Haaga-Helia
University of Applied Sciences

Development of a Knowledge Centered Service using existing Systems and Knowledge Base

Vasileios Manassakis

Master's Thesis
Degree Programme in
Information Systems Management
2020

Haaga-Helia
University of Applied Sciences

Abstract

19 May 2020

Author
Vasileios Manassakis

Degree programme
Information Systems Management, Master's Degree

Thesis title
Develop a Knowledge Centered Service using existing Systems and Knowledge Base

Number of pages and appendix pages
70 + 3

In most organizations, Service Desks are flooded with requests that require time and mostly must be resolved as soon as possible. These requests create further problems such as waste of time and resources spent resolving repetitive incidents or fulfilling similar requests. Accessing existing knowledge helps to reduce drastically the time spent solving problems and therefore to save money and resources. So, Knowledge Management (KM) is definitely a solution to these problems and a proper way to mitigate these challenges of service teams. Additionally, as organizations try to innovate, adapt and respond to constantly changing business conditions, there is a critical need for people within organizations to share and acquire ideas and information with each other.

Thus, the main objective of this study is to propose a roadmap for the case organisation to develop an appropriate Knowledge Management System (KMS), using the existing organisation's infrastructure, in order to capture new knowledge and to integrate the existing one into the daily workflows through documented and well defined processes. In addition, it aims to set up a standardized way to update the existing knowledge base by collecting the knowledge that is scattered across the organisation within non-integrated tools. The proposed plan is to start with a small pilot on a specific knowledge domain and by creating some success, to create interest for other employees to get involved automatically. Pilot will also help in testing the validity of the study and fine-tune the proposed service and it will enable the organisation to manage the risk and identify any deficiencies before substantial resources are committed.

Knowledge Centered Service (KCS) does not follow the traditional Knowledge Management but it is a just-in-time approach, which means that knowledge is created at the moment of interactions and is treated as an add-on to the problem solving processes. With KCS, knowledge is not something you do in addition to solving problems, but rather knowledge becomes the way you solve problems. Integrating the use of a Knowledge Base (KB) into the workflow and the day-to-day operations enables the organisation to benefit from improvements in policies, services and processes. KCS is a continuous process of learning and improvement where the collective experience of the entire organization contributes to a dynamic, collaborative framework. The success of KCS study depends on the organization culture, which illustrates the level of knowledge appreciation within the organization. The knowledge use and sharing must become a daily habit for employees, not something that they occasionally do. In order for the initiative to be fully successful, a knowledge sharing culture across all the organizational units must be developed.

Keywords
Data, Incident Management, Information, Knowledge, Knowledge Base, Knowledge Centered Service, Knowledge Management, People, Process, Technology.

Table of contents

Table of figures

Abbreviations

AQI	Article Quality Index
CESI	Socialization-Externalization-Combination-Internalization
CSI	Consortium for Service Innovation
DIKW	Data–Information–Knowledge–Wisdom
DMS	Document Management System
DMS	Document Management System
FAQ	Frequently Asked Questions
FTE	Full-Time Equivalent
IMS	Incident Management System
ISCRAM	Information Systems for Crisis Response and Management
IT	Information Technology
KB	Knowledge Base
KCS	Knowledge Centered Service
KDA	Knowledge Domain Analysis
KDE	Knowledge Domain Expert
KM	Knowledge Management
KMC	Knowledge Management Cycle
KMS	Knowledge Management System
PAR	Process adherence review
PDCA	Plan-Do-Check-Act
SD	Service Desk
SMART	Specific - Measurable - Achievable - Relevant - Time Bound
SME	Subject Matter Expert
SWOT	Strengths – Weaknesses - Opportunities - Threats
UFFA	Use - Flag - Fix - Add
VCI	Value Creation Indicators
WIP	Work In Progress

1 Introduction

In most organizations, people seek for information through a number of different ways and particularly by looking through documents and records, asking colleagues, searching past emails, and in the end browsing an existing knowledge base. In a knowledge oriented environment using the knowledge base is the first thing that employees must do, and therefore the ultimate goal is to integrate the use of the knowledge base into their daily workflows. Developing a knowledge base takes time, and needs a joint effort within the entire organisation and not only from the Service Desk (SD). Unfortunately, knowledge management is seen often as an extra task for already overloaded employees and is not included among the priorities of an organisation.

An important part of the knowledge integration approach is the realization that the best way to create, maintain and apply knowledge is through the people who use it every day. Even in cases where organizations have already implemented some type of knowledge based approaches, there are still problems such as lack of culture among the employees in sharing their knowledge and updating the knowledge base. The knowledge integration and use must become a daily habit for the employees, not something that they occasionally do. In order for the project to be fully successful, a knowledge sharing culture across all the organizational units must be developed.

1.1 Scope

The scope of this project is to propose a way to create a new knowledge and to integrate the existing one into the daily workflows through documented and well defined processes, like those introduced by Knowledge Centered Service (KCS). In addition, part of the project scope is to set up a standardized way for enriching and updating the existing knowledge base by collecting the knowledge that is scattered across the organisation. The proposed plan is to start applying the methodology on a specific knowledge domain with a small group of employees, organise a pilot phase in order to create some success, which in turn will generate interest from other employees to get involved.

When the KCS is being adopted, the organization enjoys an evolution of its employees' skills, its processes and supporting technologies and its relationship with its customers and other organizations. In general, the proposed knowledge approach is expected to improve the organisational performance through increased efficiency, productivity, quality and innovation. It is expected to enhance decision-making, reduce re-work and process time, and ensure broader collaboration throughout the organisation.

1.2 Objectives

The fundamental goal of the Knowledge Centered Service is to provide a methodology for sharing information, ideas and experiences in order to ensure that they are available in the right place at the right time and to improve the efficiency by reducing the need to re-discover knowledge.

The main objectives of such a development project are the following:

- Decrease resolution time for incidents and service requests and therefore improve customer satisfaction. If service desk uses the knowledge base as the first source when serving a request or when seeking a resolution to an incident, they are likely to find that this has already been resolved, and thus avoid the work of researching or seeking assistance from others to develop a resolution or fulfilment.
- Improve the knowledge sharing within the organisation and therefore increase the overall organisational productivity. If a consistent and efficient knowledge management system is in place, users may find what they are looking for, avoiding the effort to create tickets or make calls and thus increasing the overall productivity.

Interrelating the previous objectives of decreasing resolution time for incidents and reducing number of inbound emails, tickets and calls to Service Desk, it results in an increased use of resources and in a reduction of the organisation's operational costs.

1.3 Research Questions

The main question that this study attempts to answer is if the proposed approach is the best practice for knowledge management by enabling the organization to improve its ability to capitalize on what it collectively knows. In order to address this better, the following research questions according to the objectives that were set previously, have been identified:

Objective 1: Reduce resolution time for incidents and service requests.

- **RQ1** What tools can help an organisation to save time and resources when resolving issues?
- **RQ2** How the incident resolution and request fulfilment process can be improved?

Objective 2: Improve the knowledge sharing within the organisation.

- **RQ3** What factors can help employees in an organisation to obtain a knowledge sharing culture?
- **RQ4** How to integrate the use of the knowledge base into the problem solving process?

2 Knowledge Management

Knowledge Management is a systematic process for finding, capturing, organizing and presenting knowledge in order to achieve the organisational objectives and improve the overall efficiency (Davenport, 1994). It is a critical process not only for improving performance as Kind (2005) states at his paper “Humanitarian Knowledge Management” presented at the Second International Information Systems for Crisis Response and Management (ISCRAM) Conference, “The faster humanitarian organizations can identify, collect, analyse and disseminate critical information, the more effective the response becomes and the more lives are potentially saved and human suffering reduced”.

2.1 DIKW Model

The Data–Information–Knowledge–Wisdom (DIKW) model, referred also as the “Knowledge Pyramid” is one of the fundamental, widely recognized models in the information society. The role of the DIKW model in information management is to contextualize the different entities and describe the functional relationship between data, information, knowledge and wisdom as well as the transformation process of a lower entity (e.g. data) to a higher one, such as information (Rowley 2007, 164). Thierauf (1999) defines the three components as follows: Data is the lowest level, an unstructured collection of facts and figures. Information, the structured data is at the next level, and lastly knowledge is defined as "information about information".

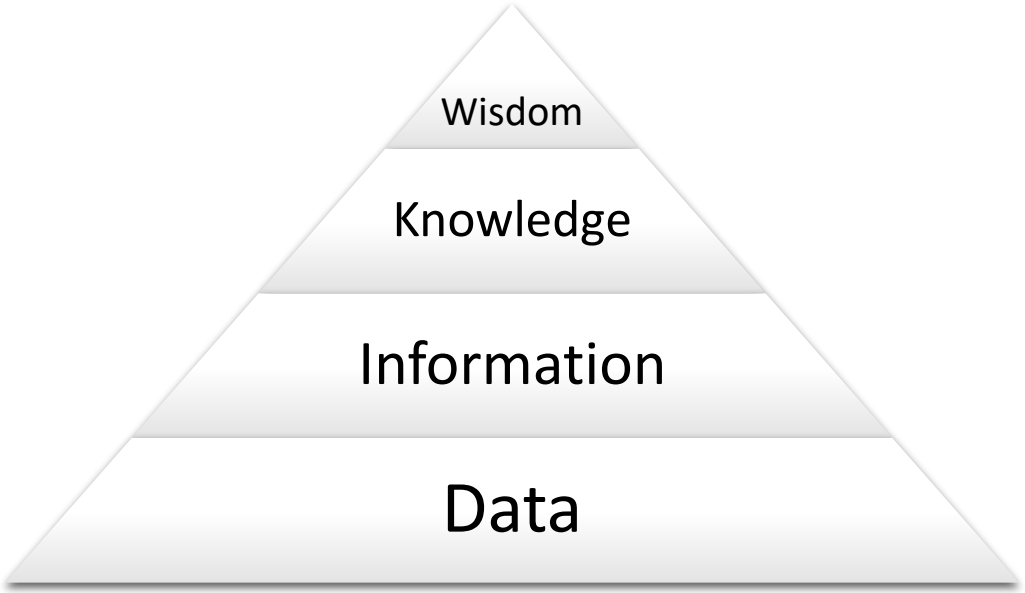

Figure 1. Knowledge Pyramid (adapted from Rowley)

The key elements of the pyramid which is illustrated in figure 1 are:

- **Data:** a collection of facts in a raw or unorganized form such as numbers, characters or any other type, mainly without meaning for humans.
- **Information:** data with context and with an enclosed meaning. Most of the times, once data has been processed turned into information.
- **Knowledge:** the result of combining information with analysis and experience. If information is the individual pieces, knowledge is the completed puzzle. Knowledge can be further classified broadly as either explicit or tacit:
    - **Explicit** knowledge can be articulated in formal language and easily codified in paper or electronic form and shared without need for interpersonal interactions (e.g facts, rules, policies, etc.).
    - **Tacit** knowledge resides in human brain and cannot be easily captured or codified. This kind of knowledge underlies on personal skills and its transfer requires interactions.
- **Wisdom:** the ability to make correct judgments and decisions mainly gained through experiences in life.

According to Mutongi (2016, 68) the DIKW model may apply better to explicit knowledge because it is very difficult to document or articulate it when dealing with tacit knowledge and therefore the model cannot be considered as a holistic approach but as different perspectives of knowledge management.

2.2 SECI Model

The Socialization – Externalization – Combination - Internalization (SECI) model is a conceptual model of knowledge theory and knowledge generation processes within organizations, which was introduced by Nonaka and Takeuchi (1996). It describes how explicit and tacit knowledge is generated, transferred, and converted within an organization. The SECI model consists of four phases of knowledge conversion as shown in Figure 2:

Socialization (Tacit to Tacit): In this phase, knowledge is transferred through, guidance, observation and mostly through interactions. For example, meetings and brainstorm sessions belong to this kind of interactions. Since many times, tacit knowledge is difficult to become formal, it can be transferred better through socialization and shared experience, like the traditional apprenticeship, where the trainees acquire their technical skills mainly through hands-on experience and not from user guides and books.

Externalization (Tacit to Explicit): During this phase, knowledge is converted from tacit to explicit through externalization, which means that it is converted to an understandable and an interpretable form. For example, documents, images, audios and videos, belong to this kind of transformation. When tacit knowledge is made explicit and shared with others, it becomes collective knowledge resulting in new knowledge creation.

Combination (Explicit to Explicit): This is the simplest form of conversion, where existing explicit knowledge is combined to create new knowledge, as happens for example when writing a new book and using information from different resources like other books, papers, web pages etc. The basis for this kind of conversion inside an organisation, are the knowledge and content management systems with the advanced search and retrieval engines.

Internalization (Explicit to Tacit): Internalization, means that, as knowledge becomes formal, it is easier to be used and learned, enriching individuals' existing tacit knowledge. For example, organizations provide training programs for its employees and therefore by attending these trainings and reading the relevant materials and documents employees internalize the knowledge, which means that create new tacit knowledge from the explicit one.

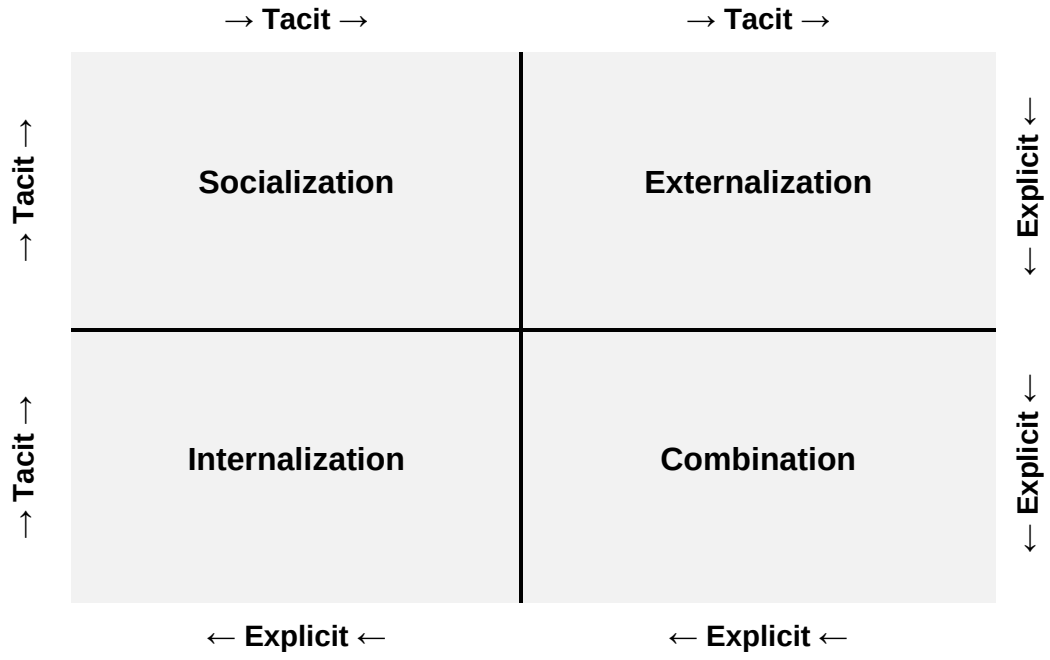

Figure 2. SECI Model (adapted from Nonaka & Takeuchi)

The SECI model explains how the knowledge is created by converting tacit and explicit knowledge. The familiarization with the SECI model in the organisation could enhance the organisation's learning culture and foster the performance and value creation.

2.3 Knowledge Management Cycles

Knowledge management cycle (KMC) is a process of transforming information into knowledge within an organization. It contains how knowledge is captured, processed, and shared into an organization. Knowledge management cycle has a crucial role in the development of organizations in a sustainable way. There are many knowledge management cycle models in literature but the most popular models are the ones described below.

2.3.1 Meyer and Zack's KM cycle

This model was developed in 1999 and it is based on the development of information oriented products, whose architecture is not so clear like this of physical products. Meyer and Zack (1996, 47) have analysed the major stages of a knowledge repository and mapped them on the following cycle: acquisition, refinement, storage/retrieval, distribution, and presentation, illustrated in the figure 3:

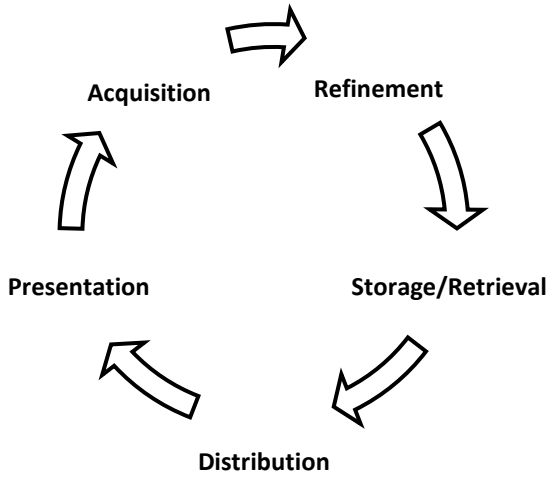

Figure 3. Meyer and Zack's KM cycle

- **Acquisition:** addresses issues related to sources of raw materials such as scope, timeline, cost, quality, relevance, accuracy, control, etc.
- **Refinement:** may be physical, such as migrating from one medium to another, or logical such as restructuring, relabelling, indexing, and integrating.
- **Storage / Retrieval:** creates a bridge between the upstream stages which feed the repository and downstream stages where product is generated.
- **Distribution:** specifies the product delivery method to the end-user and defines not only the medium of delivery but also other parameters, such as timing, language, frequency, form, etc.
- **Presentation:** evaluates the performance of each of the preceding steps, for example, does the user have enough context so that to use this content?

2.3.2 Bukowitz & Williams KM cycle

Bukowitz and Williams (2000) present a knowledge management cycle that outlines how organizations generate and maintain knowledge in order to create value. The seven steps outlined in this model are depicted in the figure 4:

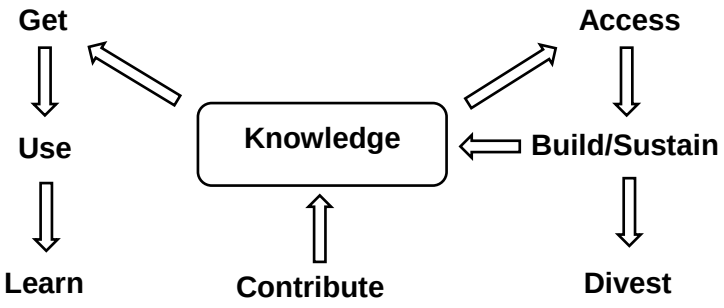

Figure 4. Bukowitz & Williams KM cycle (adapted from Bukowitz and Williams)

- **Get:** seek and obtain the information which is required to make decisions, solve problems, etc.
- **Use:** combine information in order to foster organizational innovation by using a number of creativity enhancing techniques to promote out-of-the-box thinking.
- **Learn:** learn from experiences in order to create competitive advantage, using organizational memory (lessons learned, best practises).
- **Contribute:** post what has been learned on a public knowledge repository so that the knowledge can be made visible and available to the entire organization.
- **Assess:** evaluate and map intellectual capital, define mission critical knowledge, compare with the future need.
- **Build/Sustain:** ensures that the organization's future intellectual capital will keep the organization viable and competitive.
- **Divest:** get rid of worthless intellectual or corporeal assets and transfer knowledge outside.

2.3.3 WIIG

Wiig (1993) attempted to create a practical model for KM, based on the principle that knowledge must be organized, by identifying a set of organizational knowledge processing phases. He pointed out that "Knowledge is the foundation of all functions and aspects of the enterprise". The figure 5 shows the four major steps of the WIIG model:

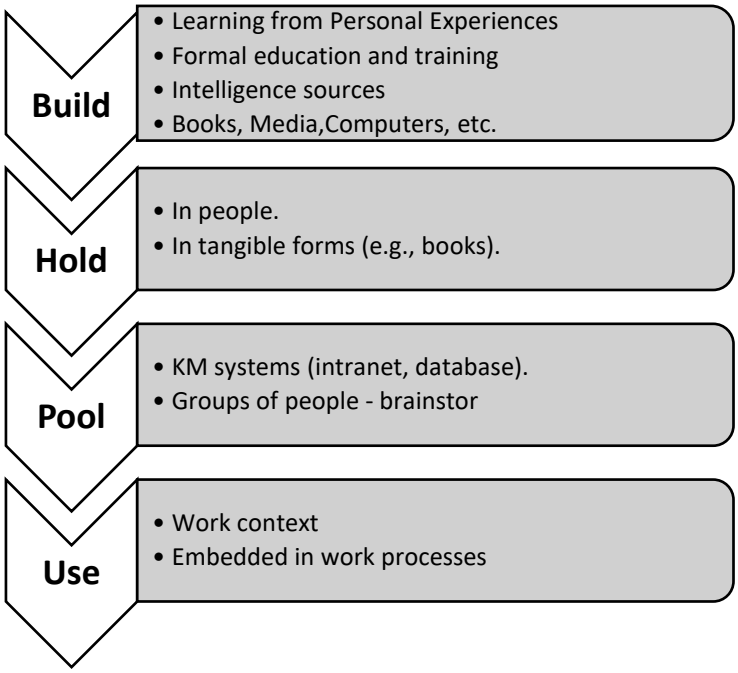

Figure 5. WIIG KM cycle (adapted from Wiig)

- **Build knowledge:** obtain knowledge through a variety of means, such as personal experience, formal education and training, and other sources such as books, media, etc.
- **Hold knowledge:** store the knowledge in a particular form, by accumulating and archiving knowledge in repositories.
- **Pool knowledge:** refer to coordinating, assembling, accessing, and retrieving knowledge through various media, such as intranets and knowledge management systems.
- **Use knowledge:** can be used in the work context to determine for example the kind of a problem, to support the synthesis and evaluation of potential alternatives, to successfully complete a task or to make a decision.

2.3.4 Other KM Cycles

According to **McElroy** (1999) knowledge life cycle consists of two main processes, knowledge production and knowledge integration. Knowledge production can be divided into 4 sub-process: Individual & Group Learning, Knowledge Claim Formulation, Information Acquisition, and Knowledge Validation. Individual & group learning involves the process by which individual and/or group knowledge is created. Knowledge Claim Formulation involves creating new organization knowledge claims. Information Acquisition process by which an organization either intentionally acquires knowledge claims or information produced by others external to the organization. Knowledge Validation requires the

knowledge claims to be subject to measure stated by the organization. Knowledge Integration requires the organization to discard the old knowledge claims and replace them with new ones.

According to **Dalkir** (2011), the processes make up an integrated KM cycle, can be classified within three major stages, Knowledge capture and/or creation, Knowledge sharing and dissemination, Knowledge acquisition and application. Knowledge content is assessed in the transition from the first to the second stage of the cycle. In order to be understood (acquisition) and used (application), knowledge is made contextual. A cycle arises because the third step will feed back into the first to update the knowledge content.

In summary, it is clear that the main phases of all knowledge management cycles are more or less the same (knowledge capture, knowledge sharing, knowledge use), even if they have been expressed with different terms. Although their adoptance into the organisational culture is not an easy process, they offer many benefits including, improvements in the business processes, savings of money and time and an increase of the overall organisational productivity.

2.4 Knowledge Management System: People, Processes and Technology

Knowledge Management (KM) is a series of activities which an organization put in place for creating, managing and sharing the knowledge within the organisation. The concept of KM was established almost two decades ago to assist organisations to develop and apply knowledge in an organized manner. According to Davenport & Prusak (1998), Knowledge Management is "managing the corporation's knowledge through a systematically and organizationally specified process" which includes both the tacit and explicit knowledge in order to create value, improve organizational performance and enhance competitiveness. The basic idea behind Knowledge management is that the most valuable resource of an organisation is the knowledge of its employees. Therefore, the organisational performance, will depend, mainly on how effectively its employees can develop new knowledge, share knowledge around the organisation, and use that knowledge with the best way.

Knowledge Management System (KMS) can be defined as a set of tools and processes used by people to capture, create, organize, share and apply knowledge. Robertson (2007) argues that a Knowledge Management System is not exclusively a technology discipline although technology plays a key role in delivering and supporting KM services. People, Processes and Technology are the main pillars of a successful KMS. People create and share knowledge through a well-organized process framework, enabled through flexible technology platforms and applications. According to Robertson (2007, these are

the three fundamental elements of a knowledge management system which work in relation to one another in order to achieve the desired goals and objectives (figure 6).

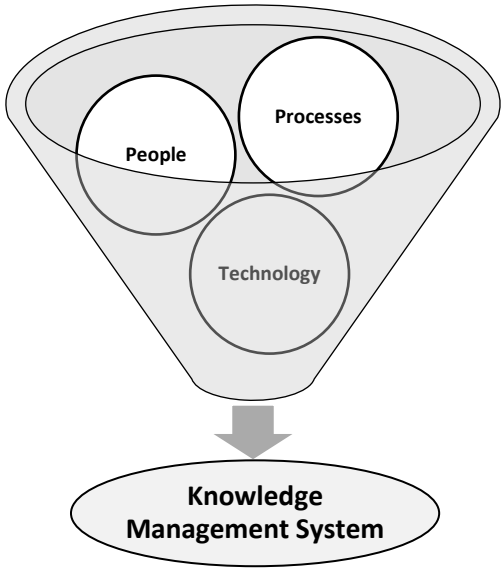

Figure 6. Main elements of a Knowledge Management System

People are the ultimate holders of knowledge. The whole success of Knowledge Management depends on the willingness of people in sharing their knowledge. The goal is to encourage them not only seek for knowledge, but to make them see the benefits of sharing the knowledge within the organization. Organizations must create a working environment that motivates knowledge sharing resulting in a developed sharing culture among the employees.

Processes is a series of actions or methods to acquire, generate, share and apply knowledge within the organization. In order to improve knowledge sharing, organisations may need to make changes to the structure of their internal processes, and even more to the organisational structure itself. People even if they have a knowledge sharing culture are ineffective without processes in place. For example, what processes can be adapted, or what new can be introduced to support people in creating, sharing and using knowledge.

Technology involves the mechanisms that store and provide access to data warehouses and knowledge sources. Organizations must invest in technology, such as information management systems and document management systems, to facilitate the presentation of captured knowledge in different ways. Technology is a crucial enabler of knowledge management by helping organizations for accessing knowledge easily, alleviating time and effort, and requiring less space. In general, the role of information technology (IT) in Knowledge Management fits perfectly as any kind of IT system may capture and use knowledge, store and retrieve knowledge, improve collaboration, locate knowledge and enhance the KM process.

Knowledge resides in people's heads and managing it, is not an easy task. The aim of knowledge management is not necessarily to apply all the collective knowledge of the entire workforce but to establish an environment where employees are encouraged to create, learn, share, and use knowledge to achieve specific organisational goals

2.5 Organisational Learning

Organizational learning is the process of creating and transferring knowledge within an organization. It is about developing new organizational knowledge (rules, procedures, policies, practices, etc.) in order to increase organizational performance. Fiol and Lyles (1985, 803) point out that "Organisational learning means the process of improving actions through better knowledge and understanding". It is a learning process within an organization that involves the interaction of individuals and collective work to achieve the organizational goals. According to Balbastre et al. (2003), different types of knowledge can be found within an organization:

- **Individual:** Personal knowledge (mainly tacit) acquired by experience, study and training. Although an organization must use individual knowledge, it cannot be based on it because when employees move to another job, the knowledge moves with them unless if the individual has already shared the knowledge with other colleagues, maximizing the benefit of this individual learning to the organization.
- **Group:** Groups, may also acquire new knowledge and competences together. Many times knowledge held in groups but not shared with the rest of the organisation. Understanding how knowledge can be acquired by groups on the basis of collective processes and shared afterwards can add a tremendous value to the organisational knowledge. When employees spend most of their time working on a team, they tend to learn as a group which means that everyone can contribute ideas and solutions.
- **Organizational:** Organizations learn and acquire knowledge through their routines and practises, which are embedded in specific organizational processes. According to Hatch (2010) "When group knowledge from several subunits or groups is combined and used to create new knowledge, the resulting tacit and explicit knowledge can be called organizational knowledge". Consequently, organizational knowledge is the aggregation of all knowledge within an organization that can provide business value.
- **Inter-organizational:** Explicit knowledge that exists outside the organization such as research studies, publications, as well as tacit knowledge found in communities like conferences, social events etc. Additionally, sometimes organisations share knowledge among them in order to gain new capabilities and improve the organisational performance.

Argyris and Schon (1996), define organisational learning not as the accumulation of knowledge but mainly as the detection and correction of mistakes and identify mainly two different forms of learning within an organization, single-loop learning and double-loop learning.

Single-loop learning is the most basic type aims to solve the problems when they have risen. In this type of learning, people, groups or organizations modify their actions according to what was happened in contrast to what was expected. In other words, when something goes wrong or does not happen like planned, we adapt our actions accordingly to improve the situation or solve the problem. For example when the thermostat notices that the room temperature is too low, it turns on the furnace to increase the temperature and mitigate the problem. However, this ignores the real cause of the problem and therefore new similar problems will appear in the future. By using only single-loop learning we make only small fixes and adjustments without solving permanently the problem. This leads to small changes in specific practices and behaviours which are based on what was or wasn't working in the past.

Double-loop learning goes deeper into the cause of the problem and can be useful in organizational learning since it can drive creativity and innovation. In single-loop learning we change our actions to solve a problem while in double-loop learning we change the underlying causes that create the problematic situations. Underlying causes might be, for example, organizational norms, policies, practices, values, assumptions etc. According to Argyris and Schon (1996) double-loop learning is a behavioural learning that changes the governing variables and teaches people how to think more deeply about their own assumptions and beliefs.

We use again the example of single-loop learning where a thermostat automatically turns on the furnace whenever the temperature in the room drops below a specific number. A thermostat that could think why am I set to that number and then explore whether or not some other number might more economically achieve the goal of heating the room would perfectly fit in double-loop learning.

In summary, double-loop learning examines the underlying assumptions behind the actions eliminating the root causes of incorrect behaviours. Single-loop learning is more like an operative level, while double-loop learning is rather a tactical level.

The figure 7 illustrates the difference between the single and double-loop learning:

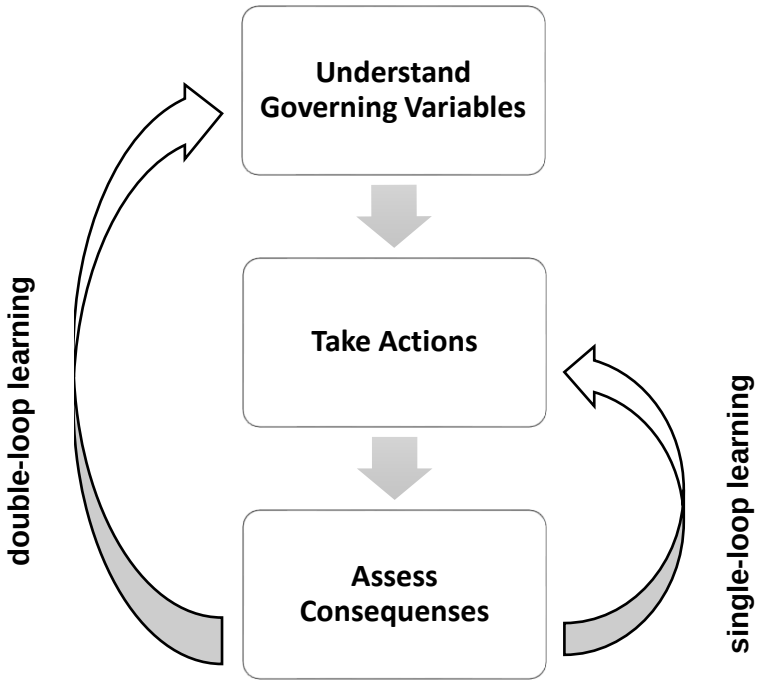

Figure 7. Single & Double loop learning (adapted from Argyris and Schon)

Another form, **triple-loop learning** or **deutero-learning** utilizes both single and double-loop learning. Although the term does not appear explicitly in their published work, it may be inspired by Argyris and Schön, the developers of single and double-loop learning. In triple-loop learning we learn how to learn by challenging existing learning frameworks and models. By learning how to learn over time, individuals discover what facilitates their learning and can thus improve the learning system itself. This learning goes beyond insight and patterns to context.

Effective organisational learning must therefore include all three forms that improve the organizational performance at all levels. However, while single-loop learning is about correcting mistakes without questioning underlying assumptions and double-loop learning is about detecting mistakes, changing underlying assumptions behind the actions (and also learn from these mistakes), triple-loop learning is operating at a higher level, developing the organization's ability to learn.

2.6 Data, Information and Knowledge Management at the European Commission

Improving the way in which data, information and knowledge are gathered, managed, shared and preserved as well as collaborative working is a priority for the entire European Commission. To support this priority, Commission issued in October 2016 a Communication on "Data, Information and Knowledge Management", setting out a corporate strategy based on two principles:

- Data, information and knowledge must be shared within the Commission as widely as possible unless there exist legal restrictions.
- Collaborative working practices should be developed and supported within and between the organisational units of the Commission.

This report identifies four main areas of improvements and outlines a first set of concrete actions for each of these areas which could be launched in a short term:

Improving information retrieval and delivery: Data and information are currently located across different repositories, databases and data warehouses and access is often difficult. Data and information search and retrieval must be made available across the organization by eliminating internal restrictions on sharing data, while ensuring full compliance with legal and other confidentiality considerations (e.g. sensitive information).

Working together and sharing information and knowledge: Collaborative working methods and tools will be made available and knowledge sharing will be promoted as the preferred working method at all levels. This is expected to increase the efficiency and quality resulting in a greater strategic alignment across the whole organization. Additionally, organisational units should review, and improve their own business processes that lead to the creation, sharing and use of knowledge.

Maximizing use of data for better policy-making: Policy making is often not driven by the available data or evidence-based statistics, and as a result organisations in all sectors and domains may make mistakes in trying to resolve issues using a wrong approach. An action plan is needed on how to better coordinate the use of new data for policy-making and how to invest in infrastructure, skills, knowledge and methods for a better use of big data which will increase the Commission's big data analytics capacity and its access to big data resources.

Creating a culture of knowledge sharing and learning: Changing the organisational culture is a big challenge. Organizations must create an engaging knowledge sharing environment that encourages bi-directional participation by putting in place cultural change management approaches. The success of this approach depends not only on the employees intention to adapt such a culture but also on the support of senior and middle-management and their readiness to lead by example. Central and local support is needed for competencies development and for ensuring that information-and knowledge-sharing objectives are built into internal policies.

An effective governance framework is required in order to prioritise, coordinate and implement the planned strategy while leaving room for the individual organization units to develop and implement their own approaches tailored to their own specific needs.

3 Knowledge Centered Service

Knowledge-Centered Service (KCS) is a methodology that focuses on knowledge as a key asset of the IT support organization and was developed by the Consortium for Service Innovation (CSI), a non-profit industry association with members such as Oracle, SAP, Hewlett-Packard Enterprise, Ericsson, etc. (Consortium for Service Innovation, 2020). The work started in 1992, and the methodology has since evolved into a rich set of principles, practices and techniques, based on the collective experience of its members. According to KCS Academy, “KCS is a proven methodology for integrating the use, validation, improvement, and creation of knowledge into the workflow”. This means that getting the work done includes also to integrate the reuse of existing knowledge, improve existing knowledge, and capture new knowledge when it doesn’t exist.

3.1 Goals & Benefits

The goal of KCS is to integrate the use of a knowledge base into the workflows within the organisation in order to:

- create content as a by-product of solving problems,
- deploy content based on usage and demand,
- develop a knowledge base of the collective experience of an organization,
- recognize learning, collaboration, sharing, and improving.

The idea behind the Knowledge-Centered Service (KCS) is simple and based on the assumption that If we can create, improve and reuse knowledge available to the entire organization, as part of our workflow, we can improve our products and services while enhancing organizational learning.

The main benefits of incorporating KCS into the organisational workflows are:

- **Operational Efficiency:** with suitable knowledge available, employees can handle well-known issues quicker letting them to spend additional time learning additional skills or providing assistance to less experienced colleagues.
- **Self-Service Strategy:** creates a self-service environment where employees can resolve an issue or serve a request without interactions with others. All this automation increases the self-service experience and reduces calls and e-mails to service desk.
- **Organizational Learning:** creates a learning environment and culture that increase individual, group, and organizational learning as well as the overall productivity.
- **Use of Resources:** reduces rework by enabling people to benefit from the collective experience of the organization captured into the knowledge base and therefore helps employees to become more efficient and effective in their work.

The KCS methodology is not just a process that helps organizations responding to issues quicker but it is about changing how employees and managers think about knowledge. Unfortunately, knowledge management often isn't prioritized or embraced by a large enough group of knowledge experts, because it is seen as an extra task for an already overloaded team.

3.2 KCS Structure

According to Consortium for Service Innovation (2019a), Knowledge-Centered Service (KCS) is a set of principles, practices and processes that focus on knowledge as the most important element of the supporting organization. KCS principles are underlying beliefs and behaviours that serve as the foundation for the Knowledge-Centered Service. The practices are the application or use of the principles and core concepts in organizing activities. Techniques are at a more granular level of detail than practices and describe activities. The figure 8 shows the fundamental elements of KCS:

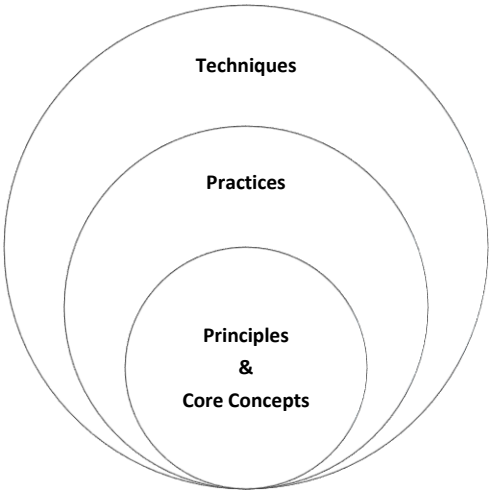

Figure 8. KCS Structure

There are four fundamental principles of KCS that aim to provide guidance on whether or not a practice or technique aligns with KCS:

Abundance: Share more, learn more. This principle based on the quotes of Bernard Shaw that "If you have an apple and I have an apple and we exchange these apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas" and implies that the more we share the more we learn. Knowledge is a product of interactions and experiences. When employees share knowledge without limitations, everyone leaves an interaction with more knowledge and experience. According to Nonaka (1991) conversion of tacit knowledge to new knowledge, is made through observation, imitation, and practice where individuals share experience through face- to- face interactions.

Create Value: Work tasks; think big picture. Knowledge workers create value through knowledge. Knowledge comes in many variations and places, all of which can be useful to the organization. The KCS techniques are designed to capture what is new and reuse or improve what is already known. The value of knowledge increases with the accessibility and frequency that is shared throughout the organisation (Davenport & Prusak, 1998). While KCS is based on knowledge, it recognizes that not all kind of knowledge has the same impact and thus allows appropriate control mechanisms, based on the different knowledge requirements.

Demand Driven: Knowledge is a by-product of interaction. This principle proposes that the demand for knowledge shows what knowledge is important or valuable to be captured and how we validate that knowledge. KCS is based on just-in-time, not on just-in-case action by capturing the knowledge and afterwards allowing demand drive our focus on the knowledge that has value. In simple words, it means that we want to solve an issue by reusing, improving, or even creating knowledge (if it doesn't exist).

Trust: Engage, empower, motivate. Trust is critical for the successful adoption of KCS and for maximizing the KCS benefits on the organization. It starts at the top of the organizational pyramid which means that the senior management and even more the executive are responsible to create a culture of trust. Afterwards, employees will do the right thing, with the right knowledge and understanding of the organization's mission and vision. Schein, *(*1985*)* believes that organizational culture is the most significant part to effective knowledge management and organizational learning.

The core concepts are the criteria by which we can validate how well specific practices and techniques align with the KCS philosophy.

Transformation and Continuous Improvement

This concept involves a double-loop process consisting of an A and B loop. The A loop is the activity which does the work while the B loop is a continuous improvement process of the A loop. The B loop activities identify opportunities for improvement by reflecting on and learning from a collection of A loop activities. This double double-loop process has been explained in details in the next section.

Buy-In At All Levels

This concept refers to the sense of autonomy or control as a key motivational factor in a knowledge-based. Leaders must create a working environment of knowledge sharing where people feel happy on contributing their knowledge. When all employees understand the values of the organization, trust their leadership and the people they work with, they will develop a culture of creating, reusing and improving knowledge.

Leadership is required

For adopting KCS successfully, leaders must drive the organizational change and create the demand for engagement. The main actions that Leadership has to take are to create a vision in terms of the value of KCS, communicate why KCS is important for each key stakeholders, encourage trust in knowledge workers in aligning with the organization's vision and improve the level of technology integration to support knowledge.

Collective Experience

The collective experience will always be more precise and complete than any individual's contribution. The concept of Collective Experience means to capture the collective experience and integrate it into the workflow enabling individuals to benefit from the collective experience within the organisation.

Collective Ownership

This concept ensures the efficiency of KCS processes and knowledge quality. If the employees are responsible for the quality and accuracy of the knowledge, then what is used is constantly getting updated. Collective ownership is related to all KCS principles and the best is for people who use knowledge every day, to create and maintain that knowledge base.

Seek to Understand Before Seeking to Solve

This concept of KCS has two implications. First, we need to understand and clarify as much as possible the issue of the requestor because trying to solve a problem before we fully understand leads to waste of time and rework. Second we have to understand what is already known about this issue collectively, so that to get ideas and reuse the existing knowledge on that issue. According to Covey (2004), "Seek to understand before you seek to solve" is widely recognized as a habit of effective people.

Sufficient to Solve

The goal in this concept is to capture the experience in a simple structure so that to be efficient for both the requestor and the responder. The level of detail must be the minimal needed to be sufficient for solving the issue (e.g. bullet list format using words and phrases that represent complete thoughts or ideas).

Knowledge Integration

This concept implies that in a KCS oriented environment, using the knowledge base must be the first thing employees do. The degree to which the knowledge base is integrated into the workflow shows the degree to which the benefits of KCS are realized. The impact and value of the knowledge is in close relation with how many people use this knowledge.

Coaching for Success

This concept involves changing behaviours and habits, which is hard work, takes time and usually requires coaching as peer mentoring. It is leaders' responsibility to create the environment in which the employees can learn but coaching is only effective if the knowledge workers (employees) have the will and culture to learn. Learning culture and learning environment are closely related and have significant impacts on individual, team, and organizational learning (Alavi & Leidner, 2001)

Assess Value

According to this concept, the value of both knowledge base and existing processes to create and maintain the knowledge, have to be assessed and evaluated. This kind of measures, enable us to identify better learning and coaching opportunities for individuals, as well as areas for continuous improvement.

KCS practices are based on what we need to do and contain one or more techniques. We divide the eight practices of the KCS methodology into two reinforcing loops, Solve Loop and Evolve Loop. Solve Loop, composed of the practises of Capture, Structure, Reuse and Improve while the Evolve Loop contains the Process Integration, Content Health, Performance Assessment and Leadership & Communication practises. A detailed description of the KCS practices can be found in the next section of the double-loop process.

In the end, techniques are the detailed actions on what we need to do. Techniques may include the skills needed to complete an action or identify the efficient way of doing/achieving something. A collection of KCS techniques make up a KCS practice.

3.3 The Double Loop Process

Knowledge Centered Service is based primarily on the concept of double-loop learning introduced by Argyris and Schon (1996) and described previously in the section 2.4. It relies on two continuous loops, the Solve and the Evolve loop, known as the Double-Loop process. Both loops are the operational activities that reinforce each other. The Solve Loop is more an immediate process for dealing with problems, while the Evolve Loop a background process for continuous improvement. Double loop learning means that solving problems creates knowledge. KCS provides a continuous process for managing, sharing, and improving knowledge, and therefore it may become the way for providing technical support to end users.

There are 8 practices in the double-loop process, four in the Solve Loop and four in the Evolve Loop (Consortium for Service Innovation, 2019c) as depicted in the figure 9:

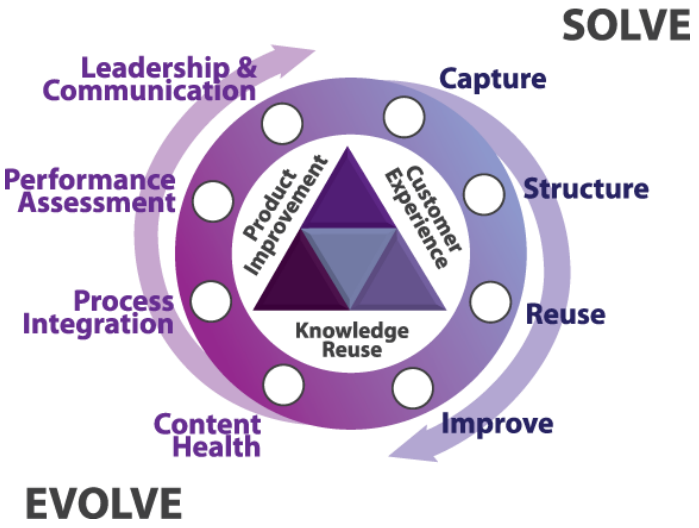

Figure 9. Double-Loop process (adapted from Consortium for Service Innovation)

The Solve Loop is the request-response workflow and contains four practices that focus on the creation and maintenance of knowledge:

1. **Capture:** When a request comes in, an article has been created for solving the customer's issue. The sooner an issue is documented, the greater the possibility that the details will be recorded correctly. We have to capture the customer's context as well as the responder's knowledge. The articles have to be created specifically for the customer, so that the information is relevant to the customer and easily searchable. The goal of this practise is to capture the experience of resolving issues.
2. **Structure:** Using simple structure or format makes knowledge base articles easy to read and use. This keeps the knowledge base consistent, making search functionalities easier for the users. Additionally, well-structured and formatted articles will save the end-users much time when searching for the required information.
3. **Reuse:** Specific words and phrases must be used to optimize the existing knowledge base articles and improve the chance of users in finding a relevant article easier and faster. When employees first search the knowledge base when trying to resolve an issue, they are likely to find that the issue has already been resolved, and therefore avoid rework and waste of time. This enhances the collective knowledge and the benefit from existing knowledge within the organisation.
4. **Improve:** Employees are inherently reviewing the knowledge as they search for articles when solving a problem. Incorrect, or outdated articles should be flagged for review and improvements. If the article is not accurate and precise, licensed users must directly update it keeping content up to date, and ensuring high quality and value.

The Evolve Loop has four components that are more focused on knowledge reuse and product improvement and represent the responsibilities of leadership and the organizational level processes needed for a knowledge oriented approach:

1. **Content Health.** The purpose of this practise is to measure the effectiveness of each article and provide guidance so that value is captured in the interaction process. In other words, the main goal is to maximize the value during the process of interaction. Cohen (1998) believes that the value of knowledge gained is difficult to be measured directly and tends to be context specific. The Article Quality Index (AQI), is used for assessing the quality of the articles content and helps maintain consistent quality of information into the knowledge base where articles are developed by various authors.
2. **Process Integration.** To increase the adoption of KCS and maximize its success, it is needed to integrate the Knowledge Base with all main information systems used within the organization, like the Incident Management System (IMS). The process adherence review (PAR) is often used to measure how often and how well employees follow the KCS workflow. PARs is not about tracking goals like the number of articles created by an employee but about monitoring how well employees use the knowledge base to solve issues.
3. **Performance Assessment.** This practice deals with rating the efficiency of the employees. Value Creation Indicators (VCI) are used to assess both the performance of individuals as well as teams' efficiency. When evaluating employees' performance, it is important to focus not on the individual's knowledge, but also on the contribution to the development of the collective knowledge within the organization. KCS introduces new responsibilities that focus on collaboration, sharing, using, and improving the collective knowledge instead of individual knowledge.
4. **Leadership & Communication**. Leadership is a key to the successful adoption of KCS practises, and must not only define the vision and set the goals for the team, but also ensure that the workflows within the organization are integrated with the knowledge base in order to support the business processes. "Leadership is fractal" which means that at each organisational level the understanding of what the organization is trying to achieve is identical. According to Debowski (2006), the role of a leader is to provide strategic guidelines, motivate others, communicate effectively, coach others, adopt good practices, and carry out the knowledge agenda.

4 Research Methodology

Basic research is not concerned with solving any immediate problems but it is an investigation on the basic reasons behind these problems. It provides a deep insight into the problems and facilitates the logical explanation and conclusion on possible solutions.

4.1 Data Collection Methods

Qualitative research was chosen to be used in order to collect the data and gain an understanding of underlying problems and motivations related to the current knowledge management situation in the case organisation. Walle (2014) states that qualitative research allows a flexible way of gathering and recording evidence and the result is likely to be more realistic, making the collected data richer. The data collection methods were included semi-structure interviews, observations and documentation exploration.

4.1.1 Interviews with stakeholders

In this project, one of the main techniques for gathering data was through semi-structured interviews with different employee groups so that to cover all the organisational perceptions of the knowledge management. The interviews were conducted through face to face meetings in the organisation's premises and the answers were recorded (audio and note-taking). The interviewed employees were from three (3) different domains and particularly three (3) from the management, four (4) from the service desk and five (5) from the business side in which product managers were mainly chosen as they are considered to be the "knowledge repository" in their domains.

An interview guide was prepared, with a grouping of topics and questions but without constraining them to a particular format and blocking new ideas to be brought up during the interview as a result of the interviewee answers. In particular the questions were grouped into three different themes to provide a guidance during the interview, including knowledge management topics from strategy, operational and practical perception. Each interview lasted from 30 minutes to an hour approximately and the last part, allowed the interviewees to develop their thoughts, concerns and ideas on knowledge management. Some indicative questions per different employee groups are listed below:

Service Desk:

- How many knowledge domains (products, services and processes) are supported?
- How big is the workload (number of requests, number of incidents, etc.)?
- What channel is used more? (Tickets, emails, phone calls, etc.)?
- What are the main problems encountered with the incident management system?

Business Users:

- Are you aware for the existence of a knowledge base?
- How often do you browse the knowledge base?
- Would you like to contribute with your personal knowledge and experience?

Management:

- What is the long term vision for organisational learning?
- Are there any rewards and recognitions for knowledge sharing?
- Do the managers trust and respect the knowledge workers?

Findings of the interviews provided another evidence that knowledge management is not just a process that must be included into the workflows but a continuous improvement practise for both employees and organisational evolution and development.

4.1.2 Observations (Gemba) & Organisation's Documentation

Gemba is a Japanese word meaning "the actual place". According to Lean management, Gemba refers to the place where the value is created, like the site of a construction project. A popular technique in Lean methodology, is "Gemba walks" which is the action to go to the place and see the actual process in order to explore the value stream in details and locate any potential problematic parts by asking questions and learning from those who do the actual work. The purpose of Gemba walks is not to review results or judge but to collaborate with employees in order to find solutions to the existing problems (Shook, 2011).

Analysing participant observation was done from two different perspectives, starting first from the business side and observing a business user when making a request or reporting an incident and from service desk perspective, observing a desk officer in resolving an incident or serving a request. Totally, six (6) observations were conducted, three from each type and particularly, they included the entire procedure from creating a service request or incident by opening a ticket via the Remedy Requester (ticketing tool) until the final resolution of the issue and the closure of the ticket.

A list of questions reviewed during these observations in order to understand better how the actual work is being done and what is the integration with the existing knowledge management system of the organisation. In the end, during this Gemba walks, experiences and feedback were shared and notes, comments as well as examples were recorded so that to be used for the analysis phase.

In terms of the internal organisation's documentation, everything related to service management processes, such as incident management, knowledge management and requested fulfilment as well as the service desk operation and internal workflows were examined and studied so that information that might be useful for the analysis process to be taken into consideration.

4.2 Data Analysis Methods

Data analysis is the process of cleaning, transforming and organizing data in order to discover useful information that can be used mainly for decision-making. Qualitative and quantitative analysis are the two fundamental methods of interpreting data. Qualitative data analysis refers to analysing non-numeric information such as interview transcripts, video recordings, notes, images and documents and it was the method applied to this study.

4.2.1 Thematic Analysis

Thematic analysis is one of the most common forms of analysis in qualitative research and it is a good approach when you try to find out something about people's views and opinions. This kind of analysis is usually applied to a set of qualitative data, such as interview transcripts where the researcher examines the data to identify common themes that come up repeatedly. According to Braun and Clarke (2006), the thematic analysis involves a six-phase process:

i. **Data Familiarisation:** The first phase is to look through the data to get familiar with it. This may involve transcribing audio, reading through the initial notes, and generally reading and re-reading the data to understand its content. In terms of how much to transcribe, we followed the Braun and Clarke's (2006) advice: "What is important is that the transcript retains the information you need, from the verbal account, and in a way which is 'true' to its original nature". This phase was time-consuming not only because of the interview transcription but also because of the content understanding.

ii. **Coding:** This phase involves generating indicative codes (labels) that identify important features that the data might have. A code is a brief description, not an interpretation, of what was said in the interview. Each time you note something interesting in the data, a code is written down, in order to gain a condensed overview of the main points recurring throughout the data. Particularly, in our analysis many codes were created such as, "knowledge", "culture", "processes", "people", "technology", "incident", "learning", etc.

iii. **Themes Generation:** Themes are generally broader than codes. In this phase the codes are examined and collated to create broader patterns of meaning, the themes. Not all the codes will fit together with other codes, creating so themes and therefore some codes might be redundant while others can become individual themes themselves. For example, in our study the codes "processes", "people", "technology" when get combined, create the theme "management system", which in turn if it is put together with the code "knowledge strategy" results to the key theme of this study.

iv. **Themes Review:** During this phase, the candidate themes are being reviewed to examine if they are related to the theoretical framework and the research questions. So, most of the times, themes are refined, which involves being split, combined, or discarded. In our thematic analysis, some themes were discarded such as working conditions or the individuals' benefits. This phase is an iterative process, where you go back and forth between themes and codes, until you think that you have coded all the relevant data accurately.

v. **Themes Names and Definitions:** This phase involves deciding on a descriptive name for each theme and developing a detailed analysis of each theme. Defining themes involves formulating exactly what we mean by each theme and figuring out how it helps us understand the data. As we analysed the themes, we identified how this was related to other themes as well as to the overall research questions.

vi. **Final Report:** This final phase involves contextualising the analysis in relation to existing literature and presenting the results in the formal written form (report). What the final report may include depends on your project nature, but there are some common topics that this report has always to contain, and particularly to describe the main themes, including examples from the data as evidence, to show how the analysis has answered our research questions and conclude with useful takeaways.

Although the phases above are sequential, and each is related to the previous one, analysis is a recursive process, moving back and forth between the phases.

Final Report

The key theme that was discovered during this thematic analysis, was the role of the "knowledge management system" combining the codes of "knowledge strategy", "processes", "people" and "technology".

Knowledge Strategy: The interviews mainly with the managers, show that although the organisation understands the need and benefits of the knowledge management, it is still not a part of enterprise strategy (transcript: "Knowledge Management is critical for the overall operation of the organisation but the available budget and resources don't place it in a high priority"). Knowledge management is disconnected from the overall organisational goals and objectives, although there are some knowledge management activities (transcript: "I cannot find a way to combine KM with the objectives of my overloaded employees"). To address these problems, a knowledge management strategy I needed putting in place a plan of action that outlines how the organization will manage organisational data, information and knowledge to improve individuals' productivity as well as the overall performance.

People: From the transcripts it is clear that most of the employees do not have clear understanding about their role inside the knowledge management system. Knowledge sharing is perceived as an extra work and the employees see the knowledge capture as a separate process and not embedded into the workflow (transcript: "*I don't have the time to record any personal knowledge and also do the work assigned to me, at the same time*"). Additionally they believe that requires learning and using additional tools (transcript: "*I know how to search for knowledge but it will be very difficult to capture my personal knowledge with the tools that I know*"). If the culture of the organization does not include sharing and collaboration, a significant management of change initiative will be needed to start creating a culture of sharing.

Processes: It is more than obvious that the biggest problem is that the knowledge management processes are not established yet or established properly. Although some employees have the will to capture new knowledge by documenting their work, well-defined methods or common practice to get or share the knowledge, does not exist in the organisation (transcript: "I don't mind to document my knowledge in my free time, but I don't know how"). The knowledge many times is kept at individuals' level because there is not yet defined process to share the knowledge (transcript: "Sometimes I take some notes and document them into a word file, but that's it"). The most efficient way to deal with these challenges is to establish a KM process model by introducing its main parts, such as knowledge collection, capture, update, sharing, and integrate this process model to the daily workflow.

Technology: A challenge came up from the interviews is that the existing information is managed and stored in multiple locations and presented through a variety of different applications (transcript: "I cannot understand where I have to search for the required information, in Sharepoint? in Confluence? or on Intranet ?"). Additionally, employees sometimes cannot find the desired information and resources, or when they succeed, the content is not complete or it is obsolete or irrelevant (transcript: "Many times the search functionality doesn't return any results and when it returns, the results are incomplete"). Building a central knowledge management infrastructure with collaboration and content management systems working with a central Knowledge Base is a way to address these challenges and resolve the problems related to the technology factor.

Although, some other themes were explored such as the "leaders contribution", "incident management", for time and space economy, only the key findings with the relevant evidences (transcripts) and possible solutions were presented above. In the next section we try to illustrate the overall state of the knowledge management in the case organisation as a synthesis of the previous findings by making a SWOT Analysis.

4.2.2 SWOT

Strengths – Weaknesses - Opportunities - Threats (SWOT) analysis is a planning technique used for generating strategic choices from a situation analysis based on internal factors such as strengths and weaknesses, as well as external factors such as opportunities and threats. This analysis can serve as a guide for managers to identify the positive and negative points inside and outside of the organization and plan an effective knowledge management strategy.

Figure 10. KM SWOT Analysis

The analysis in figure 10 shows again that the knowledge management is not integrated into the business context and organizational knowledge is still based mainly on individuals' level and not on collective experience. Besides, knowledge management initiatives are not aligned to key strategic goals of the organization and corporate vision.

Assessing organization's external and internal capabilities in order to better understand the exact need of the knowledge management initiative, is a critical process for addressing the challenges above. Incorporating knowledge into the day-to-day operational activities of Service Desk and other operational functions, can also resolve many of the organisational weaknesses presented previously. Training and coaching will help employees to increase their efficiency, capacity, and effectiveness at work by improving and updating their skills and knowledge.

5 Implementation in case organisation

According to KCS Adoption Guide (Consortium for Service Innovation, 2019b), the successful adoption of KCS is based on two basic principles, “go with the flow” and “start small, create some success and excitement, and then invite others to join“. The “go with the flow” concept means that KCS adoption enables knowledge to become demand-driven and self-correcting by the people who use it every day. Capturing incidents and problems as a work-in-progress article drive other employees of the organization into the knowledge base to add resolutions. The second concept suggest to start with a small pilot and by creating some success, others will get involved into the process automatically. Pilot will help in testing the validity of the study and fine-tune the service. The pilot phase will enable the organisation to manage the risk and identify any deficiencies before substantial resources are committed.

Knowledge-Centered service follows a continuous loop of capturing, structuring, and reusing knowledge. The KCS adoption phases are actually a continuous improvement process in which each phase must be understood and achieved before moving to the next one. Each of the phases have goals, actions, and exit criteria. The four phases described into the KCS Adoption Guide (Consortium for Service Innovation, 2019b) are depicted in the figure 11:

Figure 11. KCS adoption phases

KCS is not a prescriptive standard that must be followed as is but a methodology that organisations can adopt and adapt to their needs in order to improve the way they manage the knowledge. By fully understanding KCS practises and techniques and adapting them to the organizational processes, we expect to achieve success and deliver increased value to the entire organization. However, in order to do this we must accept that the implementation of successful knowledge service support requires a wider cultural transformation and not just a project plan to implement a new methodology. According to KCS Academy, "KCS is not something we do in addition to solving problems. KCS is the way we solve problems".

5.1 Planning Phase

The Planning Phase is the first phase and involves the appointment of the KCS adoption team and the creation of a set of plans to help in guiding the team through the execution and next phases of the KCS adoption cycle. It also involves the definition of realistic internal and external expectations and the establishment of baseline measurements. During the planning phase, the tasks/activities shown in figure 12 are proposed to take place:

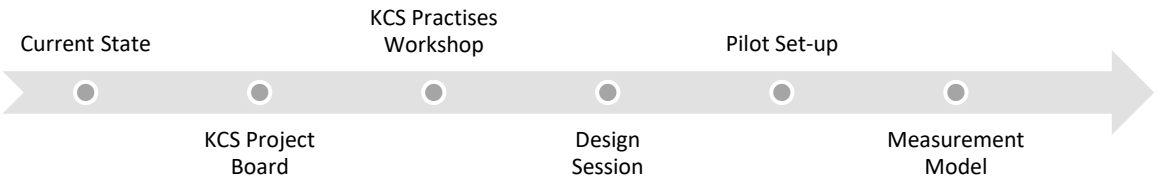

Figure 12. Planning Phase Activities

5.1.1 Current State

The current state assessment evaluates the current processes and identifies to which extent they align with KCS practices in order to find opportunities for improvements. The assessment compares the current organizational processes with the KCS practices in areas including, incident management and knowledge management.

Incident Management and Request Fulfilment

The Request Fulfilment and Incident Management are the processes for dealing with all service requests and incidents within the organisation respectively. A model, based on ITIL best practices and consisted of three levels of support, aims at providing efficient and cost effective services that would improve the overall service quality and consequently the customer satisfaction.

- The first level (**L1**) of support acts as the main interface with the customer and effectively resolves simple requests or incidents.
- The second level (**L2**) of support provides higher knowledge and support from expert groups when required.
- The third level (**L3**) of support is provided by external IT service providers that could be companies providing outsourced services to the organisation or any other third party (e.g. Oracle).

The idea behind this operational model is to offer to the customer a single point of contact for solving incidents and fulfilling service requests.

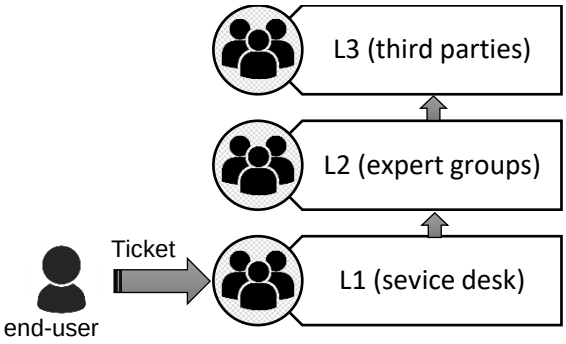

Figure 13. Service Management Levels

As shown in figure 13, the procedure typically starts with the creation of an ICT ticket in the current ticketing tool (BMC Remedy), and ends with the closure of the ticket following the resolution of the service request and the response to the user. Remedy is used to track and follow the entire process and to record all information needed to the delivery of a service request or to the identification and resolution of an incident.

When a ticket has been created and received, level 1 (L1) support verifies whether the classification chosen by the user is correct and whether all relevant information required to process the request is included in the ticket. Based on the information in the ticket, level 1 will make an initial diagnosis to discover the nature of the request or the full symptoms of the incident and determine how to correct it. If the issue cannot be solved at this level, it is escalated to the Level 2 (L2) support in which a group of experts provide functional and technical support. If L2 support cannot also solve this a functional escalation to a third level is required where an external IT service provider or a third party is triggered by the Service Manager.

Once a solution has been identified, it is applied and tested whenever this is needed. This step could be repeated several times allowing different service teams to provide their contribution to the solution. When the whole process has been completed, the person responsible for the closure of the ticket verifies that all relevant information (cause, responsibilities and final resolution) are properly stored into the ticket and the requestor receives a reply with the final resolution and the ticket is being set in ‘Resolved’ status.

Knowledge management

The purpose of the knowledge management process is to capture and share ideas, experience and information and to ensure that these are available in the right place at the right time increasing efficiency by reducing the need to rediscover knowledge. Knowledge management includes oversight of the management of knowledge, the information and data from which that knowledge derives. Knowledge management intend to provide value to

the end users and Service Desk by providing secure and easy controlled access to the knowledge that is needed to manage and deliver services.

The official Knowledge Base (KB) is placed in SharePoint online (part of Office 365), a cloud-based collaboration platform, remotely accessible, at which both the end users and the Service Desk operators can have access to find information for services and products. The structure of Knowledge Base (KB), includes libraries for manuals/user guides, FAQ, HOW-TOs, reports, lessons learned, known errors, problems, etc. The main problem is that although a structure exists, the content is poor and even worse it is not updated.

In addition to Office 365 where the main Knowledge Base is located, Atlassian Confluence is also used as another Knowledge Management tool, particularly for scientific information. Currently, it is used as content collaboration software that is leveraged from specific organisational units (with scientific scope) as a wiki. Although, Confluence gives the opportunity to scientific staff to have a central place to keep the Unit team's work easily organized and accessible, there is no further expansion and connection of this service to other units or domains, including interaction with contractors. Similarly with the Knowledge Base in Office 365 there is no any documented policy for creating and capturing information and knowledge.

In the end, additional knowledge resources can also be discovered into the Intranet as well inside the various information systems used for specific reasons (e.g document management system) creating a scattered knowledge environment within the organisation, as illustrated in the figure 14 :

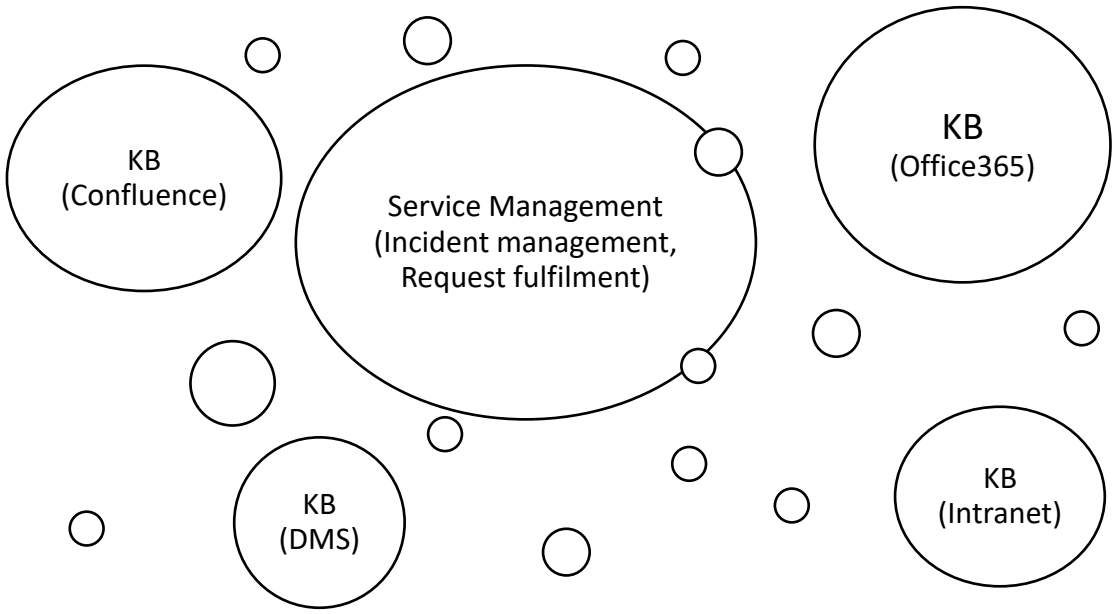

Figure 14. Knowledge resources within the organisation

As also shown in the analysis phase previously, the current Knowledge Management model suffers from the following problems:

- Information is scattered across the organisation within non-integrated tools.
- Information and knowledge is not captured, created and maintained, following approved and documented processes.
- No integration between the incident management tool (Remedy) and Knowledge management tools (Office 365, Atlassian Confluence, etc.).
- Organisation culture of knowledge sharing and learning is not developed.

5.1.2 KCS Project Board

The Project Board governs the execution of the KCS project. The main responsibilities of the Project Board include:

- taking decisions, direction and guidance on KCS project level to ensure successful implementation of the methodology,
- ensuring tracking and management of project risks, taking the decisions as required for proactive risk management,
- managing deviations and exceptions within the project scope, reallocating resources and funds, and redefining priorities,
- controlling the development and continuous improvement of the KCS adaptation in-to the organisational processes.

Project board composition may vary from organisation to organisation and project to project. A typical KCS Project Board composition, aligned with the existing roles in the case organisation, is the following:

- **Project Executive:** This role has the highest level of authority in the project context and the highest accountability in the project. It is typically a person holding a senior title. It can overrule the rest of the Project Board in decisions that are directly related to the planning and execution of the project, but he also carries the accountability for the overall success of the entire project.
- **Product Manager:** This role is responsible for a broad set of activities required to get the product to users, such as new features of future developments, change management, facilitation of the product use. The Product Manager is often in charge of planning and driving the communication with the customers, although this can be shared with the Project Manager as necessary.

- **IT Delivery Manager:** It is in charge of allocating IT / Business resources to the project and dealing with resource related issues emerging during execution of the Project that cannot be solved at Project level. It is also responsible for driving the tool functionality, performance, and integration required to support KCS.
- **Project Manager:** This role is in charge of the analysis, planning, monitoring, reporting and execution of the Project. It is also coordinating the resources allocated to the project, by assigning to them tasks and activities. It is also ensuring that that proper quality assurance and controls are applied and the security requirements are followed.
- **KCS Architect:** This person needs to have a deep understanding of KCS methodology as well as the IT Enterprise Architecture and the applications being used in the organization. It aims to ensure that the KCS practises are in compliance with Enterprise Architecture and validates that KCS integrates well with the organisation's systems.

The project board is chaired by the Project Executive and the members continue to be involved in their primary roles. At last, some representative knowledge workers are also involved in the KCS Project Board.

5.1.3 KCS Practices Workshop

This intensive KCS workshop provides the needed knowledge and skills to launch KCS and modifying KM processes successfully. Well trained professionals usually show greater productivity and higher quality of work. This workshop is intended for all members of the KCS Project Board, but also for other professionals planning to launch Knowledge-Centered Service or fine-tuning KCS practices. Besides, it is recommended for the Project Board members to get the KCS Practices Certification which ensures a thorough understanding of the KCS practices and techniques.

During this workshop, attendees will gain a deep understanding of:

- KCS principles and core concepts.
- KCS content standards and problem-solving workflow.
- Solve Loop practises and Evolve Loop practises.
- Techniques for creating high quality knowledge.
- Performance assessment and KCS measures.
- Leadership strategies and change management.
- Project plan for successful KCS adoption.
- Best KM practices and applied examples.

5.1.4 Design Session

Design session is an early phase of the KCS project where a project's key features, structure, criteria for success, and major deliverables are planned out. The point is to develop a variety of different documents which can be used to achieve the desired project goals. The main deliverables of the Design Session are:

- **Strategic Framework:** Alignment of the KCS benefits with the organisational goals and objectives.
- **Content Standard:** As the name implies, it defines the standards that ensure consistent knowledge article content.
- **Workflow:** Solve Loop process, which includes reusing, linking, and integrating the creation and improvement of knowledge into the problem solving process.
- **Technology Specifications:** list of features and integration requirements needed for the tools to support the KCS practices.
- **Communications Plan:** Policy-driven approach to define who should be given specific information, when that information should be delivered and what communication channels will be used to deliver the information.
- **Adoption Plan and Road Map:** A planning overview for implementing KCS and a high-level road map of the important parts of the KCS project (tasks, milestones) all grouped in a single visual representation, like a timeline.

At the end of the Design Phase, an initial solution will have been defined, which means that the outputs are in a draft state but sufficient to support the pilot. This is then passed to the next phases, where the initial solution is turned into a final solution. However, the people working in implementing the solution will continuously improve these deliverables based on the experience that will be gained.

Strategic Framework

The strategic framework is a powerful, although simple document that links the benefits of KCS methodology to the organisational goal. KCS promotes the need to identify the objectives and provide context for the key stakeholders such as the leaders, support employees, and the customers that intends to support. For each target objective, the adoption team must define an approach on how to satisfy that objective, the current baseline and metrics for measuring the progress and the contribution that the KCS methodology will have on satisfying the objective. The strategic framework is the basis for a successful KCS adoption because it interconnects the three key stakeholders, the users, the knowledge workers and the managers.

The strategic framework document can also be easily used as the foundation for the communication plan as well as a tool for gaining leaders' support. An indicative example of a proposed strategic framework exists into the KCS Practises Guide (Consortium for Service Innovation, 2019c), which fits perfectly to the needs of the case organisation and therefore can be used as a template for creating its specific framework.

Content Standard

It defines the knowledge article standards to ensure that there's a level of consistency for the knowledge workers. The purpose of the content standard is to provide a unified way for everyone in the organisation, to capture the appropriate information in a standardized format. The main elements that the content standard must contain are the following:

- **Article Structure:** a consistent structure is a fundamental element of KCS which contributes to both findability and readability of articles. It includes the main common fields such as, title, description, product, resolution, and cause.
- **Article Confidence:** the level of certainty that exists in the article's content, such as "WIP", "VALIDATED", "NOT VALIDATED" and "ARCHIVED". It is also called Article Lifecycle State and explained later in the adopting phase.
- **Article Audience:** who inside the organisation is allowed to see which KCS articles.
- **Article Governance:** an article attribute in order to control sensitive, critical, or regulated information.
- **Metadata:** a collection of attributes that describe a variety of things about the article (author, last modified date).
- **Templates:** a list of available templates (in case that we use more than one) and criteria for using them. A list of proposed article templates, for the case organisation can be found at Appendix 1.
- **Multi-language Guidance:** guidelines for supporting users in multiple languages.

Workflow

UFFA stands for "*Use it, Flag it or Fix it, Add it*" and is the core workflow behind the KCS methodology, where knowledge management is based on collaboration and a shared ownership of the knowledge base. Some of the core goals of KCS methodology is for the service desk to search the knowledge base early and often and also for every inquiry to be an article in the knowledge base.

According to the proposed workflow, for every issue, the first thing that the service desk must do is to search the knowledge base to examine if there is a resolution that addresses

the issue. If they do not find such an article, they can proceed to "*add it*" action, which means to create a new one (needs review from an authorized knowledge analyst before being added to the KB). If they find a relative resolution, they can "*use it*" which drives to a high-quality support at a lower cost. But, in case that the article is incomplete or outdated, then according to the authority or confidence they have to make modifications, they can proceed to "*fix it*" by themselves or they have to "*flag it*" for authorized knowledge analyst. The visual representation of that workflow is depicted in the flow chart shown in figure 15:

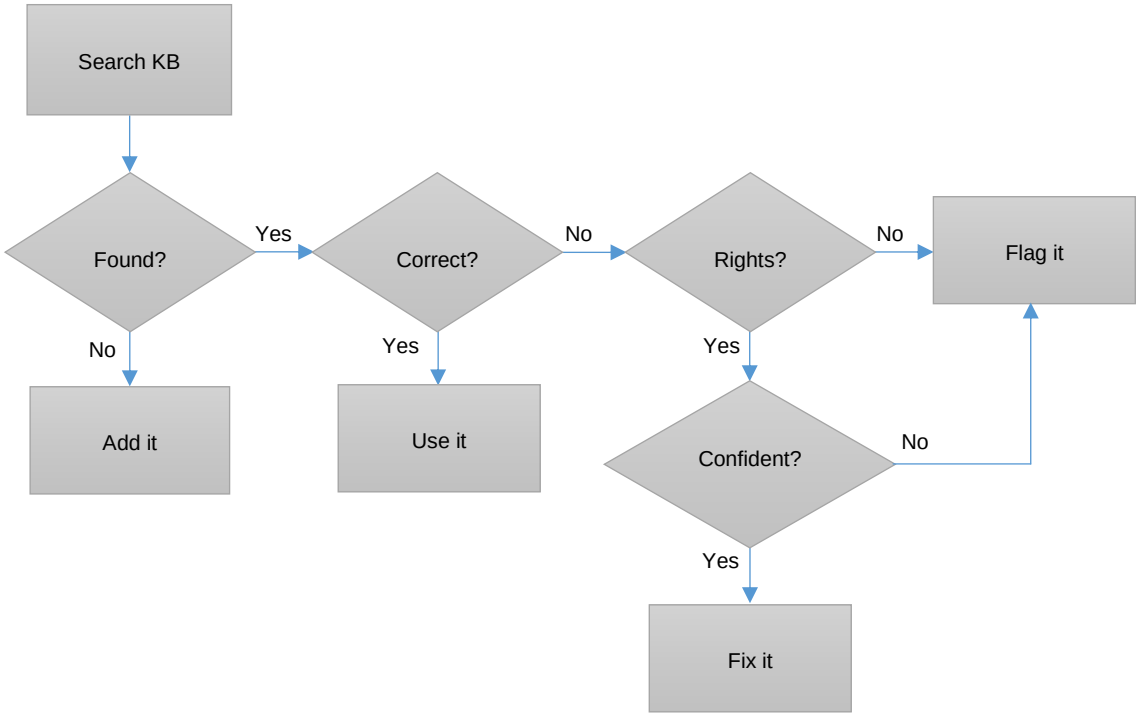

Figure 15. KCS Workflow

The designed workflow must consider the incident management and knowledge management systems being used as well as the nature of the applications and the customers being supported. The two main factors in designing the workflow are complexity and volume, but every organization may have variations. Environments with high complexity but low volume have typically longer resolution times but the use of the Knowledge Base is frequent while in low complexity and high-volume environment the average resolution times are shorter but the level of rework is very high, which means that the service desk resolves the same issue more than once. This happens because often new issues are being resolved but the knowledge workers don't get notified for the new information about the issues' resolution.

An improvement on that is to embed the structured problem solving into the above workflow. The structured problem solving is an interactive process on how to solve an issue and includes all four practices of the Solve Loop, Capture, Structure, Reuse and Improve.

It helps the knowledge worker to collect, organize, and analyze the information used in order to resolve the issue. It relies on collective experience, context, and collaborative culture.

In the first phase, the Literal, the knowledge worker tries to understand first the situation from the customer's perspective. The next step is to search the knowledge base in order to understand what is known in terms of this issue. Searching the knowledge base must become an integral part of the workflow of all knowledge workers. If a KCS article resolving this issue is found into the knowledge base, then the process has been completed, otherwise the search must be modified and repeated again by collecting additional information from the user. By searching repeatedly may result in finding articles that describe similar issues, but If a relative article is not found after many searches, the next phase, the Diagnosis, which is an analysis process must start. During this phase, any collective experience is being exploited and any relevant tools are being used. By asking clarifying questions frequently, a broader understanding of the issue is achieved. As shown in figure 16, the knowledge workers continue checking the knowledge base to see if they can find any similar article to the issue and if they cannot resolve the problem, then the issue is transferred to the next phase, the Research, for more investigation.

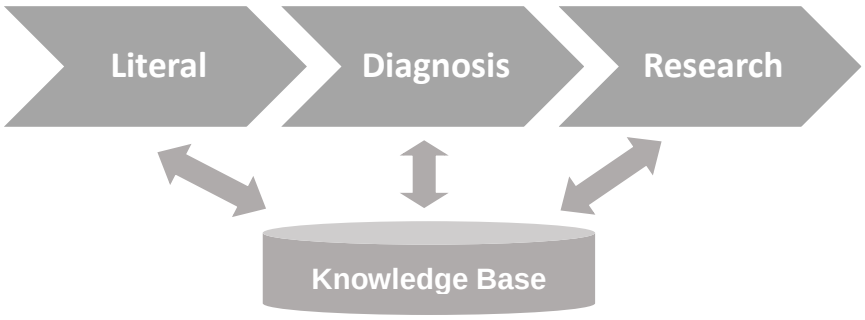

Figure 16. Structured Problem Solving (adapted from Consortium Service Innovation)

Problem solving is a collaborative approach. What actually happens during the process is that the best resources within the organisation are brought together to contribute in resolving the issue with their knowledge and experience. This is a new way to align resources and to enable collaboration, called Intelligent Swarming. According to this, the tiers of support (Level 1, 2 or 3 of escalation) do not exist but the request is allocated to the first person most likely able to resolve it and that person owns the request until it is resolved. With that way, the entire support team collaborates together in resolving issues, transferring better the tacit knowledge between its members.

Technology Specifications

Technology is a critical enabler for KCS because it enables collaborative problem-solving and knowledge sharing regardless of location and time. Support tools enable the problem solving process to become more proficient, resolve issues faster and minimize rework. To achieve these goals, the systems being used, such as the knowledge management and the incident management system must be integrated in order to enable a unified workflow among the incident creation and the Knowledge Base. For example, at least the following capabilities must be included into the integrated systems:

- search the Knowledge Base taking information from the incident record,
- create a KCS article in the KB using information from the incident record,
- link an existing knowledge article or multiple articles into an incident record,
- view KCS articles that have been linked to an incident and vice versa and,
- modify existing knowledge articles when they are being reviewed, based on the KCS license model.

The optimal environments must have a direct integration between the incident management and knowledge management systems so that the end users do not have to move between applications. Most of the KCS adoptions, like our case, do not have this kind of tight integration between the two systems. However, it would be possible to adapt the user interface of our incident management system, in order to align with the requirements described above. Below, it's a screenshot, when creating a new incident ticket in our incident management system (BMC Remedy):

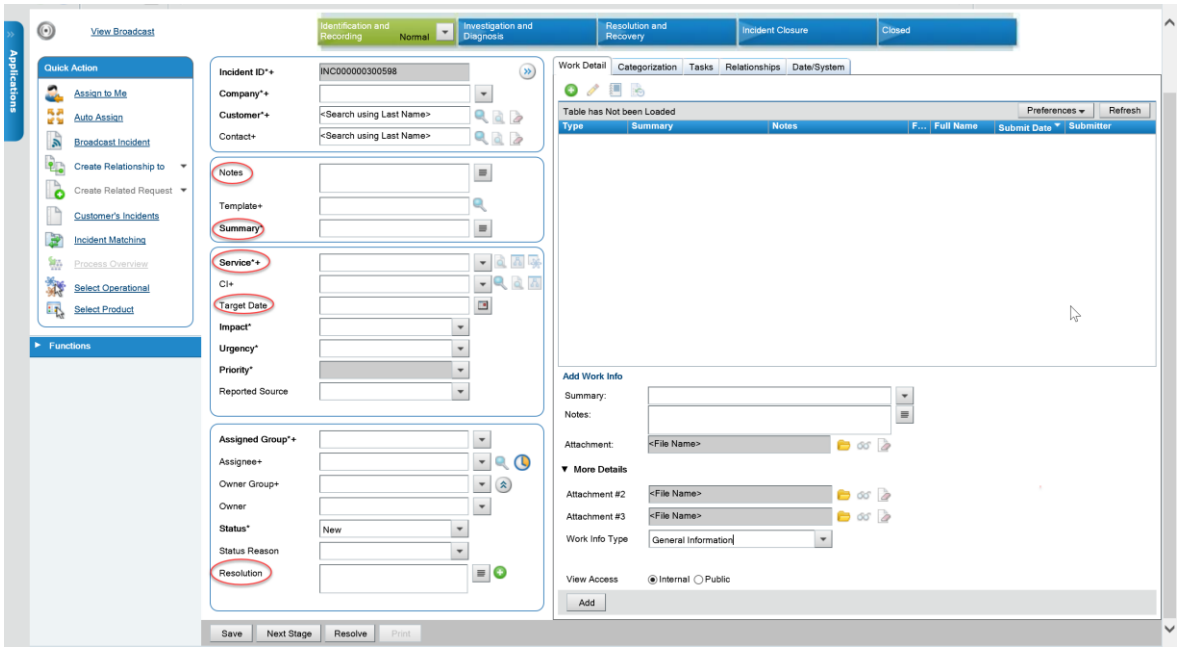

Figure 17. BMC Remedy Screenshot

As shown in the figure 17, there is already some information in the incident record (circled with red) that can be transferred when creating a new knowledge article. Particularly, the "*Summary*" field corresponds to the "*Title*" in the knowledge article templates, the field "*Notes*" to the field "*Description*" (Issue and How To template) or the field "*Question*" (FAQ template) and the field "*Resolution*" to "*Resolution*" (Issue template) or "*Procedure*" (How To template) or "*Answer*" (FAQ template) field of the knowledge article templates. However, some information in the incident record is still missing, such as the field "*Cause*" which contains an explanation of the root cause of the issue, while the tab "*Relationships*" can be used to link an existing knowledge article or multiple articles into the incident record. Additionally, two buttons must be added, one for searching the Knowledge Base and the other one for creating a KCS article in the Knowledge Base taking information from the incident record.

Even if we have the best tools and user interfaces, it won't be beneficial if we don't understand why and how to use them. No any organization that has adopted KCS has had the ideal user interface. This level of integration should not be considered as a prerequisite to get started because many organisations have succeeded with little or no integration between their incident management and knowledge management systems. However sustainability of the KCS practices requires that users must seek for improvement opportunities in terms of the integration. The KCS coaches and the knowledge domain experts must provide guidance in terms of the user interface in order to promote continuous improvement in the functionality of the technology.

Communications Plan

A communications plan is the road map for getting the message delivered to the appropriate audience. It's a basic tool for sharing information to gain support for the KCS initiative. An effective communication plan should focus on the aspects shown in the figure 18:

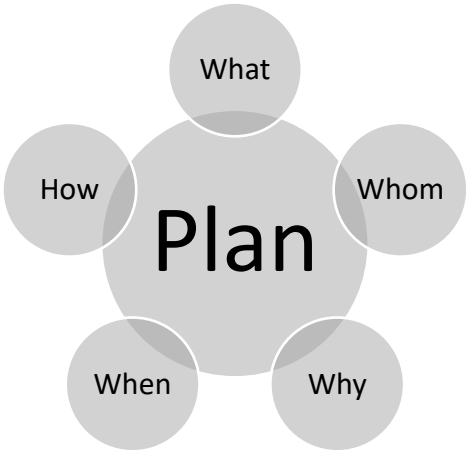

Figure 18. Communication Plan Focus

A common communications plan includes at least the following:

- **KCS elevator pitch:** a short presentation of the KCS goals and benefits.
- **Key messages:** the main KCS concepts and objectives to different audiences.
- **Target Audiences:** to whom in the organisation the messages have to be delivered
- **Media Channels:** which media channels would be the most effective to get the message delivered to the target audiences.
- **FAQ:** the answers to frequently asked questions.
- **Project Plan:** a timeline with the main phases and milestones.

The communication method depends on the message nature and the audience to be reached. In the case organisation the following methods can be used:

- IT pages on intranet.
- News feed on intranet.
- Announcement in the login or front page of an application.
- Email broadcast to wide audience.
- Targeted email distribution.
- Instant message or desktop notification balloon.
- SMS.

For the formulation of the messages, templates could be used for regularly repeating situations.

Adoption Plan and Road Map

This is the last task in the design session that helps the council to decide who should participate in the first pilot phase. The goal is to choose a group of 20-40 participants (knowledge workers), preferably from the same domain (business unit) who will test the content standard and workflow based on the experience that they have.

Some criteria for selecting the knowledge workers in first pilot phase are:

- to work in the same knowledge domain,
- to represent all levels of the incident resolution and request fulfilment process,
- to belong to different business units,
- to be open to new and different ideas.

For large organizations, the Consortium for Service Innovation recommends the Adoption Planning Matrix which is a very helpful tool on domains and pilot phases.

In terms of the Road Map, figure 19 contains a proposed timeline of the four phases of KCS adoption including the individual tasks and activities.

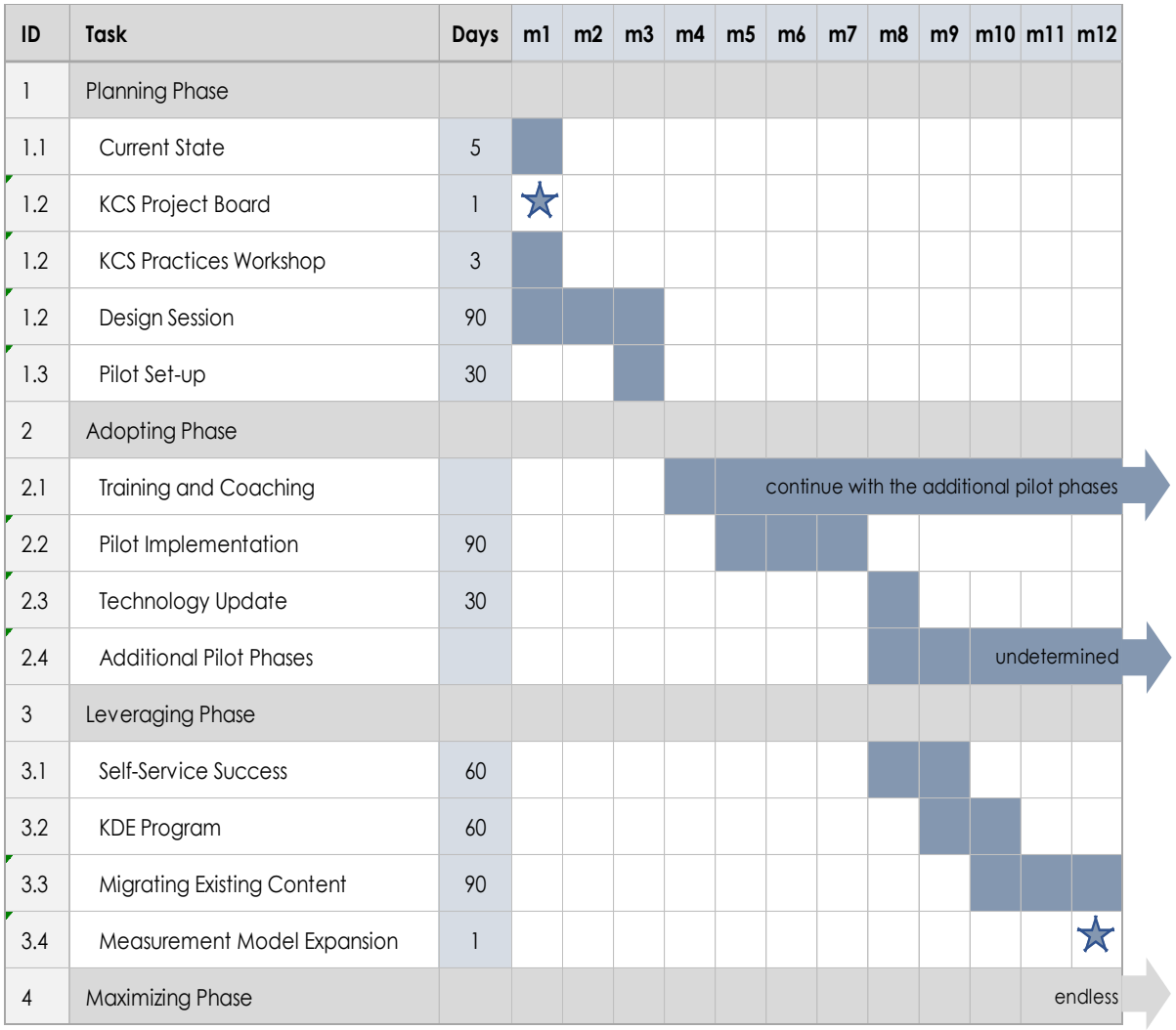

Figure 19. Project Time Plan

5.1.5 Pilot Set-up

Setting up the pilot phase is the last activity of the planning phase where the main tasks are the pilot definition, the pilot team roles, the coaching and the establishment of baseline measures.

Piloting KCS methodology take place in phases which depend on the size of the organization. The first phase is critical because if it is successful, it will attract other employees to get involved into the process. During the first phase the workflow and content standard defined previously will be tested and also the technology requirements and systems integration will get validated.

At the Design Session, we selected as the pilot team, an initial group of 20-40 knowledge workers (including Managers and Support Analysts) preferably from the same domain. As knowledge worker, is considered anyone who does intellectual work in contrast to physical work and can play the role of responder or requestor. The KCS Council is responsible for defining the roles and responsibilities as a part of building the pilot, including updating job and role descriptions. In the KCS licensing model shown in figure 20, knowledge workers can have any of the following authority/license levels with appropriate responsibilities:

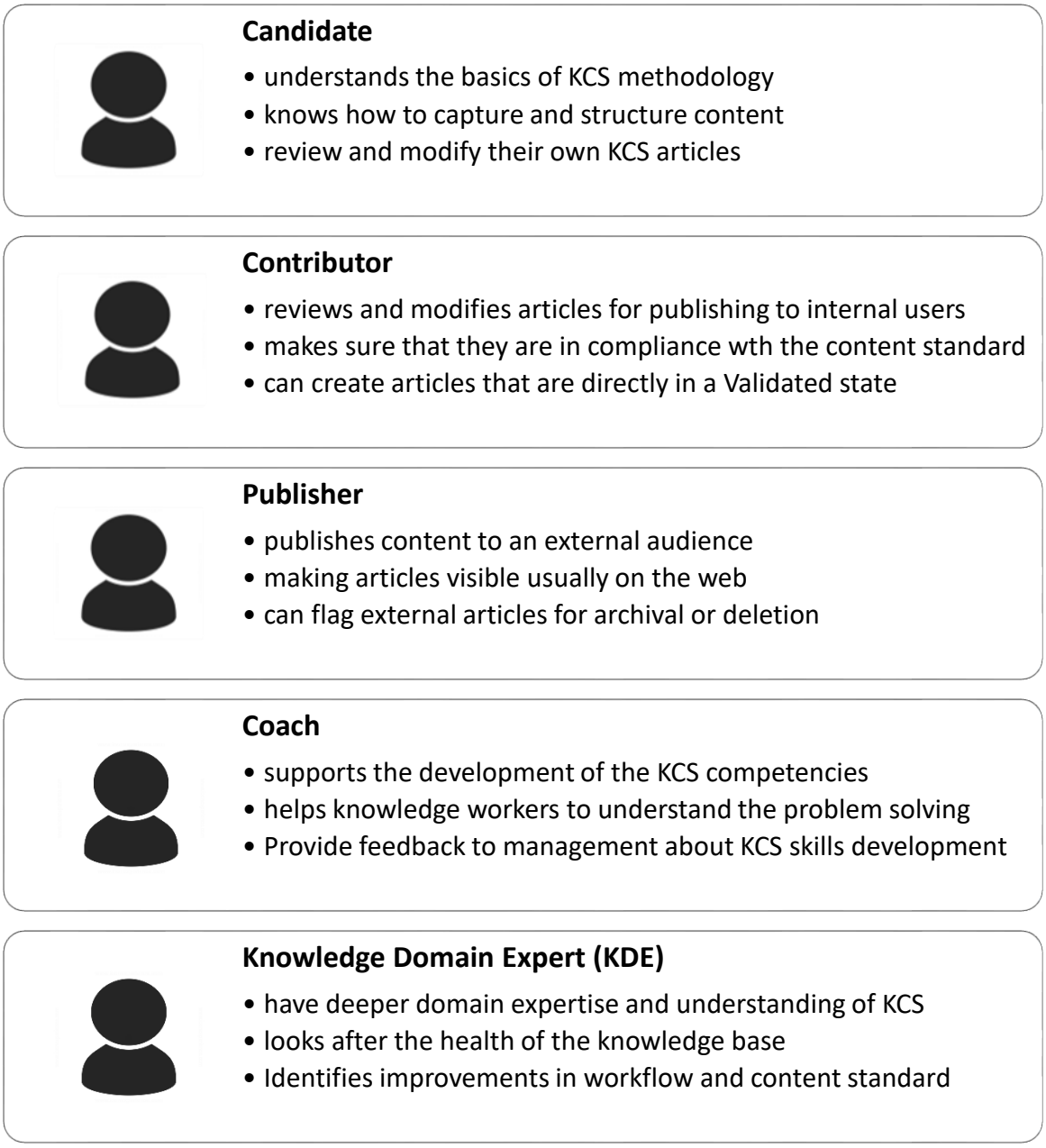

Figure 20. KCS Licensing Model

A detailed description of each role can be found in the KCS Practises Guide (Consortium for Service Innovation, 2019c).

Coaching is a critical success factor for every KCS adoption initiative. Effective coaching generates improvements in employees' performance and productivity, develops increased self-awareness, and helps maximizing the value of the KCS methodology. Coaches do not have to be subject matter experts in their domain but have an in-depth understanding of KCS. Before starting the pilot phase a training of a small group of coaches who will lead the change within the team and coach their peers in the subsequent phases of adoption, should be organised.

5.1.6 Measurement Model

Before trying to make improvements in any organizational process, it is important for the current state to be well understood. Baseline measurements is the establishment of a starting point, from which the process improvement starts being calculated. Before the pilot phase, the KCS Council should establish the baseline metrics which may be categorized into quantitative operational measures as well as qualitative cultural measures.

A balanced scorecard could be used to ensure that the right operational measures have been selected and therefore to examine if the organisation is on the right track to accomplish its goals and objectives. According to Kaplan and Norton (1992), although the traditional financial performance measures worked well in the past, they cannot measure the skills and competencies that organisations try to master today. The balanced scorecard allows an organization to be examined by four different perspectives in order to develop the appropriate baseline measures (metrics) in order to track progress:

- **Financial:** measures an organization's financial goals and the use of resources. Typical financial goals are related with profitability, growth, and shareholder value.
- **Customer:** measures organizational performance from the customer perspective as many enterprises today have a corporate mission that focuses on the customer.
- **Internal Business (processes):** measures the quality and efficiency of the organizational performance related to the product, services, or other key business processes.
- **Innovation & Learning (organizational capacity):** measures company culture and human capital, for example employees' performance, training, skills and competences. This area also includes infrastructure and technology.

According to Measurement Matters (Consortium for Service Innovation, 2019d), the list of the quantitative operational measures must be simple, reflecting the standard measurements that are most relevant to the business. A proposed list is included into the balanced scorecard, depicted in the figure 21:

Figure 21. Balanced Scorecard

The other part of the measurement model focuses on teamwork behaviours using a qualitative cultural baseline. Workplace culture is an extremely influential and motivating factor because it enables an organisation to learn from mistakes and keep their employees empowered and engaged to the organisational vision. An investment must be made in training, coaching, mentoring, and communication supporting employees to develop a knowledge sharing culture. Another investment must be made on leaders because the adoption of KCS is transformational and requires efficient leadership. Leadership responsibility is to ensure that the vision, policies and procedures are aligned and followed in order to promote understanding and buy in, while the knowledge workers are responsible for the content standard and workflow.

When applying the baseline measures we must keep in mind that the absolute numbers are not so important as the changes in trends that show the progress. The accuracy of the baseline may vary from process to process but the way it is measured is consistent throughout the adoption. We must establish measures relevant to our processes and technologies and then use them to confirm that trends are in the right direction.

5.2 Adopting Phase

The goals of this phase are to develop KCS understanding and competencies in the knowledge workers through training and coaching and attract more employees to adopt the methodology by having successful results through a pilot phase. During the Adopting phase, the tasks/activities shown in the figure 22, are proposed to take place:

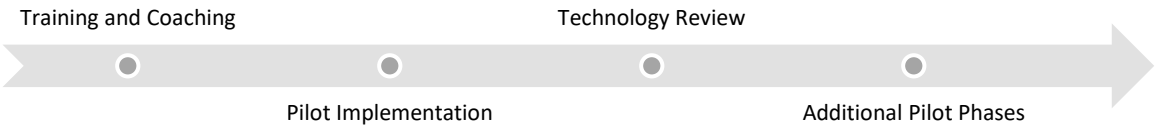

Figure 22. Adopting Phase Activities

At the end of this phase, improvements against the baseline measures, such as decrease on cost per incident, are expected due to the reuse of knowledge. Additionally this phase is expected to last more than every other phase because of the implementation of the pilot phase.

5.2.1 Training and Coaching

To prepare for the pilot phase properly, the following activities are recommended:

- KCS Knowledge Workers Training.
- KCS Leadership Workshop.
- Coaching Development Program.

KCS Knowledge Workers Training

This training is intended for the pilot team and focuses on teaching knowledge workers on KCS practices including the content standard and the workflow. Pilot team will learn how to implement the Solve loop practises, it means how to create, structure, reuse and improve knowledge.

During this training, participants will gain an understanding of:

- Solve and Evolve loops and the relation between them.
- Solve loop practices and the structured problem solving process.
- Content standard and what makes articles findable.
- UFFA (“Use it, Flag it or Fix it, Add it”).
- KCS licensing model.
- Capturing the customer’s context in the workflow.

It is recommended during the course to use real incidents in order to practice the content standard and the workflow. Employees can learn better the KCS processes as they are resolving real issues and requests.

KCS Leadership Workshop

The Leadership workshop is intended for managers in the organization who are adopting the KCS practices. This workshop gives managers a new perspective on their role helping organisation to shift from a transaction-oriented model to a knowledge- oriented model. During this workshop, manager will gain an understanding of:

- Leadership and management differences.
- Replacing linear process models with double loop processes.
- Building a culture of knowledge sharing.
- Change management techniques.
- Creating a motivational climate.
- Conflict management techniques.

Generally, this workshop provides managers the techniques and knowledge to effectively lead teams and support organisational changes successfully.

Coaching Development Program

Coaching is a critical part of a successful KCS adoption and can be beneficial for the organisation by enhancing employees' understanding of the KCS methodology and therefore increasing organisational performance. According to Jaime Roca, senior vice president of Research & Advisory in Gartner HR, "Much of today's coaching simply isn't effective, and yet we know that when managers get it right, the benefits of good coaching are clear" (Wiles, 2019).

The responsibilities of the KCS coach include:

- Acting as a change agent by promoting understanding of the benefits of KCS.
- Influence knowledge workers to practice good knowledge management.
- Promote understanding and compliance with the problem solving workflow.
- Motivate the knowledge workers to create and improve knowledge within the knowledge base according to the KCS standards.
- Develop the KCS skills and competences of knowledge workers.
- Participate in the KCS Council.

The coaching development program must be structured in three basic axis:

- Organization Coaches Selection Analysis.
- KCS Coach Workshop.
- On-going coaches support.

Choosing the right coach is a critical step to achieving success through a coaching programme. Choosing wrong coaches can be costly in time, money, and have a negative impact on individuals' productivity. KCS coaches do not have to be subject matter experts but need to have a deep understanding of the KCS practices ills. Additionally, acting as a coach does not require a university degree or any other formal qualification but good communication and interpersonal skills. Coaches' selection can be an intense process and the relationship that you develop with your coach is essential for being able to engage, progress and succeed. Having a clear strategy to refer to throughout the coaching process helps in staying on track and achieving the desired outcomes.

The KCS Coach Workshop is a three day training course with the following objectives:

- Learn coaching best practices, techniques and tools to help employees to achieve their goals.
- Acquire knowledge of the influence skills needed for effective coaching.
- Help employees in developing insights, outcomes and setting goals.
- Identify the benefits of building and fostering trust with the employees.
- Set appropriate goals with respect to KCS using the SMART technique of goal setting.

The coaches need to establish regular contacts as a coaching team and have recurring meetings (preferably b-weekly) to discuss issues and keep track of the progress of the Coaching Development Program.

5.2.2 Pilot Implementation

Piloting the KCS methodology involves rolling it out to a targeted group of employees in order to test the workflow and content standard created in the design session, gather feedback, and make improvements before deploying it to a broader audience. A pilot phase is actually a lightweight project where KCS approach can be applied within the organisation, to address specific business problems and deliver measurable results. So, let's describe how this workflow can be applied in practice, in conjunction with the License Model and the article lifecycle states.

First, we try to understand the situation from the requestor's perspective, and then we search the knowledge base to find what we collectively know about that issue. If an article

is found that resolves the issue, then we have finished unless if the existing article needs some update. If not, then a new article needs to be created. All staff in the organisation, regardless of their KCS license level are able to create “WIP” (Work in Progress) articles, where the issue description has been captured but the resolution is not yet known. Actually, “WIP” articles is a mechanism to let other knowledge workers know that the issue is under investigation and therefore promoting collaboration across the organization.

From the “WIP” state articles can move to any other state subject to confidence levels and KCS license levels. KCS Candidates can turn only their own “WIP” articles to “NOT VALIDATED” state, where the article has a resolution but it still needs a technical review related to the proposed solution and a compliance check related to the content standard, by a licensed KCS user (KCS Contributor, Publisher, Coach or KDE).

On the other hand, licensed KCS users are allowed to move any “WIP” article to “NOT VALIDATED” state, if they have low confidence in terms of the article’s resolution or directly to “VALIDATED” state if their confidence in the resolution is high and therefore the article can be considered complete and reusable. Similarly, all licensed KCS users are able to place “VALIDATED” articles back into the “NOT VALIDATED” state, when technical review rework or compliance review is required.

Finally, when it is to remove an article from the searchable Knowledge Base without physically deleting it, all KCS roles, except for KCS Candidates can put any article into the “ARCHIVED” state. Similarly, all these knowledge articles can be restored to their initial state if it is discovered that they were prematurely archived. The figure 23 shows the transitions between the article lifecycle states:

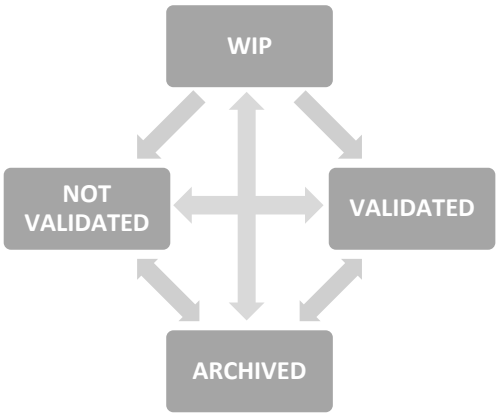

Figure 23. Article Lifecycle States

Returning back to the workflow proposed in the design phase, in case that an article is incomplete related to the resolution or the content standard, then according to the licence level and confidence they can proceed to “fix it” (“VALIDATED”) by themselves or “flag it” (“NOT VALIDATED”) for being reviewed by an authorized knowledge worker.

5.2.3 Technology Review

After the first pilot phase has been completed, the KCS project board in cooperation with the knowledge workers involved in the phase, must conduct an evaluation of the knowledge management system, and the integration with other systems, such as the incident management. Functional specifications must be reviewed and possibly revised if needed to support more efficient the workflow and the content standard. Any possible improvements must be applied before deploying the additional KCS phases.

There are four areas that must be taken into considerations when assessing the technology part of the KMS, functionality, user interface, integration and speed. Functionality refers to the functional specifications needed to support all KCS practices successfully, while the speed means that a system that operates at a realistic speed is required. The user interface must be based on the workflow and content standard and be designed so that most of the tasks to be done using a single screen. Finally, a critical enabler to support the workflow is the integration of main systems, such as the knowledge management incident management and collaboration tools.

5.2.4 Additional Pilot Phases

As a rule of thumb, the first pilot phase has been completed when the Knowledge Base is being used for approximately 75% of the requests, which means that most of the knowledge that the organization has on that domain has been captured into the KB. The optimal goal is to have the knowledge workers in doing their work without intense coaching, after the first phase. Additionally, reuse of existing articles is equal to or greater than the creation of new articles which means reduction of rework.

Once first phase has been finalised, and the workflow with the content standard may have been updated according to the collected feedback, additional pilot phases can be deployed. Preferably, the team members in the additional pilot phases must belong to different domains (business units), increasing the spread of the KCS method within the Organisation. However, the preparation for the new pilot phase must follow the same guidelines and elements described in the design. One major difference for the next phase, is that more coaches will be available and even better with a broader experience in terms of KCS methodology.

At the end of Adopting phase, it is expected that the cost per incident will decrease because of the knowledge reuse, while service quality and employee satisfaction will increase in as a result of having others to use their knowledge, creating thus a momentum for the KCS methodology in the entire organisation.

5.3 Leveraging Phase

The transition from Adopting to Leveraging phase takes place when the Knowledge Base has reached critical mass which means that enough content has been captured into the knowledge base and the possibility to find something useful through self-service functionality is more than 50%. Enabling self-service requires that enough knowledge exists into the knowledge base in order to achieve customer success without an interaction with others. A positive experience driven by self-service, means that the customers not only will come back, but they will use it more often than they requested assistance from the service desk in the past. As a general rule of thumb, if customers find approximately half of the information useful, they are likely to use self-service again.

During the Leveraging phase, the tasks/activities (figure 24) are proposed to take place:

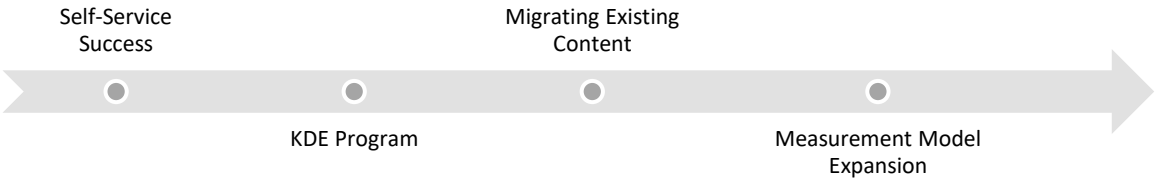

Figure 24. Leveraging Phase Activities

This phase focus on optimizing resource utilization, reducing support cost, increasing customer and employee satisfaction and improving products and services. The main indicator for this phase is that the number of articles being reused is greater than the number of articles being created.

5.3.1 Self-Service Success

The main goal of a self-service system is to provide access to knowledge with the minimum effort. A good self-service solution will reduce support costs, decrease incoming calls to the service desk, and improve employee satisfaction. Historically, the most common form of self-service was a web site with frequently asked questions (FAQ) and a search engine, designed to return relevant content from the site, on the basis of a query. A self-service knowledge base is a centralized, searchable collection of information that help users to solve problems without contacting the service desk. However, designing a self-service system is not a trivial process but requires careful thought and planning in order to develop a strategy for self-service. This strategy must at least include a vision statement, the main goals, the intended audience and the measures for assessment. Self-service improves the customer experience of service and support.

When designing such a system five factors are the main enablers for a successful self-service model:

- **Findability:** This enabler is based on the context, structure, and environment statement. All content must be created within the context of the customers, which in our case are the business units within the organisation, so that to be more likely to find it. KCS proposes a simple structure for knowledge articles which helps the search engines be more effective and efficient. The environment field in an article helps the knowledge worker to verify that this is the correct article for the issue.
- **Completeness:** This enabler of self-service success is based on volume and speed. The goal is to get most of what we know into the self-service model as fast as we can. According to 90/90 rule, 90% of what we know must be available for self-service within 90 minutes. Knowledge is time sensitive, and users expect to find answers when using self-service. A good self-service solution can solve up to ten times the number of simple cases.
- **Access:** It is important to make the self-service functionality easily available to the users. Ideally access to self-service must be integrated into the user interface although this requires a remarkable investment. The easier the users can get access to the self-service solution, the better it will be for them to get involved. Examples of good integrations include integrated search engines, integrated FAQs, and article solutions when customers log their issues.
- **Navigation:** Surveys has shown that "dead ends" is the most important factor when users decide if they would use self-service again. By "dead-ends", we mean that the users do not have to stop and start over again if they don't find what they are looking for. If the user wants to move from the self-service solution to first line support, the link should be just one click away. A good self-service system should incorporate the ability to search for answers, and an easy way for browsing all the available knowledge articles. In particular, it must include at least a basic and advanced search functionality, a table of contents and a list of frequently asked questions or "top ten" articles.
- **Marketing:** Trying to change the behaviour of the users is not trivial, but having a solid marketing plan in place will help with this change. It is strongly recommended to engage those who understand communications and get advice from a marketing specialist in order to build a marketing plan. In addition to a marketing plan, some tips and proven useful practices include creating a pre-set message for incoming calls informing users that they can use the self-service functionality or turning off the phone support and thus allowing self-service to be the only way.

A good self-service knowledge base can reduce service desk costs significantly. It can save service desk from answering repetitive questions and allow the team to focus on more complex practices, such as problem management.

5.3.2 KDE Program

A Knowledge Domain Expert (KDE) must have both subject expertise and a deep understanding of KCS. A KDE is not a full-time role but continue to have other responsibilities as a subject matter expert. The KDE is responsible for the health of a knowledge domain from a content point of view. Knowledge Domain Analysis is a critical function that focuses mainly on the quality and use of the articles. The following factors contribute to the quality of an article:

1. The Licensing Model that defines the roles and responsibilities for the knowledge workers and it has already been described in the pilot set-up (section 5.1.5).
2. The Content Standard that provides a unified way to capture the appropriate knowledge in a standardized format and it was covered previously in the design session (section 5.1.4).
3. The Balanced Scorecard that examines if the organisation is on the right track to accomplish its goals and objectives and it was analysed in the Measurement Model (section 5.1.6).
4. Article quality index (AQI) that reflects the quality of the knowledge articles stored in the Knowledge Base.

The AQI ensures consistent quality of knowledge articles stored into a Knowledge Base where articles are written by various knowledge workers. Using the AQI, a knowledge worker creates a checklist and adds a set of questions to the checklist to assess the quality of the knowledge article. For each question a weight is assigned, based on its importance in relation to the quality measurement. Then, an AQI review is performed by a Coach or a Knowledge Domain Expert by answering the questions in the checklist and the article quality is then scored based on the cumulative weight of all answers.

The metrics listed below although they have proven to be suitable for most of the cases, may vary from one organization to another:

- Duplicate: does an identical or similar article exist in the knowledge base that created before?
- Complete: are the description, cause and resolution and the other fields filled with suitable information?
- Content: do the statements captured in the knowledge article reflect complete thoughts and not complete sentences?
- Title: does the title clearly reflect the article content?

- Hyperlinks: are the hyperlinks included into the article valid?
- Metadata: is the article accompanied by the required metadata, such as type, status, keywords, etc.?

The AQI is a score based on knowledge reviews over the time and it can be used as an indicator for the quality of the Knowledge Base. As the organisation matures different metrics can be used, like versioning, global distribution, use of multimedia, as well as different weightings for each metric.

The Knowledge Domain Experts are also responsible to improve the KCS workflow and the content standard. For each knowledge domain, one or more Knowledge Domain Experts (KDE) are accountable for doing the Knowledge Domain Analysis. Knowledge domains are collections of content related to a common subject or topic.

The Knowledge Domain Analysis (KDA) focus on following aspects:

- improving the content standard and KCS workflow,
- eliminating duplicate articles,
- optimizing findability and search performance,
- increasing self-service use,
- eliminating re-work and improving success rates,
- improving the problem solving process.

A result of the Knowledge Domain Analysis is the creation of Evolve Loop articles which contain high-value content, based on the patterns of use and the grouping of KCS articles in a common topic. To remind here, that Solve Loop articles are created just-in-time while the knowledge workers work on incidents and issues. Some examples of Evolve Loop articles include procedural or step-by-step articles which define how to do a specific procedure. Another example is articles to fill gaps in Knowledge Base, in other words articles that users are looking for but they cannot find them. However, Evolve Loop articles represent a very small percentage of the total space of the Knowledge Base.

The New vs. Known analysis is an example of Knowledge Domain Analysis. It is a sampling technique that is recommended to be done periodically over a year. The main objective of this analysis is to reduce the resources spent on known issues and improve the resolution of new issues. The ratio of new versus known issues is an indicator of the health of the Knowledge Base and the effectiveness of the self-service model. The best way to apply this kind of analysis is to organise a pilot including two to three different knowledge domains.

There are four steps in this analysis which are described below:

Step 1 - Scope Definition: Identifies which product or service areas the analysis has to focus on.

Step 2 - Data Collection: This step involves gathering incidents closed over a specified period of time (usually up to two months) and building a report with all those incidents. An important element is that enough metadata must be captured in the incident records in order to perform an effective analysis. This report may include incidents with and without articles linked and particularly must contain fields like incident ID and title, incident summary, article ID and title, article resolution, etc.

Step 3 - Incident Analysis : The Subject matter experts (SMEs) from each product and service area access both the incident management system and the knowledge base in order to analyse a sample of both incident and knowledge data. During this analysis they review incidents and articles in their product/service area and categorize them according to some predefined criteria (sample spreadsheet). A random sampling of closed incidents usually up to 20% is sufficient in order to reveal useful patterns and trends.

Step 4 - Identify and Discuss Opportunities: The last step involves calculating the percentage of new vs known issues, and by analysing incidents in each category they:

- create a baseline of the percentage of new vs known issues based on which they can measure the impact of future improvements,
- identify the characteristics of known issues and assess why they are not solved through self-service functionality,
- identify the characteristics of new issues and find opportunities to improve the speed and accuracy of the problem-solving process.

The new vs known analysis is a kind of the continuous improvement process that can help in assessing the health and effectiveness of the organization's knowledge practices. The analysis can be conducted at the individual level as well as at the team level. Additionally, It shows if the organization is mature enough related to its process adoption. At the individual level, it can quickly be visible which employees follow the process and which need coaching. When every member of the team follow the process, then the unknown issues (when the issue is resolved and the ticket is closed without linking to a knowledge article) will be decreased, tickets with known issues will be resolved with consistency and efficiency, and tickets related to new issues will result in the creation of new knowledge.

A useful ”How To” for conducting the New vs. Known methodology as well as a sample spreadsheet used for this study, can be found at the KCS Academy support site (Consortium for Service Innovation, 2020b).

5.3.3 Migrating Existing Content

As we have seen at section 5.1.1 “Current State” the information is scattered across the organisation within different non-integrated systems. Apart from Office 365 where the main Knowledge Base is located, Atlassian Confluence is also used as another Knowledge Management tool, particularly for scientific information. In addition to those systems, much information also exists into an internal document management system as well as on the Intranet. So there are two options to deal with that information, either migrate massively the existing content into the central KB, or keep it in separate repositories and migrate only when there is an interest for the specific content.

Taking into account that the existing content is not complied with the KCS structure, it is strongly recommended not to mass migrate content from other repositories into the new KB because it will mess up the content homogeneity and worsen findability. A better strategy to deal with this kind of content is to create a new process in order to migrate only the content that has some value. In particular, the existing content will be kept into the other repositories but it will be available to employees via a search functionality. When knowledge workers find useful content, they will create a new article using this content but following the KCS structure and so the migration effort is only spent on the content that has value. The proposed workflow is depicted in the flow chart of the figure 25:

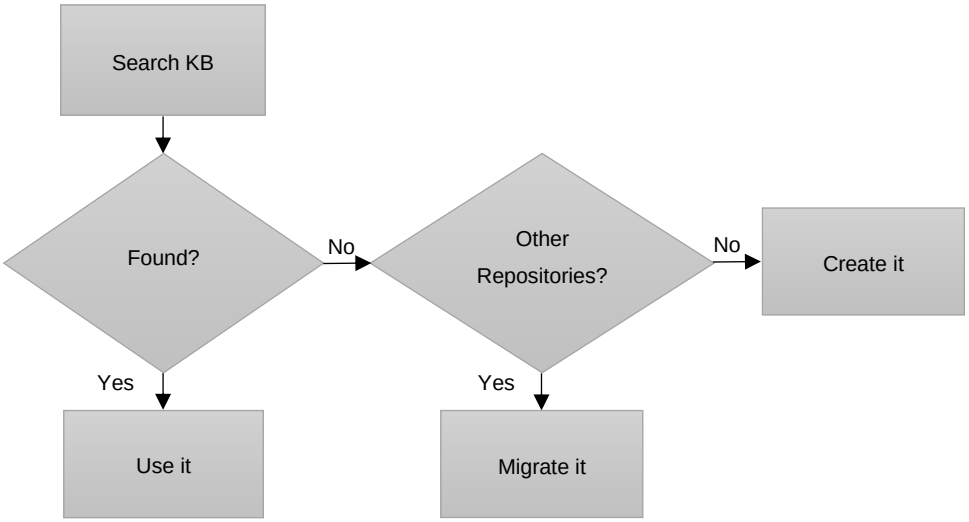

Figure 25. Migrating Existing Content

With that way, after a time period no one will be searching the content from the other repositories because all the useful content will have been migrated into the central KB. Additionally, the organisation can save lots of money in the future, by decommissioning the other systems, when those systems will not contain useful information anymore.

5.3.4 Measurement Model Expansion

During the Leveraging phase, we extend access to the Knowledge Base beyond the service desk, leveraging the knowledge into new domains and improving self-service functionality for end users. The proposed self-service model changes the nature of the support work. The old metrics, used in previous phases, such as average resolution time, cost per incident, and first call resolution rate are all in a wrong direction. This happens because now, users resolve simple issues through self-service functionality and only new and complex issues are reported through the incident management process. Most probably, these new and complex incidents require much more time and multiple resources and therefore they increase the time spent to resolve the issue (average resolution time) and the support cost (cost per incident) but the total number of issues reported, have been decreased significantly.

By leveraging the Knowledge Base through self-service, we must now introduce new metrics into our measurement model, such as customer use and success through self-service. So, we need now an updated group of measures that is not only limited to support but is expanded to cross-functional aspects. According to Measurement Matters (Consortium for Service Innovation, 2019d), the following metrics could be included into the measurement model:

- **Call deflection:** the number of resolved issues through self-service for which a respective incident would have been reported otherwise.
- **Time to publish:** the time it takes for new issues to be available through self-service.
- **Self-service use:** percentage of users who use self-service before reporting an incident.
- **Self-service success:** percentage of time it takes for users to find what they look for through self-service.

In addition to measures related to self-service success, metrics that measure the organisational value such as customer satisfaction and employee loyalty must also be included into the measurement model. In terms of the operational metrics, the percentage ratio of known to new incidents shifts from 70/30 to 30/70 which means that most of the support work in the organization spent in new issues. Solving new issues is undoubtedly a collaborative process and therefore the traditional escalation model, with different levels (L1, L2, L3), doesn't work properly. Support work is transformed from a transaction-based model to a leveraged self-service model which results in a decrease of the total support costs and an increase of the organisational performance. In general, a clear understanding and interpretation of measurements is a key factor in order to achieve a successful adoption of the KCS methodology.

5.4 Maximizing Phase

The last phase, Maximizing, is an endless phase that starts when the self-service success is at least 85%-90% which refers to the probability for the users to find what they need without interactions with others. Creating and maintaining a healthy Knowledge Base derived mainly from interactions with the users is a key indicator for the successful adoption of KCS methodology. The Plan-Do-Check-Act cycle (PDCA or Deming cycle) is a four-step model for carrying out change. Just as a circle has no end, the PDCA cycle should be repeated again and again for continuous improvement.

The Maximizing phase is a continuous improvement process focussing on identifying opportunities for business improvements (processes, policies, products, and services) and particularly on the following areas:

- resource use optimization,
- systems and tools improvements,
- support cost reduction,
- user self-service success increase,
- customer satisfaction increase.

Another focus during this phase is the reporting and feedback mechanisms in order to provide visibility to knowledge workers of their contribution and impact. The contribution of knowledge workers focus on modifications to existing articles, adherence to the content standard, internal reuse and accurate linking. In this phase, enough KCS Publishers must be available in order to do just-in-time publish for articles with high confidentiality. With a just-in-time publish model, a fast mechanism for feedback must be in place in order to enable corrective actions quickly. It is also critical the role of leadership in order to create the environment that enables the desired visibility to knowledge workers.

Once the KCS methodology has been implemented in an organization, the value to be created must not be measured only by the number of transactions but also in terms of the efficiency of the knowledge workflow and internal collaboration that extends to all business units of the organisation.

The KCS methodology is a continuous improvement model for services and processes, based on the Plan-Do-Check-Act cycle (PDCA or Deming cycle). It consists of similar stages and particularly, design the service or process (Plan), test the potential solution, ideally on a small scale (Do), measure the results and compare with objectives (Check), and implement the proposed solution (Act). So, like the Deming cycle, the KCS has no end, which means that it may be repeated continuously.

5.5 Risks

Knowledge workers are not involved in the design of the workflow and content standard: Frequently, organisational changes are designed by a small group of managers and then passed down through the organisation to be translated and implemented. But just telling employees what to follow, produces compliance at best, but not commitment at all. When employees are involved in planning the change, and particularly knowledge workers to be the owners for the workflow and content standard, they are already brought into it, making implementation both easier and smoother. Direct participation, involving all staff, can play a fundamental role to ensure change acceptance and create the conditions for employees to make effective contributions to their organization.

Lack of management ownership: All successful change initiatives should start at the top with a committed and well-aligned group of managers strongly supported by the executive. The managers themselves must adopt the KCS approach first, both to challenge and to motivate the rest of the organisation. If they do not set clear objectives and expectations, the employees will not know exactly what they have to do and the change approach will fail. Additionally, the ownership of the KCS change must be on the managers and particularly as the KCS adoption is in progress (after the first phase) there must be a responsibility shift from the KCS Council to front-line managers.

Ineffective coaching program: Coaching is one of the most effective ways for organisations to get everyone on board and aligned when planning change initiatives. Failing to integrate coaching at every phase of the KCS adoption, including planning, implementing and improving, can damage employee readiness and resilience. One-on-one, team and work group coaching are all effective methods of improving employees' skills and the right coaches need to have a strong belief in KCS and good interpersonal skills. Undoubtedly, a strong coaching culture is correlated with most of the indicators of a high-performing organizations.

Organisational Culture: Culture of sharing is critical factor to the success of KCS adoption. Organisations often make the mistake of assessing the cultural impact on the change either too late or not at all. Thorough cultural awareness can assess readiness to change, bring major problems to the surface, identify conflicts, and reveal factors that can result in resistance. The degree of a change required in many organizations may involve a cultural transformation. If the knowledge sharing cannot become a daily habit for the employees, and remains something that they occasionally do, then the implementation of the KCS project will fail. Consequently, a knowledge sharing culture across all the organizational units must be developed, in order for the KCS to be adopted successful.

5.6 Lessons Learned

The lessons learned after the KCS study, may vary from organisation to organisation but the following areas must be taken into consideration regardless the case organisation:

Leadership: For many organizations, adopting KCS is a significant change in organizational culture and therefore requires strong leadership. Leaders are mainly responsible to create the environment where employees have the will to change their behaviours. Understanding the difference between telling employees just what to do and leading by example, is fundamental. So, during this transition, sponsorship program resources and leadership training and coaching are required in order to help leaders to develop the skills and competences needed for the successful adoption of the KCS methodology.

Technology: Technology support is critical for adopting KCS as it would be impossible to implement the methodology of KCS using paper and pencil. The infrastructure supports the fundamental elements of KCS methodology, the workflow and the content standard. So, the implementation of new systems as well as the modification and the integration of existing ones, like incident and knowledge management systems, are critical factors for the successful implementation of KCS.

Learning and Coaching: Integrating learning and coaching activities at every phase of the KCS initiative, can enhance employee readiness and resilience. It is important for knowledge workers to receive training, structured and informal, to get the skills and knowledge required to operate efficiently, to develop new roles (Coaches, KDEs, etc.) and knowledge domain analysis capabilities. The user training must be a form of interactive communication and an opportunity for employees to explore new behaviours and ideas related to KCS change.

Communications: Clear, consistent, and frequent communication reduces uncertainty and fear, and helps building trust. Therefore, communication is essential before and during the KCS adoption process. All that is known about KCS, must be sent as quickly as the relevant information is available. Although, all employees should be taken on the KCS journey, the first step is to identify those employees who must be communicated about the KCS firstly. The most effective means of communication for the group and individuals that will bring them on board, must be used and significant amounts of time for employees to ask questions and request clarifications, must be allocated.

Measurements: Measurements is a critical element of a successful KCS implementation. Throughout the KCS adoption procedure, a structured approach should be put in place to measure the business impact of the changes. There are two general categories of measurements, quantitative (e.g. results) and qualitative (e.g. behaviours). The first category is the easiest and least costly to measure while measuring behaviours is a bit more challenging, but necessary, with more significant change efforts.

6 Conclusions

According to Albert Einstein “The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking”. Organisational culture is critical factor to the success of any change initiative. Most change management projects deal effectively with the formal aspects of an organization, like strategic and tactical plans, process flow structures, performance management systems, but to succeed, they also have to understand the human side of a change. Culture is how things get done around and that is influenced mostly by how employees think, believe, act and behave. In order for the KCS methodology to be implemented successfully in the organisation, there needs to be a common understanding of the process by which this will be achieved. Formulating a clear vision can help everyone understand what the organization is trying to achieve by adopting this knowledge management approach. It makes changes more concrete and creates support to implement them. The ideas of employees can be incorporated in the vision, so that they will accept the vision faster. Linking the adopted vision to strategies will help employees to achieve their goals.

The final proposal was built based on the KCS methodology and the results from the interviews with the relevant stakeholders and it is believed that, all the research questions were addressed during this study. Regarding the first one “What tools can help an organisation to save time and resources when resolving issues”, by having available a consistent and well updated Knowledge Base, support employees can find information about similar issues and situations, avoiding re-work and thus saving time and resources. In terms of the second question, it was obvious that this approach, by enhancing self-service functionalities, enables users to resolve issues that otherwise, they would have opened a ticket into the incident management system for the service desk to deal with. Related to the third research question, by having a strong leadership which creates a compelling purpose and engage people in that purpose, is definitely a factor to develop a knowledge sharing culture within the organisation. Additionally, as shown during this study, training and coaching can be beneficial in enhancing this behavioural change and improving the organisational learning. Finally, in terms of the last one “How to integrate the use of the knowledge base into the problem solving process”, when knowledge workers change their behaviour and they search before solve as well as they search often, they maximize the benefits from the proposed model by creating new articles only when needed.

It is estimated that the proposed solution will have minor implications in terms of financial investments. All the tools for incident and knowledge management are already available within the organisation. Although, some modifications will be required in order to achieve the desired integration between the incident and knowledge management systems, this

amount of investment is not expected to be high. Other foreseen costs are related to training and coaching activities throughout the adoption of the KCS approach. The main resources needed will be in terms of staff allocation time. At present, it cannot be quantified because it depends on the different KCS roles required, the number of pilot phases and the duration of each phase. During the adoption of KCS, it is expected that the knowledge management will be part of business operations, whereby the creation and maintenance of knowledge will require about 0.10 full-time equivalent (FTE) for operational staff.

The implementation of the KCS project is in line with the strategic priorities of the organisation and the planned resource outlook for the coming years, in particular with respect to the investments in human resources, ensuring continuous capacity-building of staff. For the successful implementation of KCS, the organisation needs to be constantly changing and improving, either by reviewing the processes, training and coaching the employees, or updating the technology. KCS is based on building a new organisational culture and gradually transferring people from the old state to the new one. By analysing the changes needed, you can prepare your teams in advance and help guide them through the transition until the new method becomes a routine.

As a result of the recent situation with the corona virus threat, remote work became increasingly common practice. This practice offers many benefits to employees like flexibility, time saving from long transfers, elimination of office distractions but also it often prevents organizations from creating an organisational culture. With remote work, employees no longer have the ability to walk down to ask someone for the guidance they need. As the proposed working model focus on collective experience which gained from group work and interactions, it would be interesting to be investigated how the online communication and collaboration tools can keep active these interactions and contribute to the creation of knowledge. Creating an organisational culture of knowledge sharing that encourages collaboration and support, regardless of whether employees are in the same room or on the other side of the globe, could be also something for further investigation.

The purpose of this study was to improve the operational efficiency of the case organization by enhancing the current learning and knowledge sharing system with the introduction of a new working model. The adoption of KCS, changes the nature of interactions in the traditional support model where the distinction between support levels must be eliminated, creating a sense of one unified team. Providing a support structure is critical to assist employees to emotionally and practically adjust to this change and to build proficiency of behaviours and technical skills needed to achieve the desired business results. The main outcome from this study is that the knowledge management initiative should not be carried separately but integrated into daily business operation together with the employees who create the knowledge.

References

Alavi, M. & Leidner, E. 2001. Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. MIS Quarterly, 25, 1, pp 107–136.

Argyris, C. & Schön, A. 1996. Organizational Learning II: Theory, Method and Practice. Addison-Wesley Publishing. New York.

Balbastre, F. & Oltra, V. & Martinez, J. & Moreno, M. 2003. Individual, Group, and Organizational Learning Levels and Their Interactions: An Integrative Framework. Management Research. 1, 3, pp 253-267.

Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. Qualitative Research in Psychology. 3, 2, pp 77–101.

Bukowitz, W. & Williams, R. 2000. The knowledge management field book. Prentice Hall. London.

Cohen, D. 1998. Toward a knowledge context: Report on the first annual U.C. Berkeley Forum on Knowledge and the Firm. California Management Review, 40, 3, pp 22–39.

Consortium for Service Innovation, 2019a. URL: https://library.serviceinnovation.org/KCS/KCS_Principles_and_Core_Concepts. Accessed: 21 December 2020.

Consortium for Service Innovation, 2019b. URL: https://library.serviceinnovation.org/KCS/KCS_v6/KCS_v6_Adoption_Guide. Accessed: 13 March 2020.

Consortium for Service Innovation, 2019c. URL: https://library.serviceinnovation.org/KCS/KCS_v6/KCS_v6_Practices_Guide. Accessed: 20 March 2020.

Consortium for Service Innovation, 2019d. URL: https://library.serviceinnovation.org/KCS/KCS_v6/Measurement_Matters. Accessed: 10 April 2020.

Consortium for Service Innovation, 2020. Current Members. URL: https://www.serviceinnovation.org/current-members/. Accessed: 12 December 2020.

Covey, S. 2004. Current Members. The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change. Free Press. New York.

Dalkir, K. 2011. Knowledge management in theory and practice. Second edition. MIT Press. London.

Davenport, T. & Prusak, L. 1998. Working Knowledge: How Organizations Manage What They Know. Harvard Business School Press. Boston.

Davenport, T. 1994. Saving IT's Soul: Human Centered Information Management. Harvard Business Review. 72, 2, pp 119-131.

Debowski, S. 2006. Knowledge Management. Milton, QLD : John Wiley & Sons Australia Ltd.

European Commission, 2016. Data, Information and Knowledge Management at the European Commission. URL: https://ec.europa.eu/transparency/regdoc/rep/3/2016/EN/C-2016-6626-F1-EN-MAIN.PDF. Accessed 8 September 2019.

Fiol, M. & Lyles, A. 1985. Organizational learning. Academy of Management Review, 10, 4, pp 803–813.

Hatch, J., 2010. Defining Organizational Knowledge: Turning individual knowledge into organizational intellectual capital.

Kaplan, R. & Norton, D. 1992. The Balanced Scorecard – Measures That Drive Performance. Harvard Business Review.

King, D. 2005. Humanitarian Knowledge Management. Second International Information Systems for Crisis Response and Management (ISCRAM) Conference. Brussels.

McElroy, M. 1999. The Knowledge Life Cycle - An Executable Model for the Enterprise. ICM Conference on knowledge Management, Miami, FL.

Meyer, M. & Zack, M. 1996. The design and development of information products. Sloan Management Review. 37, 3, pp 43-59.

Mutongi, C. 2016. Revisiting Data, Information, Knowledge and Wisdom (DIKW) Model and Introducing the Green Leaf Model. IOSR Journal of Business and Management (IOSR-JBM). 18, 7, pp 66-71.

Nonaka, I. 1991. The knowledge-creating company. Harvard Business Review. 69, 6, pp 96–104.

Nonaka, I. & Takeuchi, H. 1996. The Theory of Organizational Knowledge Creation. International Journal of Technology Management. 11, 7/8, pp 833–845.

Robertson, J. 2007. There are no "KM Systems". Step Two Designs. URL:http://www.steptwo.com.au/papers/cmb_kmsystems/index.html. Accessed:16 December 2019.

Robertson, J. 2007. There are no "KM Systems". Step Two Designs. URL:http://www.steptwo.com.au/papers/cmb_kmsystems/index.html. Accessed: 16 December 2019.

Rowley, J. 2007. The wisdom hierarchy: Representations of the DIKW hierarchy. Journal of Information Science. 33, 2, pp 163-180.

Schein, E. 1985. Organizational cultures and leadership: A dynamic view. Jossey-Bass Publishers. San Francisco.

Shook, J. 2011. How to Go to the Gemba: Go See, Ask Why, Show Respect. Lean Enterprise Institute. URL: https://www.lean.org/shook/DisplayObject.cfm?o=1843. Accessed: 15 February 2020.

Thierauf, J. 1999. Knowledge Management Systems for Business. Quorum Books. Westport.

Walle, A. 2014. Qualitative Research in Business: A Practical Overview. Cambridge Scholars Publisher. URL: https://ebookcentral.proquest.com/lib/haaga/detail.action?docID=2076546. Accessed: 25 March 2020.

Wiig, K. 1993. Knowledge management foundations --Thinking about thinking-- How people and organizations create, represent, and use knowledge. Schema Press. Arlington, Texas.

Wiles, J. 2019. Think Employees Thrive With Constant Coaching? Think Again. Gartner. URL: https://www.gartner.com/smarterwithgartner/think-employees-thrive-with-constant-coaching-think-again/. Accessed: 10 April 2020.

Appendix 1. Knowledge Article Templates

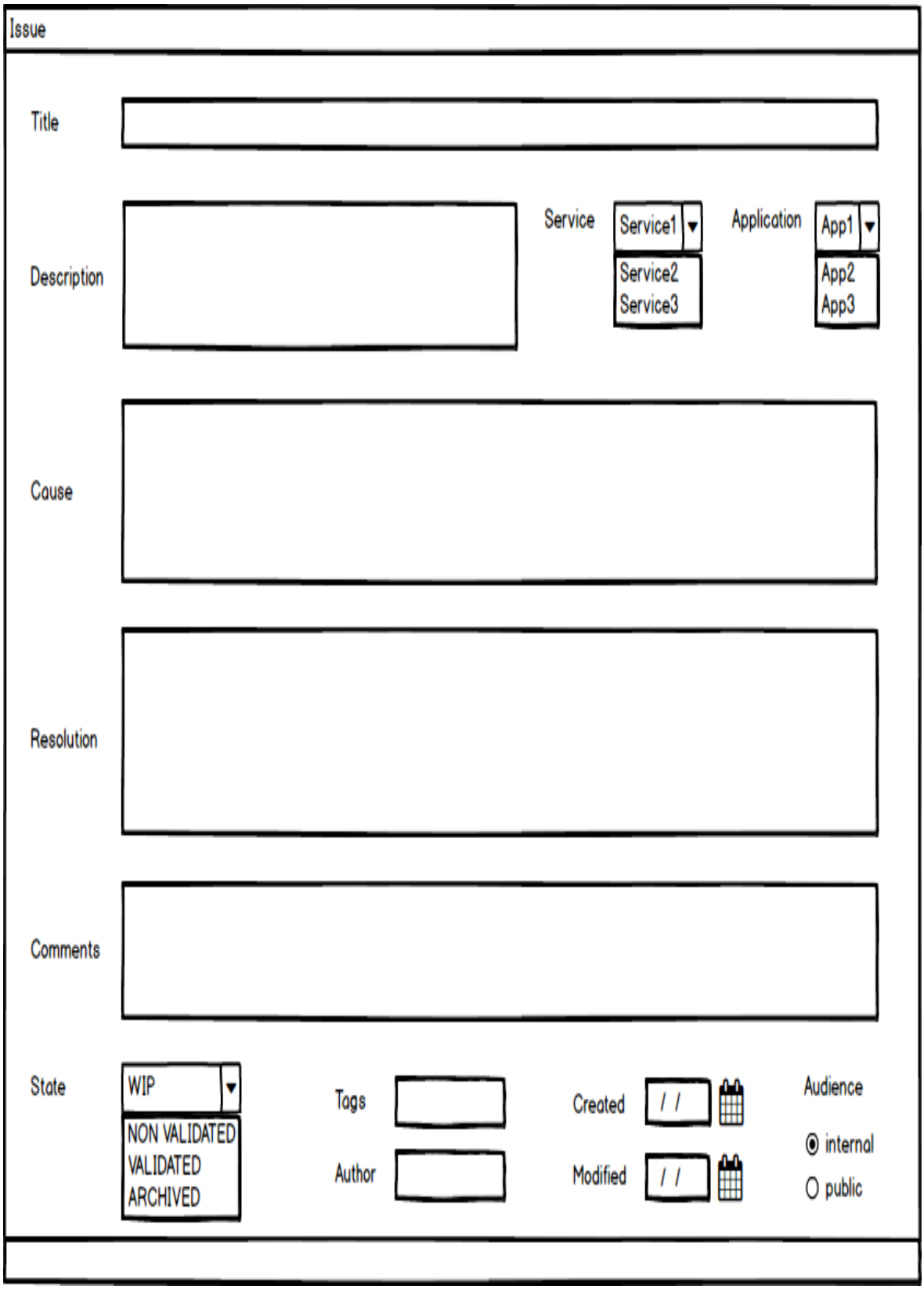

Figure 26. Issue Template

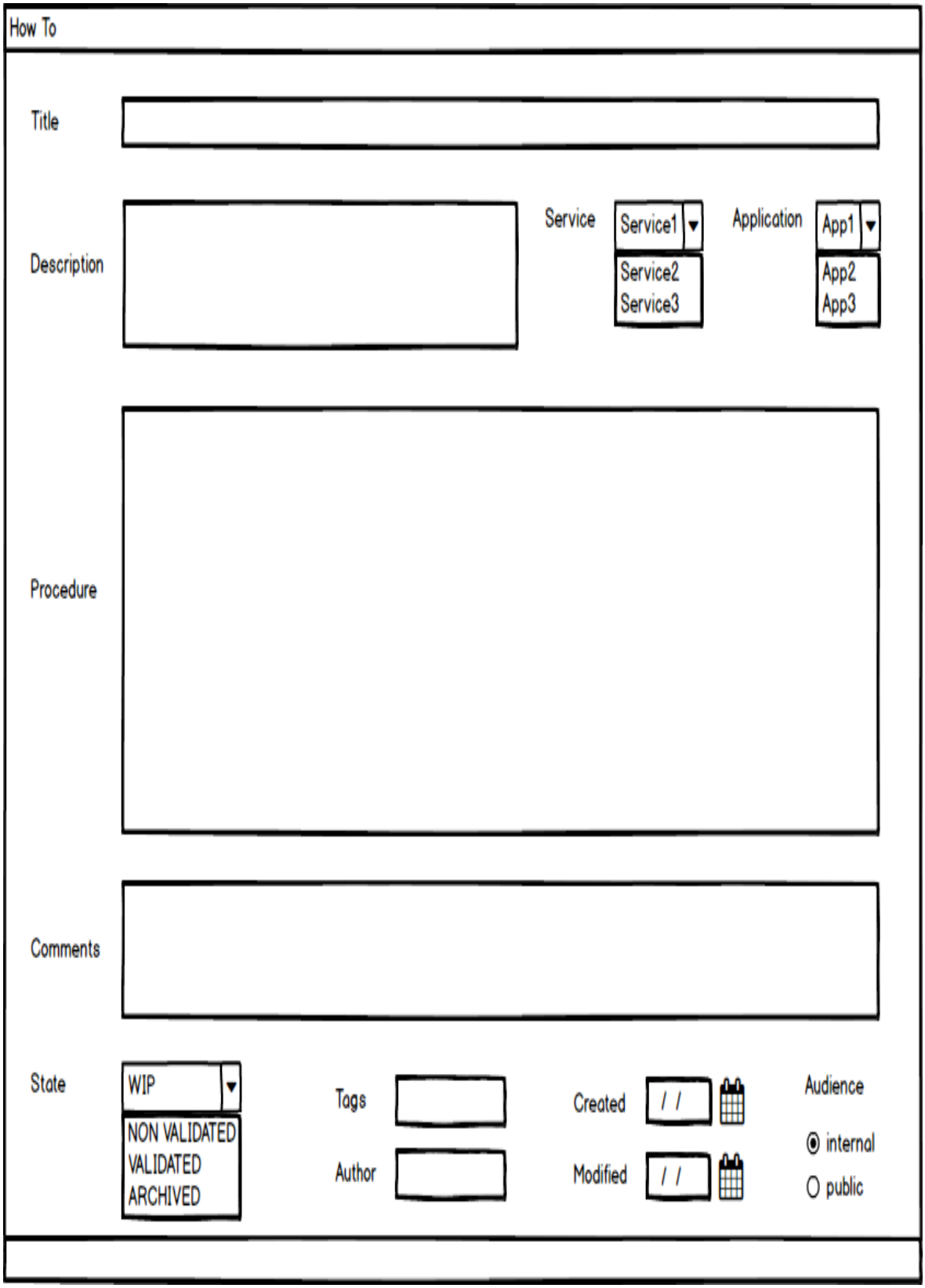

Figure 27. How To Template

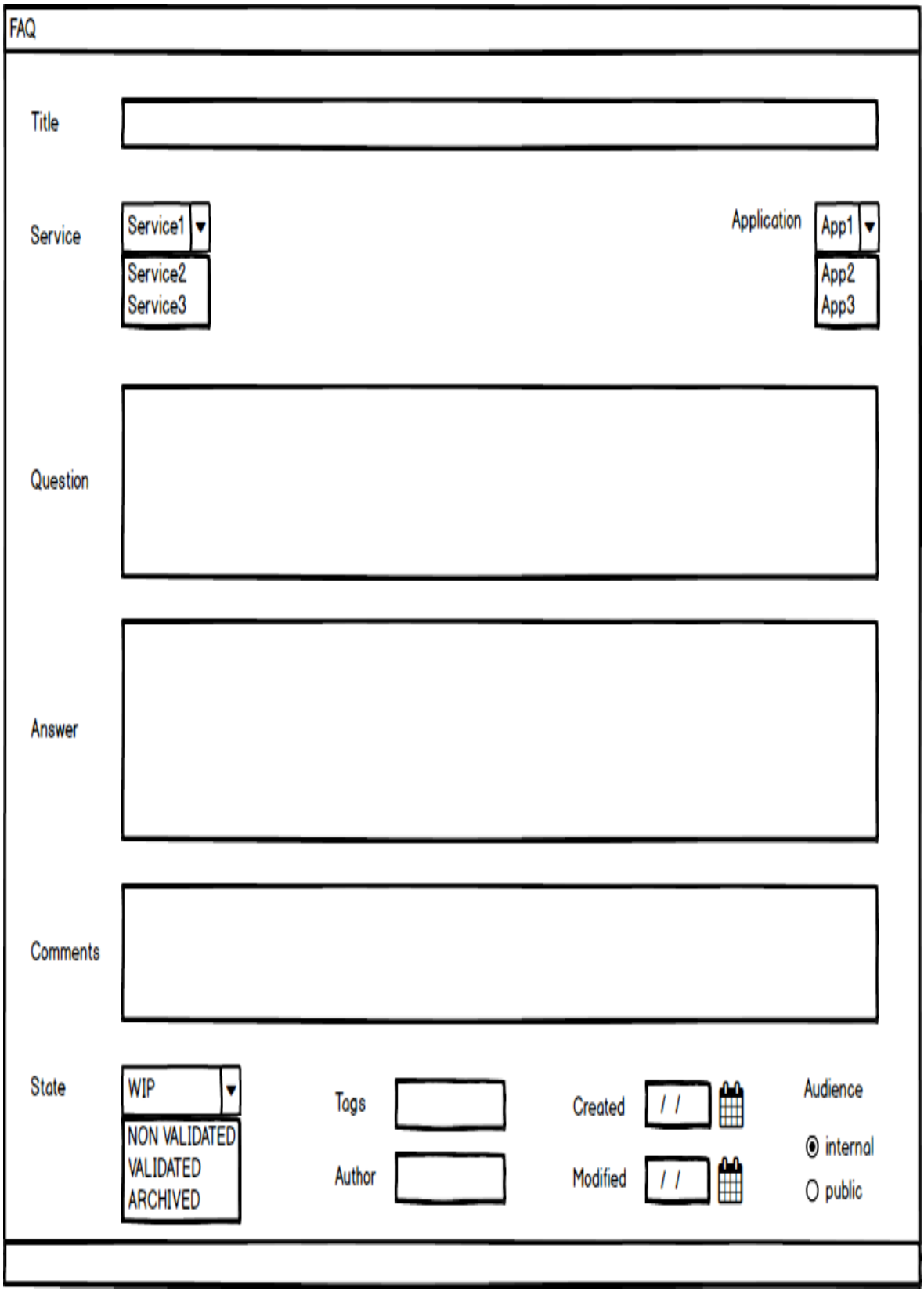

Figure 28. FAQ Template