Identifying and Assessing Knowledge Gaps in ISO 9001 Certified SMEs using a Knowledge Audit Framework

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Abstract: The importance of knowledge management in ISO 9001 certified Small and Medium-Sized Enterprises (SME) gained importance over the past few years. A company-wide knowledge base could not only improve the central organizational decision-making, but furthermore contribute to sustainably preserving and expanding competitive advantages based on proper knowledge management (Ayinde et al., 2021). Therefore, the paper aims is to present a Knowledge Audit Framework, especially for ISO 9001 certified SMEs based on current theories and described for practical implementation. The framework will additionally help these ISO 9001 certified SMEs to manage relevant business processes and moreover improve the crucial documentation of several knowledge-intensive business processes. The framework is derived from current research and empirically based on the case study research method combining a participating observation, direct observation during a focus group workshop, and a structured questionnaire in order to prioritize the evaluated knowledge gaps. This prioritized listing of gaps builds the basis for efficient knowledge management improvements in the organization and the implementation of necessary measures in the field of knowledge management.

1 INTRODUCTION

With an increasing number of organizations recognizing knowledge as an integral part of their sustainable competitive advantage, the need for developing and managing this intellectual expertise gained importance over the last few years (Durst and Runar Edvardsson, 2012). Especially for Small and Medium-Sized Enterprises the establishment of a knowledge management strategy often entails different challenges usually caused by a general constraint of resources and a concentration of power in most SMEs (Bridge and O'Neill, 2018). Foreseeing these difficulties often leads to not implementing organizational knowledge management systems in SMEs and instead subsequently counting on the intellectual expertise anchored in employees' minds (Yew Wong and Aspinwall, 2004). To facilitate and support the initial step of implementing a sustainable knowledge management system in SMEs, this paper will propose a framework to collect existing organizational knowledge, identify the gap between documented and non-documented knowledge and assess the identified knowledge gap. Probst (1998) additionally highlights the importance of identifying and assessing the existing knowledge before implementing different organizational knowledge measures. Inconsistencies in the knowledge identification process will not only influence the quality of the knowledge management system but furthermore lead "to inefficiency, uninformed decisions, and redundant activities" within the company (Probst, 1998, p. 21). After a general introduction to the topics of knowledge, knowledge management, knowledge audit, and the different processes used for managing intellectual expertise, section 3 will focus on a detailed description of the suggested framework and the methodological approach used for designing the Knowledge Audit Framework. The paper will be concluded by reflecting on the limitations of the framework and furthermore highlighting potential applications in terms of further research.

2 THEORETICAL BACKGROUND

The following section will focus on the theoretical foundation for this paper. After defining knowledge itself and its categorization into tacit and explicit knowledge, the topic of knowledge management will

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be introduced as well as the concept of knowledge audits.

2.1 Definitions of Knowledge

In order to implement a successful knowledge management system, a solid understanding of knowledge and its characteristics is crucial. There are two main ways of defining the term knowledge. Whereas Epistemologists explore the topic of knowledge from a more philosophical point of view (Bolisani and Bratianu, 2018), most definitions used in the field of knowledge management base their interpretations on the underlying data contributing to the generation of intellectual expertise by relying on the so-called DIKW-hierarchy designed by Ackoff (1989). This hierarchy describes the interconnection between **D**ata, **I**nformation, **K**nowledge and **W**isdom. According to Ackoff (1989), data can be described as randomly concatenated symbols. When this data is further processed in order to fit in a predefined context, the next level in the DIKW-hierarchy can be reached. As soon as the information is enriched by human experience knowledge is generated. Only understanding the generated knowledge and interpreting it using intelligence will lead to the final hierarchical step called Wisdom. To further refine the DIKW model, North (2011) proposed a redesign of the hierarchy by adding three more dimensions and arranging them in so-called "Knowledge Steps". By applying this framework, North (2011, p. 37) defines knowledge as "[...] the process of the purposeful interconnection of information". Probst (1998, p.23) on the other hand defines knowledge in a business context by referring to it as "[...] the totality of knowledge and skills that individuals use to solve problems. This includes theoretical knowledge as well as practical everyday rules and instructions for action". In an attempt to further classify knowledge based on its characteristics Nonaka and Peltokorpi (2006) distinguish between tacit and explicit knowledge. Howells (1996, p.92) describes tacit knowledge as "non-codified, disembodied know-how that is acquired via the informal take-up of learned behaviour and procedures". Especially the learning aspect can be recognized as one of the key processes when it comes to generating tacit knowledge (Howells, 1996). As this type of knowledge mainly originates from experience and is used subconsciously, documenting this knowledge often presents a challenge for SMEs. Sternberg (1997) furthermore underlines the challenge of documentation by pointing out the characteristics of tacit knowledge being highly individual and subjective. Explicit knowledge on the other hand can be described as more objective knowledge that can be "expressed in words and numbers and shared in the form of data, scientific formulas, specifications, manuals, and the like" (Lee et al., 2006, p. 153). Additionally to the advantage of documentation mentioned in the previous paragraph, explicit knowledge can be furthermore clustered using keywords which simplifies the searching of the documented knowledge

2.2 Introduction to Knowledge Management

The first endeavors of managing intellectual expertise can be found in ancient roman culture where people started to document information about civilization, commercial contracts, and governmental processes (Sveiby, 1997). Whereas this information was only accessible to an exclusive and selected group of people, the establishment of community libraries provided a broader audience with the possibility to access knowledge in an easy and structured way (Ives et al., 1997). With different technical and organizational developments in the following years, knowledge management evolved to what is now deemed as one of the central processes in establishing and maintaining market competitiveness (Teece and Pisano, 1994). According to Nonaka and Takeuchi (1995, p. 3) knowledge management comprises all organization's capabilities "to create new knowledge, disseminate it throughout the organization, and embody it in products, services, and systems". Whereas Nonaka's and Takeuchi's definition primarily focuses on the three processes of creating, disseminating and embodying knowledge, Probst (1998) extended this definition by adding three additional operational knowledge processes: (1) knowledge identification, (2) knowledge acquisition, and (3) knowledge preservation. To align the knowledge management strategy with the general strategy of the organization an additional strategic layer was introduced, including the definition of knowledge goals at the beginning and concluding the cycle with knowledge measurements. Following the cycle of "Knowledge Blocks" according to Probst (1998) will not only help to define a knowledge management strategy but furthermore also constantly improve and re-assess the strategy and measures in place.

2.3 Knowledge Audit

Based on the strategic re-assessment in the concept of Probst (1998), knowledge audit supports reaching the knowledge goals which have to be in line with the organizational objectives. Therefore, periodic reviews

and corresponding evaluation of the existing knowledge has to be performed and documented for further improvement. This is also a demand for the continuous improvement required by the ISO 9001 and other quality management norms. It is crucial to find out where the gaps in knowledge assets and duplicates of knowledge in the organization can be identified (Ayinde et al., 2021). By far not all of the knowledge in companies is documented in the right way or at all. According to Serrat (2017) around 80 % of an organization's intellectual expertise is represented in tacit knowledge. This poses the challenge of identifying these knowledge parts, documenting, and auditing them to achieve organizational objectives. The Knowledge Audit Framework presented in the next chapter will exactly offer an option for that.

With the necessity of process management given by quality management norms, it is important for SMEs to focus on the most valuable business processes and their improvement. With that in mind, it is crucial to identify the knowledge-intensive business processes (Ploder, 2020) and start improving their knowledge documentation first. Identifying these knowledge-intensive business processes helps to focus and use the limited resources in SMEs efficiently.

Overall, certified organizations need to intensify the managed knowledge audit activities combined with the ISO 9001 audit requirements. To support SMEs in assessing the available knowledge, the audit aspect will be a fundamental part of the developed framework shown in section 3.

3 THE KNOWLEDGE AUDIT FRAMEWORK

Based on the given theoretical concepts in section 2 this chapter explains the development and the structure of the final Knowledge Audit Framework for ISO 9001 certified SMEs with a special focus on the core processes rooted in the business process management theory (Dumas et al., 2018) and also included in all quality management related norms. Based on the concept of knowledge-intensive business processes, their measurement, and their importance for companies (Ploder, 2020), it is beneficial to use the core processes as a starting point for the knowledge audit. This suggestion can be also supported by the fact that managing processes represent a base requirement for ISO 9001 certified companies.

The aforementioned process focus combined with the active management of knowledge is also required from a quality management perspective. The given norms which are applicable for SMEs in different industries could be ISO 9001:2015, ISO 13485:2016, and others. Especially the requirements given in the changed ISO 9001:2015 within clause 7.1.6 can be mentioned which directly calls for the knowledge which is necessary to establish high-quality products and services besides the necessity to safe the knowledge in the organizations. Additional to the described clause 7.1.6 also clauses 7.2 addresses the competencies and skills of employees and clause 7.5 addresses the documentation of information. Clause 7.1.5 furthermore addresses the active management of knowledge in line with quality standards (Ayinde et al., 2021).

To combine the given requirements in SMEs the authors used the concept of a case study design by Yin (2009) which includes at least a triangulation of methods to answer a given research question based on a single case study (Yin, 2009). The necessary steps within the case study are defined as follows: (1) designing of the case study, (2) preparation and planning of collection of evidence, (3) collection of the case study evidence, (4) analysis of the evidence and (5) reporting of the outcomes. This paper will focus on steps 1 and 2 only, steps 3 to 5 will be reported after the implementation which is planned for Q4 2022 to validate the concept together with a cooperation partner which is an ISO 9001:2015 certified SME in Austria. The aim of the framework displayed in figure 1 is to identify the status quo of knowledge management at the company and develop an optimum status of knowledge management. By the comparison of the as-is status with the should-be status, the potential knowledge gap between documented and non-documented process knowledge will be identified.

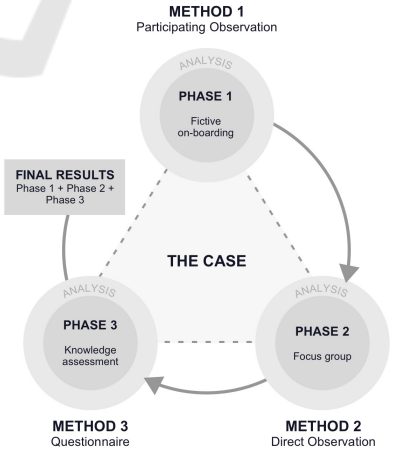

Figure 1: Knowledge Audit Framework.

A crucial part of the first step is the definition of the research question for the planned case study. Based on the given explanations and theoretical back-

ground the following research question will be tackled within this case study: How to conduct a knowledge audit to identify and overcome an organizational knowledge gap between documented and non-documented knowledge? To answer this research question the authors have chosen the methodology of participating observation in **phase 1** (DeWalt and DeWalt, 2011) to get an explanation of the current state of needed and documented knowledge in the company. It is planned that one of the authors is part of a fictive on-boarding phase in one department documenting all the information which is gained through this first observation in a field diary with all pieces of evidence that are given to a new employee. Based on the observed information a first as-is process model will be established based on the BPMN 2.0 ((OMG) Object Management Group, 2013) syntax and the corresponding knowledge evidence are mapped to the existing process. After the as-is analysis, an improved to-be process model will be developed by the authors, simply based on the given evidence and inputs during the on-boarding process. This to-be process model will build the foundation for the following phase.

For **phase 2** the authors will use the methodology of a focus group workshop to reflect on the designed to-be process together with the experts in the company and to unveil the different knowledge gaps which can be based on missing sharing in the on-boarding phase or on changes in the to-be process which also has to be discussed during the focus group session. The aim of the second methodological approach is to gain insights into the potential knowledge gaps by comparing the knowledge needs from the focus group session with the documented knowledge collected from phase 1.

Phase 3 will afterward focus on the prioritization of the identified knowledge gaps. From a resource point of view, especially for SMEs with highly restricted resources, a prioritization of the gaps can help to overcome the shortcomings in a quick and organized way. For this analysis, the authors base the prioritization on the model of Magnier-Watanabe (2015) which will be distributed as an online questionnaire based on the gaps from phase 2. The concept is based on measuring two dimensions of knowledge: breadth and depth. Whereas knowledge breadth refers to the diversity of knowledge and whether knowledge is limited to a single domain (narrow) or spans over multiple disciplines (broad), the depth of knowledge describes the complexity of the knowledge and the characteristic of whether it is superficial and easily traceable (shallow) or deeply anchored (deep), so-called know-how. In order to assess and quantify the previously identified knowledge gap, a classification scheme by Magnier-Watanabe (2015) was selected and extended to a 4-point Likert scale, ranging from very narrow to very broad and very shallow to very deep, to cater to the needs of phase 3 and eliminating the choice of a neutral answer. The output of phase 3 will be a prioritized list of all knowledge gaps which should be tackled in the further course of implementing knowledge management measures.

The three phases in the proposed framework should then be implemented in the company-wide yearly audit plan to guarantee the re-evaluation based on the framework to ensure not falling to a worse position by changes that are not covered in the current knowledge documentation. This also helps to assure the accuracy of the required quality management-related documentation as well.

4 LIMITATIONS & FUTURE RESEARCH

In conclusion, this paper suggests a framework to identify and implement measures to overcome an organizational gap between documented and undocumented knowledge. This could help to overcome current flaws in the field of knowledge management, increase the effectiveness of sharing intellectual expertise, and optimize internal processes associated to the different phases of knowledge management. As the framework described in this paper should only serve as a proposal based on relevant literature, the obvious limitation of this publication lies in the currently missing application and evaluation of the model using real-life data. The application and evaluation of the suggested framework is planned to be executed in Q4 of 2022 with a cooperating Austrian company certified in ISO 9001. After the first implementation, the applicability of this framework for SMEs in special will be evaluated and adapted if necessary for further implementations. In terms of additional research opportunities, the evaluation of the framework could be expanded geographically and to diverse sectors. Furthermore it would add value and help to improve the suggested framework by linking it to the information audit theory (Heisig et al., 2020) to later come up with an expanded concept for practical use in ISO 9001 certified SMEs. This expansion will additionally focus on the more technical aspects of knowledge transfer based on the understanding of data gathering and data structuring (Buchanan and Gibb, 2008; Jones et al., 2013).

REFERENCES

Ackoff, R. (1989). From data to wisdom. *Journal of Applied Systems Analysis*, 15:3–9.

Ayinde, L., Orekoya, I. O., Adepeju, Q. A., and Shomoye, A. M. (2021). Knowledge audit as an important tool in organizational management: A review of literature. *Business Information Review*, 38(2):89–102.

Bolisani, E. and Bratianu, C. (2018). The Elusive Definition of Knowledge. In *Emergent Knowledge Strategies*, volume 4, pages 1–22. Springer International Publishing, Cham. Series Title: Knowledge Management and Organizational Learning.

Bridge, S. and O'Neill, K. (2018). *Understanding enterprise: entrepreneurs & small business*. Palgrave, London, fifth edition edition.

Buchanan, S. and Gibb, F. (2008). The information audit: Theory versus practice. *International Journal of Information Management*, 28(3):150–160.

DeWalt, K. M. and DeWalt, B. R. (2011). *Participant observation: a guide for fieldworkers*. Rowman & Littlefield, Md, Lanham, Md, 2nd ed edition. OCLC: ocn656213202.

Dumas, M., La Rosa, M., Mendling, J., and Reijers, H. A. (2018). Introduction to Business Process Management. In *Fundamentals of Business Process Management*, pages 1–33. Springer Berlin Heidelberg, Berlin, Heidelberg.

Durst, S. and Runar Edvardsson, I. (2012). Knowledge management in SMEs: a literature review. *Journal of Knowledge Management*, 16(6):879–903.

Heisig, P., Ogaza, M. A., and Hamraz, B. (2020). Information and knowledge assessment – Results from a multinational automotive company. *International Journal of Information Management*, 54:102137.

Howells, J. (1996). Tacit knowledge. *Technology Analysis & Strategic Management*, 8(2):91–106.

Ives, W., Torrey, B., and Gordon, C. (1997). Knowledge Management: An Emerging Discipline with a Long History. *Journal of Knowledge Management*, 1(4):269–274.

Jones, A., Mutch, A., and Valero-Silva, N. (2013). Exploring information flows at Nottingham City Homes. *International Journal of Information Management*, 33(2):291–299.

Lee, C. K., Foo, S., and Goh, D. (2006). On the Concept and Types of Knowledge. *Journal of Information & Knowledge Management*, 05(02):151–163.

Magnier-Watanabe, R. (2015). Recognizing knowledge as economic factor: A typology. In *2015 Portland International Conference on Management of Engineering and Technology (PICMET)*, pages 1279–1286, Portland, OR, USA. IEEE.

Nonaka, I. and Peltokorpi, V. (2006). Objectivity and subjectivity in knowledge management: a review of 20 top articles. *Knowledge and Process Management*, 13(2):73–82.

Nonaka, I. and Takeuchi, H. (1995). *The knowledge-creating company: how Japanese companies create the dynamics of innovation*. Oxford University Press, New York.

North, K. (2011). *Wissensorientierte Unternehmensführung: Wertschöpfung durch Wissen*. Gabler, Wiesbaden, 5., aktualisierte und erweiterte auflage edition.

(OMG) Object Management Group (2013). Business Process and Notation (BPMN).

Ploder, C. (2020). A Measurement Model to Identify Knowledge-intensive Business Processes in SMEs:. In *Proceedings of the 12th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management*, pages 133–139, Budapest, Hungary. SCITEPRESS - Science and Technology Publications.

Probst, G. (1998). Practical Knowledge Management: A Model That Works. page 14.

Serrat, O. (2017). *Knowledge Solutions*. Springer Singapore, Singapore.

Sternberg, R. J. (1997). *Successful intelligence: how practical and creative intelligence determine success in life*. Plume, New York.

Sveiby, K. E. (1997). *The new organizational wealth: managing & measuring knowledge-based assets*. Berrett-Koehler Publishers, San Francisco, 1st ed edition.

Teece, D. and Pisano, G. (1994). The Dynamic Capabilities of Firms: an Introduction. *Industrial and Corporate Change*, 3(3):537–556.

Yew Wong, K. and Aspinwall, E. (2004). Characterizing knowledge management in the small business environment. *Journal of Knowledge Management*, 8(3):44–61.

Yin, R. K. (2009). *Case study research: design and methods*. Number v. 5 in Applied social research methods. Sage Publications, Los Angeles, Calif, 4th ed edition.