisfaction to the new IT knowledge management process.

2.2   Data collection and analysis

Various sources of data were used in this thesis. Table 1 indicates the sources of data and what they were used for.

Table 1.   Data sources and the use of data

Data set	Source	Content	Used for
Data set 1	ITSM tool reporting	Metadata behind knowledge articles	Current state of IT knowledge management

	Induction session with SIAM Team lead	Overview of IT knowledge management in the case company's environment	IT knowledge management effect on the case company's IT and Business
	Workshops with Service managers	Knowledge management problem areas regarding IT services	Current process deficiencies, Vendor requirements in the future process
	Gathered observations of IT environment	Stakeholders, Knowledge article use cases, IT knowledge management connections to other processes	Current state of knowledge management, organization characteristics regarding IT knowledge management
Data set 2	Interviews with SIAM Team lead	IT knowledge management requirements, scheduling of development work, material to be created	IT knowledge management process definition, working methods
	Workshops with Service managers	Using IT knowledge management in the case company's IT	IT knowledge management requirements in Service manager point of view
	Observations of service desk operating quality	Using knowledge articles in incident and problem resolution	Process requirements from service desk point of view, tool customizations to improve article utilization
	Gathered observations of IT environment	Multi-vendor environment characteristics in process	Process description, tool customization to include vendor participation
Data set 3	Estimated article validity increase from the article review	The comments on article review participants on the overall article quality	Knowledge base structure finalization to enhance possible problematic article types

	Workshops with service managers	Multi-vendor environment characteristics affecting service managers' work	Finalizing process design, assignment groups and ITSM tool rules
	Estimated increase in article metadata quality from the article review	The amount and type of empty metadata fields	Assigning rules to article types in ITSM tool

Quantitative data used to evaluate the current situation of the case company's IT knowledge management was obtained from the ITSM tool reporting. The data gathered consisted of the following metadata behind knowledge articles:

- Article type

- Article category

- Affected solution

- Time stamps (created, published, updated)

- ITSM tool users (created by, updated by, author)

- Sub-category

- Support group

The ITSM tool contained many more types of metadata behind the articles, but due to the fields not being consistently filled, they were not useful for the development.

2.3   Discussing reliability and validity

Due to the nature of this project, the reliability and validity cannot be discussed in their most technical nature. Also because a process development is always highly dependent on the individual or a group performing it, the work itself leaves much room for different approaches and outcomes. However, they can be addressed on a contextual level.

Reliability, as in its most common meaning, refers to the repeatability of the outcome. As the process development outcome is regarded, the conclusions of this thesis are not repeatable in a way that in the same environment another performer would end up with the same kind of proposal. However, it can be stated that as the best practices and the development model used are the de facto standard of the industry, so the most important elements of this development would be included again with the same initial situation.

As the subjectivity of the observer is the concern in the reliability discussion, the approach used in this thesis which included as much exact data as possible and critical evaluations of the individuals' input, it can be stated that the reliability is on a sufficient level.

The validity, however, is not a major issue in a project of this nature because any kind of strictly scientific approach to a process development project would probably create a good outcome in theory, just to pose major problems when implemented in a real-life environment. This is induced by the differences in every IT environment, which cause the characteristics of the environment to have an extensive effect considering the outcome.

When considering the usual ways to ensure validity in a research, it can be stated that this project follows the normal guidelines regarding choosing a methodology suitable for the project's characteristics, sample method being coherent and applicable and the fact that the respondents were not offering their input in a pressuring or disruptive situation.

3   Current state of the case company's IT knowledge management process

As mentioned in the first chapters of this thesis, the current knowledge management process is outsourced to the service desk supplier (Figure 2).
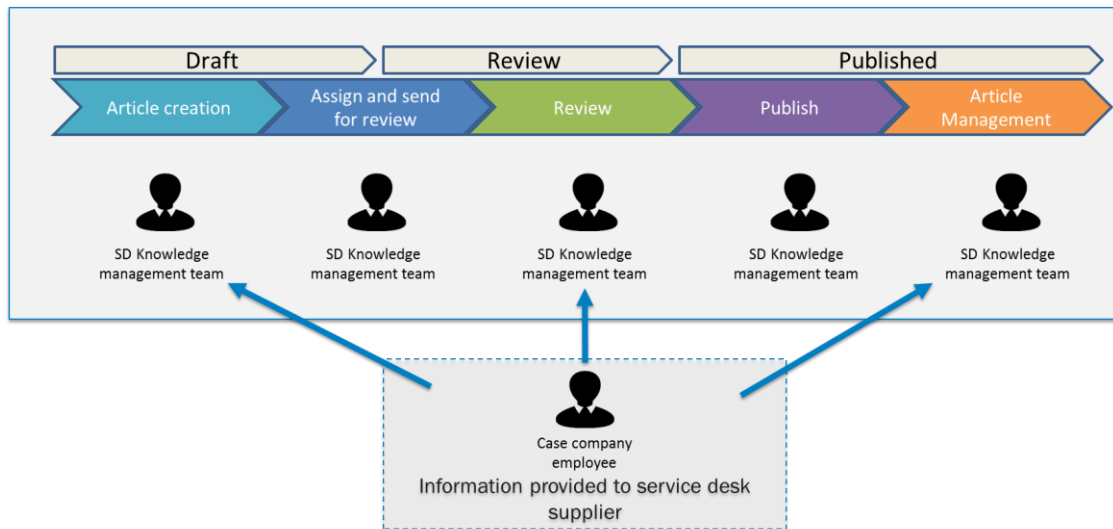

Figure 2.   Current process and roles

In addition to the process itself, this chapter focuses on describing the effect the current IT knowledge management has on the case company operations. The conclusions are based on the state of IT knowledge management described in the previous chapters, reflecting it to the best practices and principles described more thoroughly in the following chapters, as well as other observations made in the case company IT environment.

First of all, as can be seen in the previous figure, the case company's employees and other suppliers who have the required knowledge to create, validate and update the articles, can influence the knowledge base content only through the service desk supplier's knowledge management team.

From the case company's perspective since the process activities, roles and responsibilities are outsourced to a specific supplier, the process does not need to be thoroughly analyzed to detect deficiencies, but the strengths and weaknesses from the case company's perspective are enough to describe what should be done differently.

3.1 Process strengths and weaknesses

Some of the observations from the current state are not necessary process weaknesses since they could be suitable for another environment even though they have a negative impact on the case company's IT operations. Some of the described features are also not process related, but are covered here to create a clear picture of the overall situation around the current IT knowledge management.

General observations

The current IT knowledge management process does not support other IT service management processes as defined in its purpose. The current process states, as defined in the process description of the service desk supplier that while a knowledge article containing a recognized problem workaround is possible to be created through the problem management process, the knowledge article holding that workaround information is retired once the original problem ticket is resolved, thus hiding the workaround information in case a similar problem re-occurs.

The Service desk is not using the knowledge articles as they should. The data from the ITSM tool shows that currently only 26% of incidents are resolved with a link to a knowledge article. This indicates that neither the structure of the knowledge base nor the metadata behind knowledge articles contributes to finding information and that the information does not exist in a form of a knowledge article or the service desk agents are not performing as they should. This has a prolonging effect on the resolution time of incidents and can have large business impact in case the incident relates to, for example, a production critical IT component.

Communication with the service desk is not efficient even though there is an established communication channel and process governance model. In some cases, when service managers have informed the service desk about useful articles retiring before they should, the service desk has failed to react on time, leading to production critical documents being retired even though they should not. Unfortunately, there is no measurable data available about this topic, but it is more of a common opinion around the organization, and the large amount of complaints from service managers indicates it to be true.

In addition to these issues, the end user portal structure does not enable end users to find right articles for self-help purposes. It can be recognized that even with an optimized end user portal structure, the missing metadata of the knowledge articles would not make the search for articles possible. The portal is not in the scope of this project.

The current knowledge management process can be analyzed only from the case company's perspective because there are no other process roles outside the service desk supplier besides providing article content. The current knowledge base and the ITSM tool data can also be analyzed in a similar manner since they are key parts of the overall process and are contributing in the process in every phase.

Strengths

The strengths that were identified were mostly based on the interviews of the service managers. It was clear from the beginning that most of the key employees were very skilled in their fields, with the required information to participate in the creation of knowledge. They also had identified the need for a new knowledge management process and were looking forward to be part of the process.

The number of existing articles was on a high-enough level to start utilizing the current knowledge articles more efficiently. The service desk supplier's knowledge management team was also skilled and motivated. In addition, the development of the new knowledge management process was prioritized on the management level, and it was set as one of the focus areas for the year 2017.

From the process point of view, the strict process control and the clarity of roles form the service desk supplier's side can be seen as a strength, but only if one ignores the complete disregard for including the necessary personnel in the process activities.

Weaknesses

Unfortunately, the weaknesses in the current way of distributing information and the service desk supplier's process were much more extensive than the strengths.

The current process did not contribute on a sufficient level on the validation of the information in the knowledge articles. Nobody had a clear picture of what were the articles

that should have been published and what currently published articles should have been retired instead. The reason behind the lack of validation is not explicit, but more a result of a prolonged time of insufficient IT knowledge management process.

As mentioned, all changes to knowledge article content or metadata and the creation of new articles had to go through the service desk. This lack of responsibilities among the case company's personnel had affected the case company as frustration among employees, as unnecessarily slow implementation of changes to the knowledge base content, as outdated and wrong information in the articles and as a lack of utilization of the knowledge in the ITSM tool. In addition, the lead time for the process was too long even though it could not be measured accurately.

The effects these weaknesses had on the case company's operations were immense. For example, several service managers had multiple examples of incidents when the service desk agents had not read the instructions provided, thus assigning tickets to wrong resolution groups and unnecessarily extending the resolution time, which had led to prolonged disruptions in business activities.

To summarize the state of the current knowledge management process, one particular service manager stated that "The service desk does not read the knowledge articles created with the information we have provided for them, we can't update the articles by ourselves and when we complain about any of it, nothing ever changes around here".

The information obtained from the service managers' interviews can be found from the Appendix 2.

3.2   Current structure of the knowledge base

The knowledge base structure affects the planned use of articles and tool-based rules and other customizations for certain article types and categories as well as determines which users can view certain articles. The current structure can be stated as a weakness, as explained in the following paragraph, but since it is a whole different entity from the process perspective, it is described separately in this chapter as well as the new knowledge base structure is described separately in the proposal.
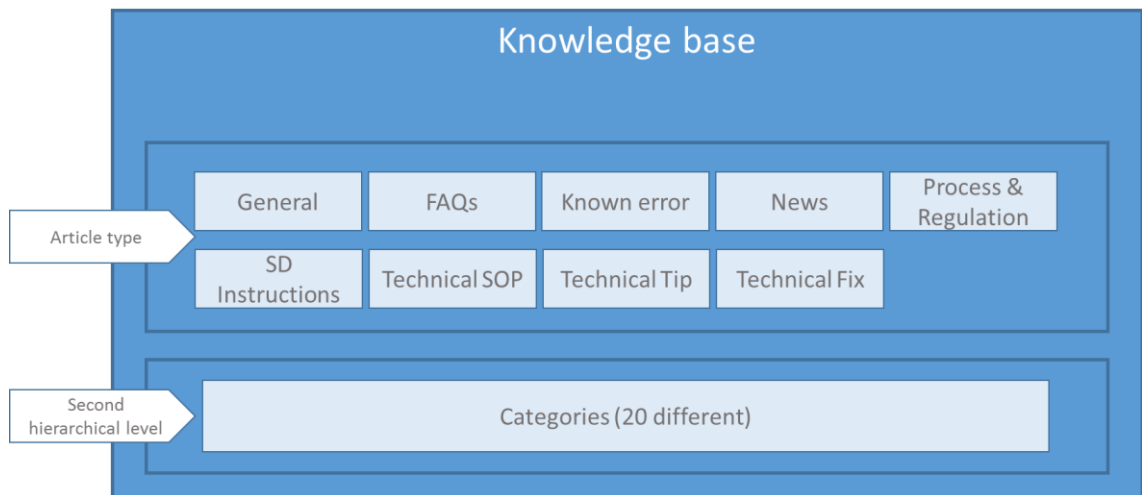
Figure 3.   Current structure of the knowledge base

It can be seen from the current knowledge base that user types cannot be defined for articles based on the knowledge base they are stored in since there is only one knowledge base. There are also several features which have a negative impact on navigating in the knowledge base as well as information validity, such as unclear article category names, e.g. the article type General, and undistinguishable article types like Technical SOP, Technical Tip and Technical Fix.

The second hierarchical level in the knowledge base is also problematic because there are no restrictions in what category can be applied to certain article types, thus not enabling searching for information or navigating towards certain articles. Also, the categories are very technical, such as Virtual server or Network gear/Appliance. They are also very general high-level terms, thus not helping the person looking for information to navigate towards right article. One needs to keep in mind that the users of the knowledge base are not only IT personnel.

3.3   ITSM tool functionalities in IT knowledge management

The ITSM tool has a large role in IT knowledge management. The articles are stored, controlled, created and process steps are validated through the ITSM tool.

The foundation of IT knowledge management is built by defining the structure of the knowledge base. Through the knowledge base structure, one can apply type-specific rules to articles regarding article lifecycle and visibility.

The article has four lifecycle phases: Draft, Review, Published and Retired. Defined individual's actions move the article to the next phase once the previous steps have been completed.

The following data is from the ITSM tool reports, which indicates the current state of IT knowledge management in the case company on March 29th 2017. The table itself explicitly shows that the state of the current IT knowledge management is not very good.

Table 2.   The ITSM tool data

Description	Data	Definition
Article statuses	Build 2,53 % Draft 12,36 % Editorial Review 5,54 % Published 28,26 % Retired 51,32 %	The article status changes throughout its lifecycle from Build to Retired. Published articles are viewable and can be used by defined groups. The large number of articles in the Build, Draft and Editorial review phases indicates that the process is not working efficiently.
Article type: General	24,91 %	Article type is part of the hierarchy of the knowledge base. It defines the planned use of article. If article type is General, it doesn't enable any specific users, actions or rules to be assigned to it because one cannot be sure what kind of articles it holds.
Article category: Empty	38,3 %	Article category is also part of the hierarchy of the knowledge base. It enables rules and users to be defined for articles.

Articles not linked to incidents	60 %	Many articles should be used to resolve incidents. In this case, most of the articles have never been linked to an existing incident even though most of the articles are used for incident resolution.
Not used (Use count)	94 %	Articles have a "Use count" to indicate if they have been viewed. However, this figure is affected by the article transfer from previous ITSM tool two years ago.
Transferred from the old tool (Created by certain person)	31 %	From the Created by field, it can be presumed that the articles created by the same person who transferred the articles from the old ITSM tool are older than two years old.
Affected solution: Empty or "SIAM Knowledge Management"	36 %	The Affected solution field connects article to specific IT service. Most of the articles can be linked to specific service but still haven't.

To conclude, the following table summarizes the strengths and weaknesses, and it should give a clear picture, whether some improvements are necessary or not.

Table 3.   Strengths and weaknesses of current state

Strengths	Weaknesses
• Number of written articles • Service structure in the ITSM tool • Amount of expertise in the case company's personnel and suppliers regarding IT knowledge article topics • Existing communication channels between the service desk supplier, other suppliers and the case company	• Uncertainty if the published articles contain valid information • Uncertainty if the retired articles should be retired or if they are still valid • Process responsibilities only within the service desk supplier • Proposed improvements take a long time to be implemented due to lack of control

	• Responsibility areas of the case company's service and solution managers not accurately described in ITSM tool • No existing IT knowledge management roles with the case company's personnel in ITSM tool • Articles not being used in incident resolution • Process by definition not keeping problem management related articles Published

The strengths and weaknesses will be more thoroughly rationalized through the theoretical framework used and the reasoning behind the proposal. As a rule-of-thumb to explain the strengths and weaknesses, it can be stated that the process should be under the case company's control to be influenced, the content and the lifecycle status of the articles should be known, the individuals with the expertise should be included in the process and the ITSM tool should be able to support the process.

As the strengths, weaknesses and process features have been identified, the theories and best practices to be used to develop the new IT knowledge management process must be chosen accordingly. The following table indicates the objectives for different parts of literature used.

Table 4. Objectives and the related literature

Objective / Issue	Literature perspective
Validating article information	ITIL Service transition – Best practices of knowledge management
Process responsibilities not involving key personnel	Knapp's ITSM Process development model
Utilizing the established communication channels among IT ecosystem	ITIL Service transition – Best practices of knowledge management

Developing the process	ITIL Service transition – Best practices of knowledge management Knapp's ITSM Process development model
Understanding the reasons behind knowledge management	General knowledge management theories and different natures of knowledge

4 Existing theories and best practices

The different areas for existing knowledge to be searched in were general knowledge management and the definition of knowledge, IT knowledge management, and ITSM process development. General knowledge management was used to create an understanding of the basic principles behind the process to be defined; IT knowledge management's best practices were utilized to pre-define some process features, and ITSM process development model's structure steered the development.

4.1 General theory of knowledge management

Knowledge management can be seen as an activity of a more cultural and multi-disciplinary nature, when IT knowledge management is more about ITSM process relations, IT roles and information recording and utilization activities. Therefore, they need to be handled separately in this project.

Knowledge management is widely recognized as an important activity in organizations. However, the development to its current form is an outcome of a long chain of events, as the organizations have grown and the knowledge within has become more difficult to manage.

Managing information resources, in which knowledge management can be seen as logical expansion of, initially focused on data management. Files and corporate databases held the necessary data for organizations operations. The concept expanded to incorporate information, which can be described as data with meaning. From this organic development became knowledge management, which is more about managing content rather than storing data. (McNurlin and Sprague 2006,: 263)

The definition of knowledge works as a bridge with traditional knowledge management and IT knowledge management. McNurlin and Sprague (2006, p. 264) define knowledge to be information with direction or intent. In that definition, intent is derived from strategies or objectives. When compared with the ITIL definition for purpose of knowledge management, which can be interpreted to provide information for all other ITSM processes

(The Cabinet Office 2011, p. 181); the linking to strategies and objectives is apparent since ITSM processes have their defined objectives in organizations IT.

4.1.1 The nature of knowledge

To understand the need for IT knowledge management process at the case company, one must understand the effect knowledge management, and especially certain articles, have on the organization's success.

Organizational knowledge is different from other forms of knowledge because it has evolved from different origins and is engaged in different ways than just one person's experiences would have. (Choo 2002, p. 263)

The organizational knowledge characteristics are crucial things to consider when designing the process since the new knowledge management process must be flexible enough to enable applying articles in various business areas and supplier organizations, an at the same time enable future development and easy additional usages without knowing the future direction the case company's IT will develop towards.

There are three different kinds of knowledge within an organization: tacit knowledge, explicit knowledge and cultural knowledge. Tacit knowledge is the implicit knowledge used by people in their daily work. Usually it is hard to verbalize because it is mostly expressed through actions and skills. (Choo 2002, p. 264) From the IT knowledge management point of view, this type of knowledge is what is finally delivering the benefits of the process. Capturing the expertise and knowhow of the people working on IT-related issues is vital for the quality and stability of IT operations.

As the knowledge is captured to knowledge articles, it becomes explicit knowledge, tangible and formally codified, recorded for future use (Choo 2002, p. 264). Through this transformation, the previously silent and unrecorded tacit knowledge becomes part of the organizations operations, adding value to its IT activities and business processes.

Adding value to organizations operations, the knowledge articles become part of the third defined knowledge type: cultural knowledge. Organizational cultural knowledge is based on experience, observation and reflection of the organization and environment. (Choo

2002, p. 267) Although this may seem like a far-fetched description, what else the organizational knowledge used daily in IT is than remarks and observations made, quick fixes discovered and efficient procedures established through years of development towards efficiency while avoiding service downtime?

4.1.2   Business case and concrete effects of knowledge management

IT is far more easy to describe how well functioning knowledge management process is adding value to organizations than to define real-life examples around that topic. In the book Knowledge management strategy and technology written by Bellaver and Lusa (2002, p. 27), the business case of generating and distributing information is, however, described.

Some of the challenges mentioned by Bellaver and Lusa (2002, p. 27) that can be at least partly tackled with optimized distribution of knowledge are listed below:

- Business volume increase without increased amount of employees

- Service quality increase

- Time to market reduce

- Legal or regulatory actions minimization

The above mentioned challenges can easily be fitted also to IT knowledge management. Business volume increase with the same number of employees is, of course, the service desk trying to do their work with minimum number of employees, increased service quality is the experience of end users whose incidents and requests are resolved in a shorter time and time to market reduce equals the effect available information of current services has when introducing new services and when developing the old ones. The above-mentioned legal or regulatory actions are the complaints and sanctions from dissatisfied business counterparts.

The benefits of knowledge management strategy and implemented knowledge management process are also covered in the book Decision support and business intelligence systems (Turban et. al. 2011, p. 509). Turban et. al. state that some or all of the following benefits can be achieved:

- Reducing the loss of intellectual capital when employees change

- Reducing the costs by not solving same problems multiple times

- Obtaining information from suppliers, thus achieving economies of scale

- Reducing redundancies of knowledge-based activities

- Increasing productivity with easily and quickly available knowledge

- Increasing employee satisfaction by enabling personal empowerment and development

The main reason for investing in the knowledge management is the strategic need for competitive advantage (Turban et al. 2011, p. 509).

An interesting link between traditional knowledge management and IT knowledge management is how the ITSM tool controls and enables all the success factors mentioned by Turban et. al. (2011, p. 510) necessary for knowledge management: infrastructure consisting of culture, structure and technology as well as knowledge process architecture of protection, conversion, application and acquisition of knowledge.

4.2 Best practices of IT knowledge management

Most IT knowledge management best practices have been developed by solution providers or commercial framework developers. Usually the search for best practices leads to accepting one of these approaches without resources or understanding for a critical evaluation. In many cases, ITIL knowledge management is the accepted de facto standard even though when compared to many other processes ITIL knowledge management is not explained as profoundly as many other ITIL processes. To gain a realistic picture of the possibilities, other views need to be evaluated in addition to ITIL, but since the case company's IT environment is mostly ITIL compliant, the new IT knowledge management process also needs to be.

4.2.1 ITIL knowledge management process

In ITIL, the name of the process is knowledge management. In a non-IT narrative, the term is wider than in the topic at hand, which is the reason why this thesis mostly uses

the term IT knowledge management, but in this chapter, the first term is used to describe the process defined in ITIL.

The knowledge management process is defined in ITIL as to enable understanding the situation, consequences and benefits of the situation currently at hand or of challenges to come by using the knowledge of stakeholder identities, risk levels and performance expectations and available resources and timescales. These activities allow the organization to deliver high-quality services. The main factors affecting the usefulness of knowledge management are described as the accessibility, quality and continued relevance of the data and information. (The Cabinet Office 2011, p. 181)

The objectives of knowledge management are the following:

- Reliable and secure knowledge, information and data being available to improve the quality of management decision making

- Improved quality and efficiency of service provider activities, reduced costs and increased satisfaction by reducing the need to rediscover knowledge

- Clear and common understanding of the value the IT services provide to customers

- Service knowledge management system (SKMS) maintaining

- Knowledge gathering, analyzing, storing, sharing, using and maintaining (The Cabinet Office 2011, p. 182)

These objectives are equally important when defining a new knowledge management process for the case company and must be considered in all phases of development and design.

Knowledge management principles

Being a best practice framework, ITIL describes many policies, principles and basic concepts, which need to be evaluated individually to choose the correct components for the case company. ITIL can't be implemented as is, but instead one must fit the best and most useful parts to the current environment.

When considering the current state of knowledge management and the main organizational requirements at the case company, the most vital principle from ITIL Service transition can be seen to be the following: knowledge and information must be accessible for all employees that need them in order to support the IT services. In addition to being accessible by relevant personnel, the knowledge and information need to be created, reviewed, approved, maintained, controlled and disposed according to a documented process. The policies and processes must be reviewed at least once a year. (The Cabinet Office 2011, p. 183)

The previous paragraph can be interpreted to describe the biggest problem the case company currently has regarding knowledge management; articles are not visible for the employees and suppliers needing them, the articles are hard to find in the knowledge base and the process does not contribute to keeping the information within the knowledge articles valid.

The Data-to-Information-to-Knowledge-to-Wisdom structure

Usually knowledge management is demonstrated and displayed with the Data-to-Information-to-Knowledge-to-Wisdom (DIKW) structure.
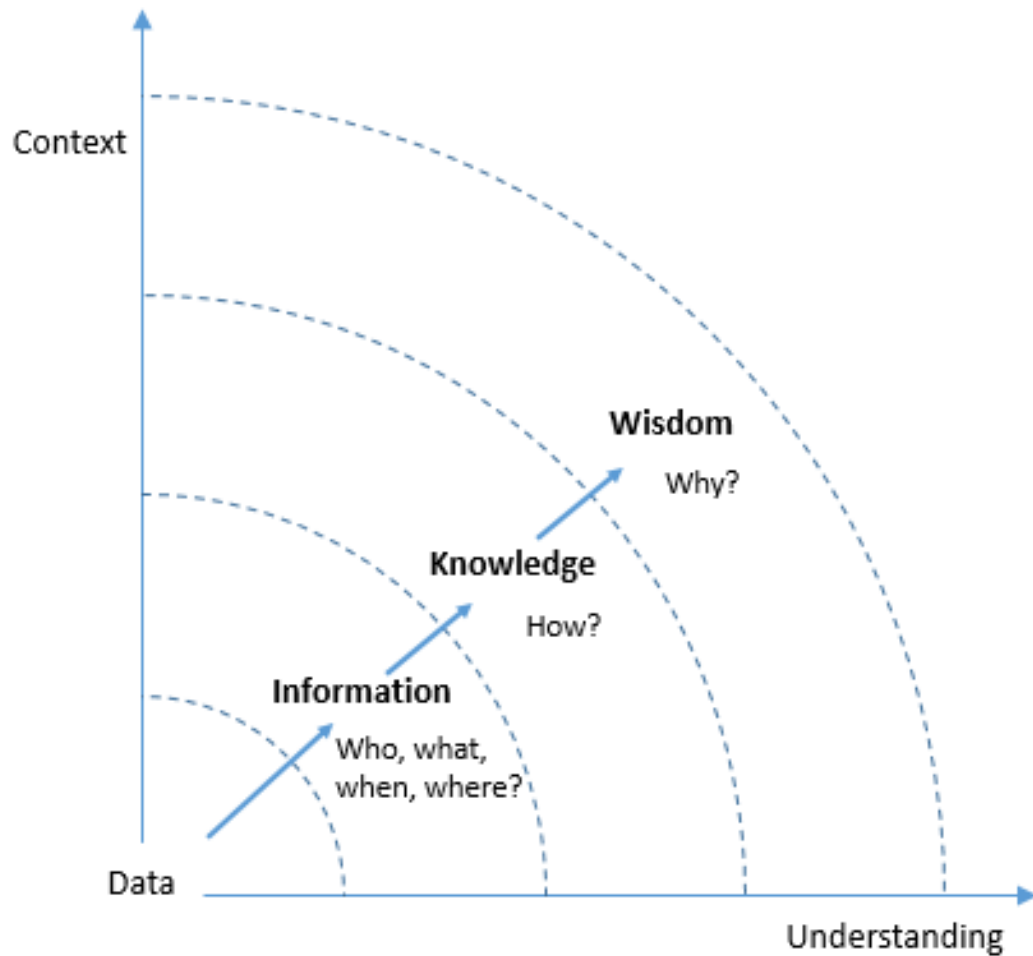
Figure 4. The Data-to-Information-to-Knowledge-to-Wisdom structure (The Cabinet Office 2011, p. 184) (self-illustrated)

As described in ITIL Service transition, data is a set of facts. Key activities around data are the abilities to capture accurate data, to analyze and synthetize it and, finally, to transform data into information. At the same time, the activities to identify data and re-source its capturing accordingly, to maintain data integrity and to archive and purge it must be executed in a controlled manner. (The Cabinet Office 2011, p. 183)

The development towards information begins with providing context to data. The key activities regarding information are managing the content, making information easier to query, find and use as well as learning from experiences. (The Cabinet Office 2011, p. 183)

Involving tacit experiences, ideas, insights, values and judgements of individuals is described to create knowledge from information. Knowledge is gained from own and peer's expertise. Analysis of information and data is involved in the synthesis of these elements, which leads to new knowledge being created. Knowledge is based on a context and puts information in an easily usable format which facilitates decision-making. (The Cabinet Office 2011, p. 183)

Wisdom is defined as to create the value of knowledge management. More specifically the value is created through correct and well-informed decisions. Involved in wisdom is the application and contextual awareness providing a strong judgement enhanced by common sense. (The Cabinet Office 2011, p. 184)

Table 5.   Knowledge management resource examples (The Cabinet Office 2011, p. 184)

Type of knowledge management resource	Example
Data	Date and time at which incident was logged
Information	Average time to close priority 2 incidents
Knowledge	Average time to close priority 2 incidents has increased by about 10% since a new version of the service was released.
Wisdom	Recognizing that the increase in time to close priority 2 incidents is due to poor-quality documentation for the new version of the service.

The development from data to wisdom includes a lot of activities and individuals. It can take time in a large organization to finally reach the situation where the actual value is derived from.

Data, information and knowledge management procedures

One of the most critical sections of ITIL regarding the knowledge management process is the requirement to set up mechanisms to support efficient knowledge management. The intended outcomes which are the most relevant in this case company's environment are the following:

- Identifying the service lifecycle data and what information is to be collected

- Defining a procedure required to maintain the information and to make it available to appropriate personnel

- Defining the activities needed to convert data into information and eventually to knowledge

- Establishing authority and responsibility for all required items

- Reviewing stored knowledge, information and data to ensure validity

- Updating, purging and archiving knowledge, information and data according to documented policies (The Cabinet Office 2011, p. 190)

ITIL Service transition contains many more best practices around knowledge management, but since the case company is already ITIL compliant in many parts, and since they are not needed to justify the conclusions made in this process development, they are not described here. Most of the process KPI's defined are also from ITIL Service transition, but because of their self-explanatory nature, they will also not be described here.

4.2.2   The service knowledge management system

Nowadays, as most large corporations have automated their ITSM environment, and the processes within are controlled by the ITSM tool, also knowledge is stored within the service knowledge management system (SKMS). In ITIL Service transition, it is presumed that SKMS is the core of the knowledge management. (The Cabinet Office 2011, p. 184)

There are many different ITSM tools available, but they all have similar requirements in knowledge management. To understand knowledge management, the relationships between SKMS, configuration management system (CMS) and configuration management database (CMDB) needs to be briefly described.

As described in the ITIL Service transition and as Figure 5 below illustrates, the knowledge management is mainly focused on the SKMS. The large quantities of data needed in knowledge management is also held in the SKMS. An important part of the SKMS is the CMS, which describes the attributes and relationships of configuration items (CI's). Many of those CI's are knowledge, information or data assets, thus stored in the SKMS. The configuration data is recorded in the CMDB and is being fed through the CMS in to the SKMS. SKMS supports the delivery of the services and informed decision-making. (The Cabinet Office 2011, p. 184)
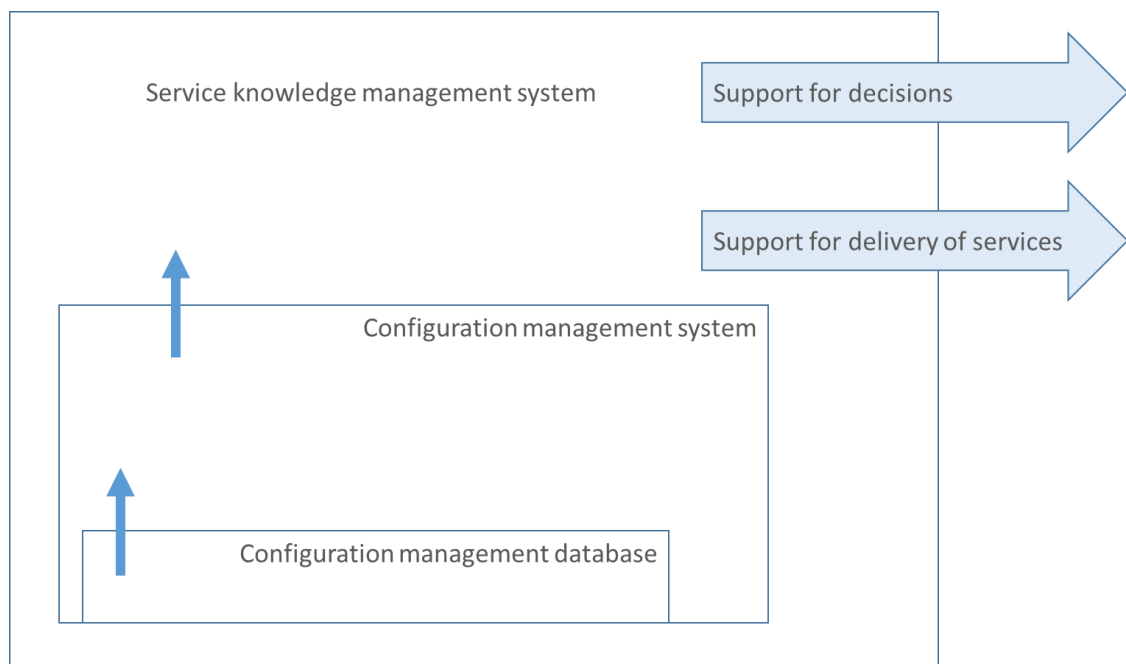

Figure 5.   Relationship of the CMDB, the CMS and the SKMS (The Cabinet Office 2011, p. 185) (self-illustrated)

The data required and used in knowledge management will be described in the following chapters. As many of the needed knowledge and information assets are CI's, changes in them are controlled through the change management process, and their attributes and relationships are documented in the CMS.

4.3   Best practices of ITSM process development

In this chapter, the documentation of ITSM process development and the actual steps in the process development phase have been divided in their own chapters since they can be identified as two separate parts of this project.

4.3.1   ITSM process development documentation

The deliverables of IT knowledge management process development are aligned with the industry best practices. Process development has six core components: Policy, Overview, Roles and Responsibilities, Process map, Activities and Vocabulary (Knapp 2010, p. 50). All these are defined in this project even though all of them are not extensively included in this thesis.

The requirements for comprehensive process documentation are generally defined in an unambiguous manner although some variations exist. The required factors to take into consideration in process documentation are listed below:

- Changes to job descriptions, employee performance management programs and incentive programs

- Procedures for employees' and external suppliers' way of working

- Tool requirements

- Data collecting and reporting for process performance measuring

- Vocabulary for promoting, performing and discussing process (Knapp 2010, p. 73)

The documents produced are covered in the following chapters, as the overall development steps taken are described.

4.3.2   ITSM process development steps

For the processes and IT activities to be successful, business and customer requirements must be prioritized during process design and planned improvements (Knapp 2010, p. 21). For the case company, this acts as a motivation for the whole process development because of the business and customer requirements for IT knowledge

management process are identified, and it can be seen that the company is losing money while waiting for the new process, for example through prolonged service downtimes.

The following picture (Figure 6) illustrates Knapp's (2010, p. 74) ten-step approach on ITSM process design.
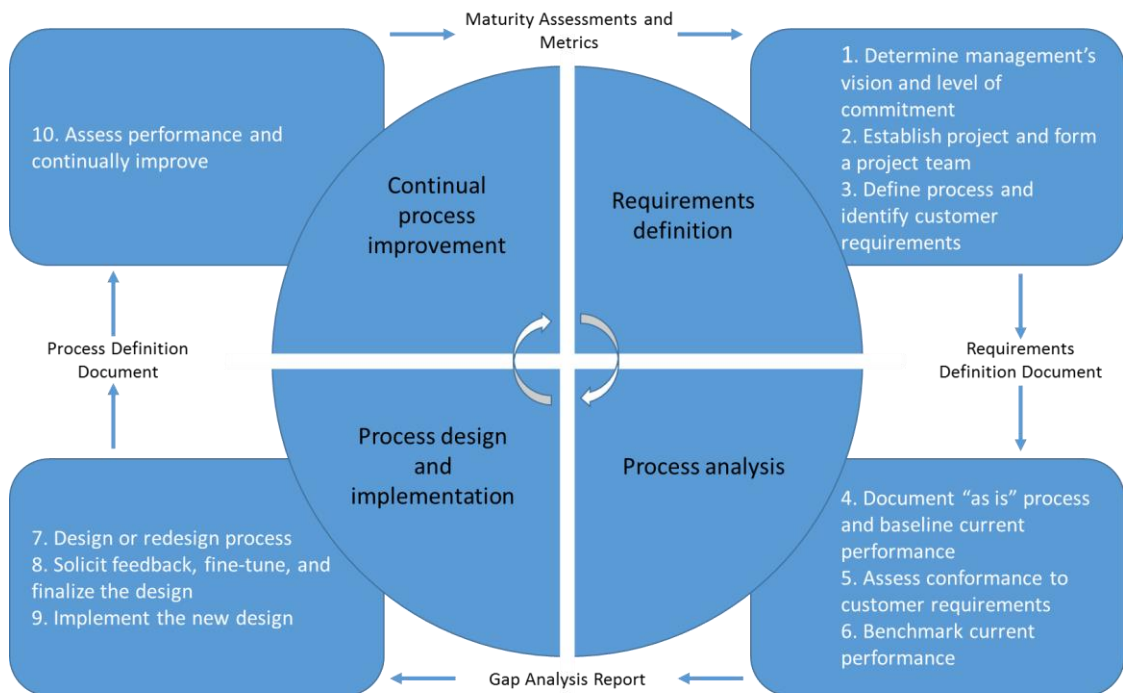

Figure 6.   Ten process design and improvement steps (Knapp 2010, p. 74)

Because the figure above is highly self-explanatory, it does not need to be extensively analyzed with other theories in this thesis, but instead can be described in the next chapter through the process development.

It can be stated that all the parts in the development model are equally necessary. However, they need to be individually evaluated and hand-picked to suit the real-life situation; similarly ITIL best practice adaptation to organization needs to be applied for its relevant parts.

Process definition in step three contains purpose, goals, objectives, policies, triggers, boundaries, inputs and outputs (Knapp 2010, p. 83), which are elements that can be applied to any IT service management process and are defined also in ITIL.

4.4   Aligning theory and best practices with development

Previously mentioned different aspects of theory and best practices had different roles in the process development. Understanding the knowledge management principles was necessary to communicate the development efficiently to stakeholders. The nature of knowledge and understanding the differences between the different forms of knowledge was needed to realize how the knowledge articles should be created, how the users could be guided with the ITSM tool and what the means to enable the service desk's article usage are. Understanding the business case of knowledge management gave a clear target for the new process, which partially could be used in defining the process requirements.

The IT knowledge management's best practices were extremely useful in the development process. The ITIL knowledge management objectives can be interpreted as a pre-defined checklist indicating what IT activities to include in the new process. ITIL knowledge management principles, however, give answers to some of the most difficult questions that were arisen during the development, for example, how the information flow within organization should be controlled. In addition to the general knowledge managements business case, the DIKW-model for the ITIL service transition was used to describe and emphasize the business value of the process.

The ITSM process development's best practices guided the concrete work to define and design the new process. A project like this is not moving forwards and towards its target without well-defined steps and a structured approach regarding the deliverables.

The theoretical framework used in this thesis is connected to the concrete elements of the proposal in Table 6 in the section 5.1.

5 Developing the case company's IT knowledge management process

The previous chapters described the theoretical background and the best practices for this development project. Basically, the way of working and the phases for the development are aligned with Knapp's development model. The process requirements, the means to affect the business challenges through the new process and the different factors to consider are described in the knowledge management theory and in ITIL.

Applying the ITSM process development model

As described in the previous chapter, Knapp's model for the development was used for its relevant parts. The documentation was recognized as an important element, excluding the previously mentioned changes to job descriptions since the IT knowledge management process does not affect the way of working for most people. Also, the vocabulary in IT knowledge management was already familiar for relevant personnel, thus not needing more explanations.

As this project was initiated by a recognized need for a new IT knowledge management process with an existing production critical IT, the development must begin with understanding the case company's IT environment. This was mostly related to the previously mentioned first data set of the development

To identify the requirements for the new IT knowledge management process, two out of three recommended methods were used for a needs assessment: beginning with direct interviewing and documentation review, continuing with analysis (Knapp 2010, p. 22), as described in section 2.3. Physical review was not needed since all the required information was available by other means. The process requirements identified were considered accordingly in the whole development project.

Going through the development steps, one can notice that the first two steps, management's level of commitment and project establishment can be seen as already taken when the IT knowledge management process was decided to be defined and resourced, thus demonstrating the management's commitment.

The service desk supplier's IT knowledge management documents held all the information needed for the initial evaluation of the current process, so the steps three and four; process definition, requirement identifying and as-is process documentation, can also be stated as completed before the work begun. Naturally it takes time to gather and go through said documents, but they were existing and available when the project started.

The actual development began when the service managers and other IT community members started to reveal their needs regarding the IT knowledge management process. Step five, customer requirement conformance assessment, indicated the current process's minimal conformance to the requirements and to the needs of the case company's personnel, as described in the current state analysis.

Current performance, as described in step six, did not need benchmarking since the gathered data revealed the poor state of the IT knowledge management. Basically, steps seven to ten describe the most of the work made during this project.

As described in the following chapters, the concrete value of this project can be seen to be delivered starting from the process design step seven. The design of the process, using feedback for improving and eventually finalizing the design, implementing the new process and assessing its performance required most of the time used in this project. The following chapters mostly focus on the finalized design although assessing performance and planning future improvements are also covered to some extent.

The documents described in Knapp's (2010, p. 74) model and their relevancy were evaluated. It was decided that the documentation needs to be created as part of the solution, but the documents do not need to be distributed extensively since the process training together with the tool utilization will control the process sufficiently. The documents were not seen to be relevant for the clarity of this thesis.

Knowledge article review

An article clean-up project was necessary to be executed in parallel with defining the new IT knowledge management process since the current knowledge base content was not to be trusted in terms of information quality. Also, there was no way to be sure that

correct articles were published or retired, so the whole amount of articles needed to be reviewed.

This operation is not defined in process development model since the need for the review is caused by the case company's specific situation. The best practice describing the need for this kind of activity can, however, be found in the ITIL Service transition, where it is mentioned that reviewing the stored knowledge is one of the mechanisms needed.

The article review was carried out by the whole IT ecosystem, the case company's employees and vendors alike. Articles were reviewed by their relevancy and content validity, which provided information on which articles were to be taken to the new knowledge base as published. During the review, the article type, category and the affected solution was added to each article to be published to direct them to right section in the new knowledge base. This metadata is used to identify the process requirements, as well as they are enabling the tool to work properly. Unfortunately, the article review was not finished during this thesis, so the mechanism to utilize metadata need to be described based on assumptions.

New knowledge base structure

To make the new process more understandable, it is necessary to first describe the new knowledge base structure.

The new knowledge base structure is very different from the old one. Previously there was only one knowledge base where all the articles were stored in. The new structure makes it possible to divide articles for different viewers; IT knowledge base for IT personnel and End User knowledge base for other employees. The end user articles are of course also visible for the IT professionals, but for example the language used in them needs to be understood by a wider audience than just IT.
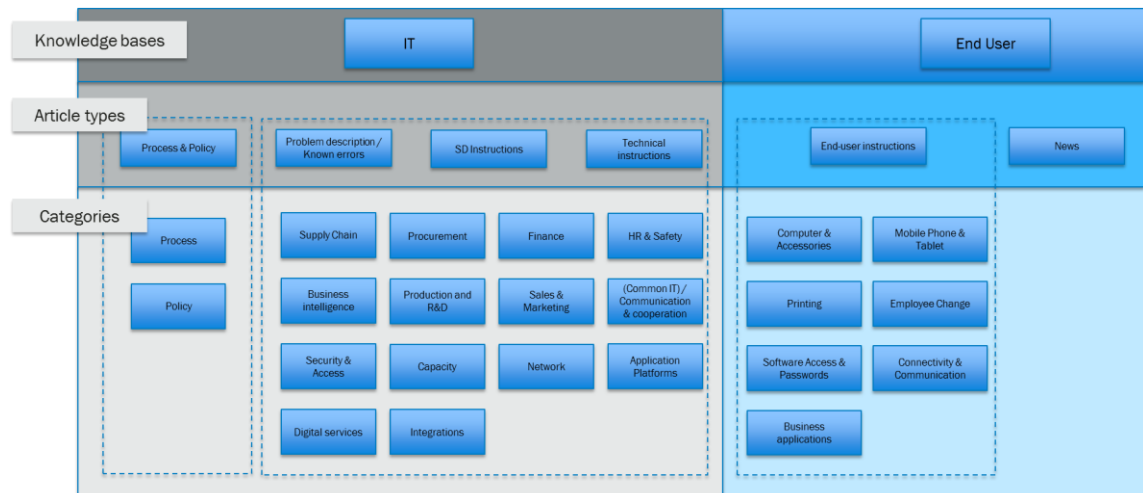
Figure 7. Proposed structure of the knowledge base

The Process and Policy type articles contain information regarding standard operating procedures and agreed processes. They are reviewed yearly; IT process documents are reviewed by SMO process owners, production related policies are reviewed by service managers and other specialists.

The articles of Problem description / Known error type are created through the problem management process. They are linked to the problem tickets they were created with, as well as the CI's affected by the original problem. They are also reviewed yearly by the subject matter experts in the related responsibility area. This topic will be more thoroughly described in the section "Tool perspective to the articles".

SD Instructions are created by the service managers, specialists and the service desk alike, and they are used by the service desk in their work.

In the End user knowledge base, some of the End user instruction type articles are created and reviewed by the service managers and other specialists, some by the service desk. This is determined in the article creation phase, if the author selects a service or a CI that the article is related to, the review will be executed by the case company employees. If the field linking the article to a service or a CI is left empty, the article will go for review to the service desk.

News are created by the service desk and they do not need to be reviewed and approved, but instead can be published straight away.

5.1 Defined IT knowledge management process

Figure 8 describes the proposed IT knowledge management process. Because of the simple nature of the process, a traditional flowchart is not needed here, as it would only distract the reader. The flowchart showing the whole article creation process can be found in Appendix 1. On the top of the figure is described also the article lifecycle phases, which are also described more thoroughly on the section "Tool perspective to the articles".
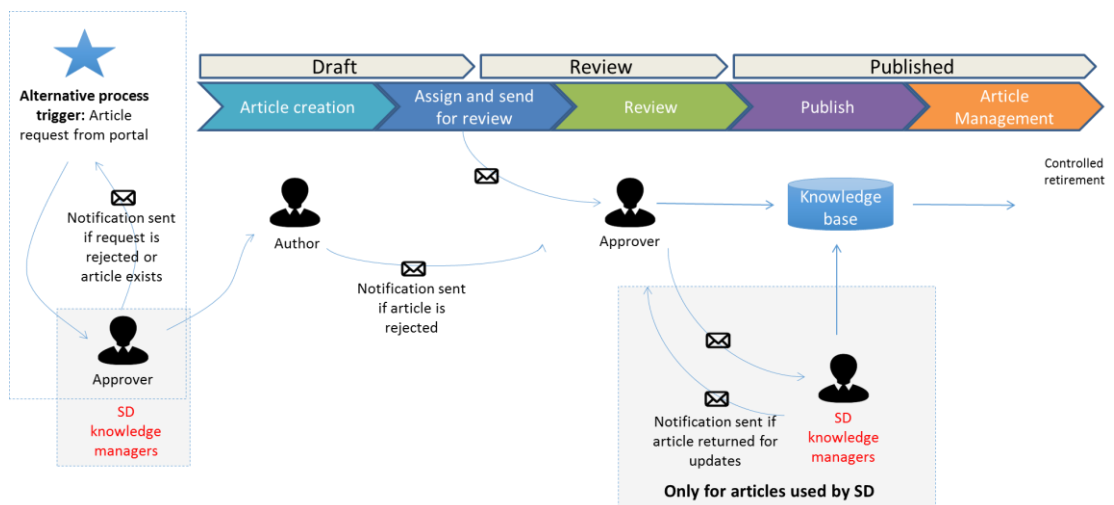

Figure 8.   Proposed IT knowledge management process

The process is triggered when an article is being created by the author. Once the author is satisfied with the article, it is sent for review to subject matter experts who validate the content, decide the need for the article and the knowledge base the article should go to.

An alternative process trigger is the "Article request from portal", which means that an end user can suggest an article straight from the service portal in case they do not find the information they were searching for. In that case, the proposal would go for validation to the same subject matter experts, who then would act as the author for the article. The alternative process trigger is meant to activate the case company's personnel in the IT knowledge management process to improve the number of articles used in specific intent, as it was described in the theory by McNurlin and Sprague in the chapter 4.

Once the article has been approved by the subject matter expert, they can either publish the article in the knowledge base, reject the article if it is not needed or send it back to the author for improvements.

The service desk is the final publisher for the SD instructions type of articles. This may not be a necessary step for the process since the subject matter experts are responsible for their part for offering information needed by the service desk agents. However, as the main pain point for the service managers was, as previously stated, the poor usage of the service desk instructions when resolving incidents, this step aims to make it mandatory for the service desk to read the articles and to validate the article understandability and content. This also highlights the organizational knowledge characteristics and its importance, as described in section 4.1 referring to Choo's theory in Information Management for Intelligent Organization.

The proposal of the new IT knowledge management process is a crossroad combining conclusions from three different elements: the business challenges caused by the poor current state of IT knowledge management, the best practices and theories described in earlier chapters and the case company specific features in carrying out ITSM activities. The following table indicates how these conclusions are combined in the new proposed process. The source describes where in this thesis it is described, the input column indicates the content of the conclusion made and the output defines how the conclusion is included in the process design.

Table 6.   Theoretical framework manifested in the proposal

Source	Input	Output
General theory of knowledge management	Overall understanding of the meaning of knowledge management in organizations	Process designed to keep information up to date and available for right audience through defined reviews and validity checks.
The nature of knowledge	The information is refined to create additional value	Right individuals involved in the process, groups with the right expertise evaluating the article content

The business case and concrete effects of knowledge management	The IT knowledge management is not just an organizations necessary activity, but more of a part of the business creating additional value	The process is monitored and controlled, SMO knowledge manager is following its quality and executes improvements
ITIL knowledge management	Identified best practices included in the proposal	Right article for right audience, article review to validate existing content, documented process followed in every phase, documents reviewed regularly, defined article types and categories, clear process responsibilities
Best practices of ITSM process development	Planning and development executed through structured model	The development model applied in all phases of development extending to the defined details of the proposal, requirements, using feedback and assessing performance

The previous table is naturally a simplification. The proposal and the definitions within are a combination of the overall understanding how the situation could be improved through the new IT knowledge management, enabled by all the efforts taken in this project.

5.2   Tool perspective to the articles

The following figure shows the status changes of the articles. The first element is the alternative process trigger, which is not a defined article status, but more of a preliminary article draft in the tool.
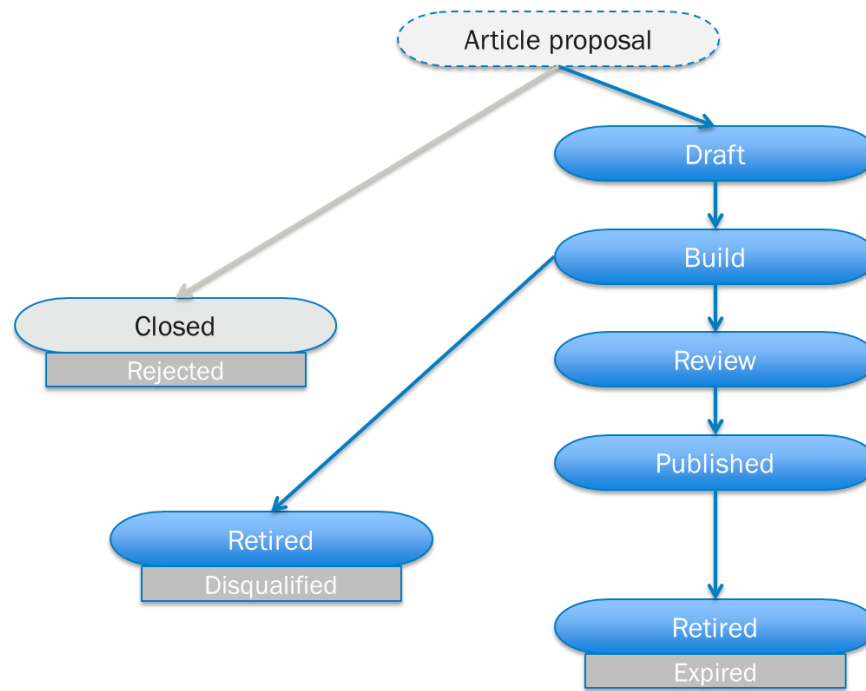
Figure 9.   Article status changes in the ITSM tool

The article stays on the Draft stage, until the author is satisfied with it and submits it for build. The article stays on the Build status waiting for approval by the subject matter experts. After the subject matter expert has gone through the article and is satisfied with it, the article stays on the Review stage waiting to be published.

The notifications which guide the process, are determined by the article type and the service or CI it is linked to. When creating an article, a service or a CI the article topic is related to is chosen, which automatically directs the process notifications to the change management group related to that service or CI. The notifications inform the individuals of their process tasks. Due to the lack of defined roles and groups in the tool, it was decided that change management groups are the groups most likely to accurately contain all the subject matter experts with sufficient information on the article topic. This is critical for the process and information quality, as it was described in section 4.1., the expertise of the specialists transforms the tacit knowledge to the documented explicit knowledge, finally to be part of the organizations cultural knowledge.

If the article is not linked to a CI or a service, it goes for review to the service desk. The service desk will review most of the end user articles since the articles do not necessarily

have a specific service or CI to be linked to. The article type News do not need the link, but instead they are published instantly by the service desk as stated previously.

All of the articles have their pre-defined validity periods. Once the article has reached its valid-to date, it can either be retired, sent for review or republished. A notification will be sent to the right group 30 days before article expiration to ask for actions regarding the article. A new notification will be sent a week before the expiration, and finally SMO's knowledge manager will assign the article for review if no actions are taken.

As a result from the service managers' concern regarding the service desk using the articles, the service desk instructions will be made mandatory to be linked when resolving an incident. When the incident needs to have a connection to the service desk instruction used when resolving the incident, the IT organization has a new way to oversee and affect the quality of corrective measures taken by the service desk agents, as well to identify insufficient instruction articles. However, since some of the incidents are very common, to enable the service desk agents to work efficiently, during incident resolution it is possible to check a box indicating "Common issue" or "No related article found".

The number of article linked to resolved incidents is estimated to grow from the current 26% to approximately 80% through the new process, the new knowledge base and the improved control in the service desk's daily work.

To recap, the following table describes what role different types of metadata has in the process.

Table 7.   ITSM tool metadata used in IT knowledge management

Data	Determines
Service / CI	The articles in the IT knowledge base must be linked to a service or a configuration item. This defined the assignment group.
Assignment group	The assignment group consists of the subject matter experts, who have the required knowledge about the article topic to

	create and especially to review the articles. In the case company's environment, due to the lack of previous IT knowledge management activities, the change management process groups are used since they are the only suitable option to link article topics to the service / CI level.
Valid to	The valid-to date is filled automatically by the tool since in most articles the validity period of the article is one year. After that, the article needs to be reviewed again for its relevancy an information correctness.

The metadata is a critical element in IT knowledge management since all the knowledge articles are created, stored, viewed and the process steps are taken in the ITSM tool.

5.3 Roles and responsibilities

As described in the first chapters, the new IT knowledge management process is meant to insource responsibilities to the case company's personnel and ownership to the SMO. This can be seen as the service desk supplier's knowledge management team's mitigating responsibilities, and on the other hand, new process tasks for the case company's service managers, solution managers, end users, IT suppliers and other stakeholders.

Newly defined roles for the case company's personnel and IT suppliers in IT knowledge management are knowledge user, author, knowledge manager and assignment group members, also known as the subject matter experts.

Table 8.   Proposed new roles and responsibilities

Role	Responsibilities	Who?
Knowledge user	- Uses knowledge articles - Suggests new articles - Comments and gives feedback about articles	All case company's employees

Author	• Writes articles • Improves returned articles	All case company's IT employees
Knowledge manager	• Publishes articles • Retires articles • Sends expiring articles back for review	Members of the change management groups
Subject matter expert	• Writes articles • Reviews articles • Improves insufficient articles	Members of the change management groups

The knowledge manager, author and the subject matter experts are at this point in many cases the same individuals per situation, but they are acting under different role when executing different tasks. This is to enable the future improvements for the process, when more time-consuming IT knowledge management would require differentiating the employees participating in the process. The maturity of the organization does not make this possible at the moment, luckily the light nature of the IT knowledge management process does not even require it.

The knowledge manager process role is not the same as the SMO knowledge manager. The SMO knowledge manager is the process owner, with little to no process tasks, whose responsibility is to look in to the quality of the process itself, follow trends, identify improvements and escalate process violations and deficiencies.

5.4   Business challenges addressed and current state affected

As stated in the previous chapters, the new IT knowledge management process is addressing the issues the case company has with their current process. Even without any data or measurements from the new process, it can be stated that the necessary improvements will be effective since they are addressed in the process task level instead of task execution quality level.

The business challenges of the case company regarding IT knowledge management were two-sided: process ownership and the flow of information.

With this proposal, the process ownership is brought back to the case company. Through the assignment groups used to guide the process, the stakeholders with the expertise to produce knowledge articles are given the responsibilities they desired. The one-sided function executing all the process tasks is still as a part of the process, as the service desk supplier has remaining responsibilities with the new design, but with control and quality assurance in the case company's side. The vendors were included to the process with the article review, and they will continue to act in the process, as they are receiving the notifications as part of the assignment groups, and can contribute and bring their expertise to wider audience to use.

The flow of information is mostly affected with the new knowledge base structure and the rules assigned for each article type. For example, with the new process, the information within the articles is validated regularly, non-technical users can view only the articles that are written in a language suitable for them, and the navigation in the knowledge base and searching for information is made easier with the enhancements.

The flow of information is also affected with the service desk instructions. The new proposed process will control the use of the knowledge articles, and the service desk agents need to state why they are not using the articles in e.g. incident resolution, which will lead to creation of new articles and new instructions for the service desk in how they should act regarding the use of knowledge articles.

5.5   Quality and control

The quality of the process can be regarded from the overall process point of view or from the article quality point of view. These are both delivering value to the IT operations and are equally important for the case company, but where the quality of the process is measurable and can be easily affected, the article content quality issues surface only through individual observations or incorrect actions taken as a result of false information.

The control is carried out through the ITSM tool, and can be affected through the tool customizations.

Quality

The process quality depends on the following factors: amount and direction of the process phase triggered notifications, time from Build to Published and the number of articles waiting for review. Naturally, the use of knowledge articles especially by the service desk is also a quality issue, but it is not covered here since it was already described in the previous chapters.

The correct receivers of notifications are defined by the groups in the ITSM tool. In the IT knowledge base, if certain articles that are linked to services or CI's contain do not have the right members in their change management groups, the process will not move forward because the employees who receive the notifications will not act accordingly. In the end user knowledge base, there is a similar issue, but the service desk involvement decreases the risk since they are also receiving some of the notifications.

The time from Build to Published describes the amount of time it takes for the article creation process to reach its end, finishing with the new article being published and available for the right audience. This process proposal could be implemented also to a much heavier knowledge management environment, where the number of articles and stakeholders would be larger. However, in the case company, because the process tasks for roles author, SME and knowledge manager are usually executed by the same individual per article, this will not most likely be an issue. In case problems occur, the ITSM tool reporting can be used to follow and identify issues, after which they can be addressed and intervened with new operating procedures.

The number of articles waiting for review indicates that the key individuals participating in the process are either not aware of their responsibilities or do not prioritize it accordingly. This is not dependent on the process and must be considered in a higher level by addressing the employees and their ways of working.

The article content quality depends on the base level of expectations that the individuals using the articles have regarding their content, as well as the needs of the people acting according to the instructions stored in the articles.

The level of expectations towards the article content quality can be affected positively by distributing high quality information within the articles. However, since the current state

has been so long insufficient, the expectations are also low. The expectations will naturally go higher when the process supports the ambitions that people have in sharing their expertise through the articles, but it will take time.

Instructions affecting for example the service desk agents' and technical specialists' work are of a more critical nature, leading to a higher need for quality. If already published articles are noticed to be insufficient, they will be assigned for review and updated since there is a strong focus in the case company to improve operations quality.

Control

As previously mentioned, the new proposed IT knowledge management process is highly controlled by the ITSM tool. By contrast to many other processes, the IT knowledge management does not contain many non-tool related tasks, but it is somewhat steered by the tool in all phases. This reduces the need for other means of control because there are no other tasks or activities that could be neglected besides the tool assigned tasks.

However, the process control is affected positively by the explicit definition for the owner of the process, measurements, KPI's and reporting procedures even though they are not in the scope of this thesis.

From continuous process improvement perspective, the needed data to justify the improvements are mostly related to the previously mentioned quality attributes and measurements and are, therefore, automatically delivered to the IT knowledge management process owner.

5.6   Future improvements

After the process implementation, there will certainly be some minor enhancements to be carried out because the process applicability to the case company cannot be exactly estimated since the key stakeholders have not had these kinds of responsibilities in the past. However, the light nature of the process decreases the risk for poor process fitting.

Some of the improvements that will most likely be implemented are described in the following table.

Table 9.   Proposed future improvements

Improvement	Motivation
CMDB data linking services and CIs to subject matter experts to be enhanced	The current maturity level regarding the accuracy of the CMDB is not very high, and after the process implementation some issues caused by for example the lack of service owners and change management groups of certain services and Cis need to be addressed.
Most critical articles to be reviewed and fitted to more suitable template enabling more efficient use	As some of the articles are needed on almost daily basis, it is necessary to improve the efficiency in carrying out the tasks described in the articles. This can be influenced with restructuring those articles.
Service desk process responsibilities reviewed and controlled by additional means	There is no certainty of the quality of the service desk activities in acting as a part of a IT knowledge management process outside their ownership. This may cause some problems with e.g. the time it takes to publish the articles, and needs to be addressed with control mechanisms not defined at this point.
The guidelines for the types of information that should be stored in the knowledge base to be revisited and redefined	As a part of the quality improvement focus at the case company, the need for available documents is evolving. This may cause some new requirements for the knowledge base, as new types of articles may need to be introduced to the knowledge base.
Adding new process phase increasing vendor participation in the process	The notifications steering the reviewing of the articles can currently only be sent towards one group. In the future, it would be beneficial to include vendors by dividing the notifications in to two, for example review related notifications to the case company personnel, and update related notifications to vendors.

The new IT knowledge management process will not be improved in a vary standardized manner since as stated earlier, the maturity level of the case company is not very high and the continuous improvement process has not been implemented. IT knowledge management process owner will be responsible for gathering feedback and identifying the improvements to be taken forward. The final decisions regarding larger tool customizations are naturally made by the IT management because they are responsible for financial decisions. Minor customizations and process enhancements can be made as part of the normal process management, but need to be considered separately. No structured process improvement model is deployed mostly because of the said maturity level and the lack of controlled process evaluations.

6 Conclusions and evaluation of the new IT knowledge management process

The objective of this project was to develop a new IT knowledge management process for the case company. A high-level statement can be made that the process was developed with respect to the business in addition to the IT requirements set by the low quality of current state IT knowledge management activities and the effect it had on the case company's business.

6.1 Results and recommendations

The following figure summarizes the outcome of this project against the objectives defined in the beginning.
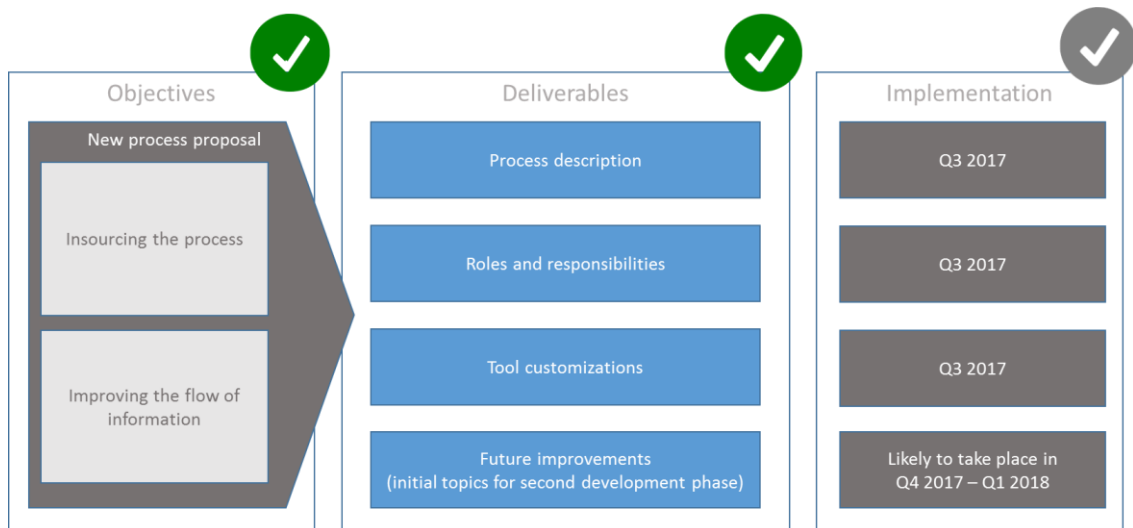

Figure 10.   Results of the project

The implementations of the process description, the described roles and the changes to the tool are likely to take place during the third quarter of 2017, and the planned improvements few months after that. Due to the many changes takin place in the case company's IT operations, it is not possible to exactly estimate the future of the proposal.

The recommended phase to implement the proposal is during the summer when, due to vacations, the amount of IT activities in the case company is smaller, which would leave

the responsible persons more time to become familiar with the new process. The details of the implementation were uncertain at the time of this thesis.

6.2   Evaluation

When planning the new process, the key stakeholders were actively included in defining the requirements from their point of view, the vendors were brought along to add their expertise in the value created for the case company, and the best practices were used to avoid impetuous conclusions that could have been incorrect or poorly suitable for the case company.

It also became clear during the development how important it is to obtain a good overall picture of the company's business and operations since theories and best practices to implement as is are not available, but one must choose from several different approaches the elements, which are most beneficial for the situation at hand.

As the development advanced, the plans made were communicated to the stakeholders to open discussion about the future benefits, thus iteratively testing the relevancy of the design.

The results of this project were not only process related, but new information and conclusions regarding other areas of IT operations were revealed, bringing the additional value of this project even higher. As an example of said value, one can consider the observation on how the lack of roles and service-related responsibility groups in the ITSM tool restricted the design to indicate a vital development are for the future in the case company's IT.

The process development project such as the one covered in this report usually follows a structured approach, and the development projects can be seen to be very similar when compared to other projects. The differences between process development projects are usually shown by the quality of the outcome. In this case, the outcome was addressing the case company's situation well, the IT community was active and working together to achieve a mutual goal. In addition to the new streamlined process, the spirit of cooperation and communication in the community can be interpreted as a small win, affecting the case company's operations more widely in times to come.

The case company has been satisfied with the proposal even though the process has not been implemented yet. However, it needs to be stated that at the time this project was carried out, the situation at the case company was extremely hectic, raising a question about the level of detail the IT management along with the stakeholders has considered it. Luckily, the IT knowledge management's most critical elements are already in place: the tool enabling the process, the expertise to evaluate and create knowledge and the understanding to develop and follow the IT knowledge management activities.

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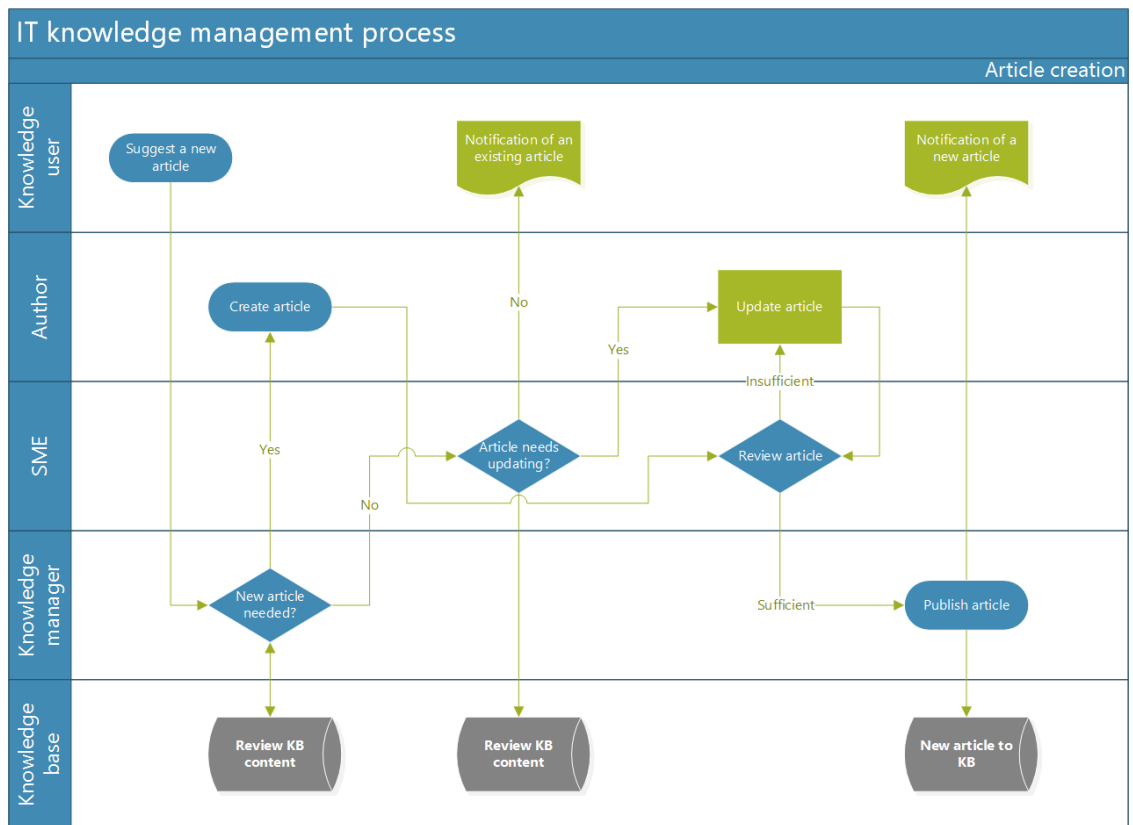
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Appendix 1

Appendix 1. Flowchart of IT knowledge management process article creation

Appendix 2. Main outcomes from the interviews with the service managers

Phase of development (Data set)	Findings
Data set 1	• Service desk is not using articles as they should • Frustration among the case company personnel on not being able to participate in the IT knowledge management • Some of the current articles are critical even for the business processes • The IT vendors have a lot of information that should be used more efficiently
Data set 2	• The service managers need IT knowledge management to carry out their own responsibilities • The service managers' perception in IT knowledge management varies, the process needs to take it into consideration with simplicity • Some service managers are more eager to participate than others in the future process • The size of the organization does not make 100% process efficiency possible because the responsibility areas are so different by nature
Data set 3	• The change management group is the only suitable option to steer the notifications to assignment groups • The process implementation needs to be well executed and the tool needs to support it because of different level of interest and skill in the IT community • Service desk needs other options than only linking the article to incident resolutions • The planned knowledge base is suitable for service managers' use if the number of mandatory fields in article creation is not very high