# Digitization of Knowledge Management Methods

(White Paper)

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***Abstract:*** *In increasingly digitized working environments, it is becoming increasingly important that the used knowledge management methods feature a higher degree of digitization. This is the best way for using them optimally in their respective environment and for yielding full benefits. For a better overview in the "tool jungle", a categorization of IT tools for knowledge management (KM) is presented first. Any KM method can be digitized by using tools from suitable categories. The procedure for digitization is explained and illustrated using the example of the KM method "FAQ". In order to ensure the sustainable application of the digitized KM method, a step-by-step digitization and an accompanying change management approach are outlined. The latter includes the assignment of "knowledge ambassadors" supporting the implementation process.*

***Keywords:***
*digitization, KM method, tool, tool category, change management, knowledge ambassador*

The digitization of our society is progressing rapidly. This transformation poses great challenges not only to individuals, but above all to organizations. For example, customers strive to organize their lives completely online. This begins with the purchase of products for daily needs and extends to the handling of all their business activities. More and more employees would like to perform their work regardless of time and place and therefore increasingly demand flexible working models and environments (teleworking, home office). More and more companies want to have their businesses and projects handled by flexible, globally operating teams in order to be able to realize all strategically relevant and profitable business options. Increasing amounts of data (big data) are needed to develop new business opportunities in ever shorter time frames for sustainable business success (Kraft 2015, Hirt/Willmott 2014).

However, companies often have difficulties with digital transformation due to inadequate corporate cultural framework conditions. Last but not least, employees often lack the necessary skills to handle digitized work steps professionally. From this perspective, the question arises as to how methods of knowledge management can be designed in such a way that they can accompany these changes and help secure the business success of the transformed company.

## Introduction

The above intro already shows that the term "digitization" is used in different contexts. It therefore makes sense to take a closer look at the various concepts that are important in the context of knowledge management (KM).

The term "digitization" means first of all (1st meaning) the use of information technologies (IT) performing business processes as consistently as possible. They serve above all for information gathering and visualization as well as for synchronous or asynchronous communication between interlocutors. The "digitized" information retrieval can, for example, take place in a search engine through a search query, the result is visualized by displaying the found entries. Project team members who are widely dispersed can hold a team meeting (synchronous communication) or discuss topics in the forum of a project platform (asynchronous communication) by using a video conferencing system. With regard to KM methods, this significance is of particular interest because KM methods are used to support business processes, e.g. lessons learned processes (see Mittelmann 2011, pp. 74-79; Mittelmann 2019, pp. 142-150) in the context of projects.

In the context of "Industry 4.0" the term (2nd meaning) stands for the convergence of humans and machines into cyber-human systems (cf. Bendel 2015, Hess 2016). The most well-known and currently fiercely discussed example is the autonomous vehicle, in whose transport task man only intervenes in exceptional cases. More profoundly, this integration describes the concept of the "digital factory", in which employees, software tools (applications) and cyber-human systems are used jointly to create virtual and real products (cf. Zäh et al. 2003, p. 76).

The term is also frequently used (3rd meaning) in connection with the observable changes that organizations are experiencing through the increased use of IT in all their business activities. The term stands here as short form for "digital transformation". The most well-known example for this kind of transformation is the company Uber, an online passenger transportation service. The company lives from the commissions from the revenues of the arranged passenger transports. The service is provided exclusively via a smartphone app or a website. It does not have its own means of transport and does not operate any switching centers.

The digital shift mentioned here is not in itself a new phenomenon. For several decades, information technologies have been used to accelerate and improve business processes. What has increased dramatically in recent years, however, is the pressure for transformation from massive progress on many technological fronts (Matt/Hess/Benlian 2015). Therefore, this meaning should not be ignored when introducing or adapting knowledge management in organizations.

Since in the context of knowledge management there is also confusion between the terms "method", "tool" and "instrument", a clear definition is made here:

- A "method" is a procedure, a plannable approach or a documented process that can be reused in the future, the execution of which leads to the goal in a fixed sequence of steps (Cermak 1993; Chroust 1992, p. 50; Mittelmann 1998, p. 154; Mittelmann 2019, p. 16).
- A tool is an object created for a specific purpose with the help of which something is produced or manipulated. This tool can also be in the form of a software system (cf. Heinrich 1993, p. 335; Dudenredaktion; Mittelmann 2019, p. 16; wikipedia 2016).
- An "instrument" (in the technical-scientific context) is a complicated device for technical and/or scientific measurements or experiments (Mittelmann 2019, p. 16; Wiktionary 2016).

From these definitions it can be derived that methods are used in knowledge management. By using suitable tools in the form of software systems in appropriate process steps, the methods can be digitized. The use of the term "instrument" should be avoided, since in the context of knowledge management (currently) no measuring or examination devices are used.

On the software market there is an overwhelming number of tools (see Figure 1) that can be used for digitizing KM methods. In addition, this market is constantly changing. Unsuccessful tools are taken off the market and new ones are added. Therefore, a categorization of IT tools is proposed below that can be used for the digitization of KM methods without having to name concrete tools such as Twitter, Xing or Pinterest. The categorization makes it possible to define requirements for the needed tool for the selected KM method without even knowing a specific tool. This facilitates the selection of suitable tools tremendously.

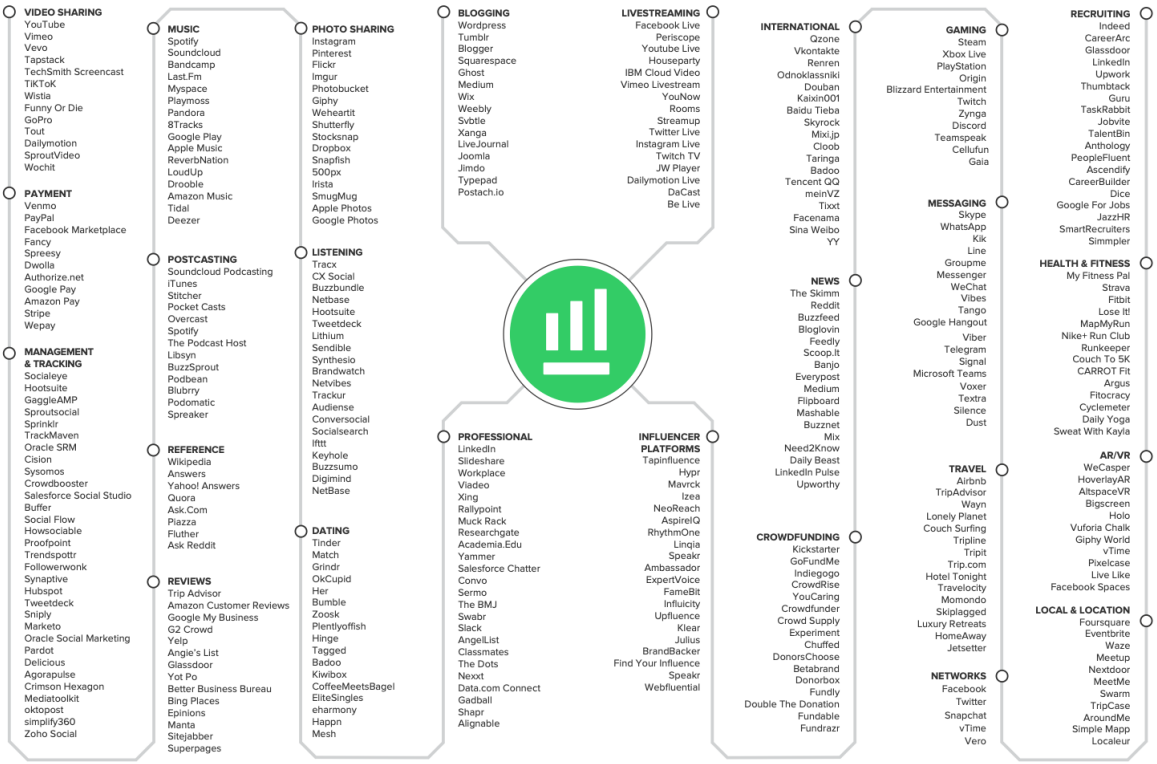


Figure 1: 2019 Social Media Map (© Overdrive Interactive 2019)

## Categories of Digital Tools

The categorization does not include all kinds of tools, but only those that can be used for the digitalization of knowledge management methods. The categories are named with the help of verbs that characterize the desired functions of the tools.

The tools are each clustered into twelve categories (see Figure 2). Three categories are combined into a group with a clear functional focus. The focus of the "networking-messaging-collaborating" group (orange in Figure 2) is on communication. The most important aspect in the group "sharing-publishing-distributing" are the artifacts, contributions or links that are posted online (color green in Figure 2). The group "survey-gaming-learning" deals with interaction in the respective subject area (color violet in Figure 2). The group "searching-visualizing-curating" (color blue in Figure 2) comprises finding, organizing and presenting information with defined objectives.

In the following, the most important functions that tools must provide are defined for each category.

Tools in the *networking* category assist in establishing and maintaining relationships in the net.

e.g. Social Networking, Business Networking, Social Media

Tools of the category *messaging* enable people to exchange text, audio and/or video messages in real time or asynchronously.

e.g.
in real time: Instant messaging, telephone conference, chats, video conference, web conference
asynchronous: E-mail, voice mail, SMS, mailing lists, discussion forum

*Collaborating* category tools enable content to be developed, discussed, changed and adapted synchronously or asynchronously according to objectives.

e.g. electronic group calendars, social bookmarking, social tagging, groupware, team rooms, discussion forum, workflow management system, project cooperation system

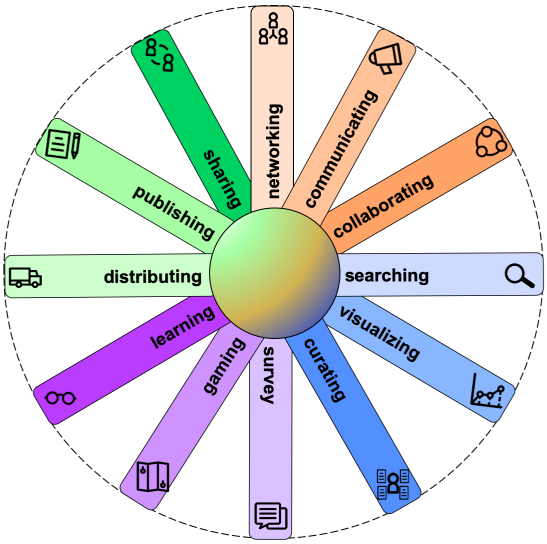

Figure 2: Tool Categories

Tools of the category *sharing* provide the possibility to share any artifacts (e.g. documents, presentations, videos) with other people within self-selected groups on the net and to exchange comments about their content.

e.g. folders for closed groups, team rooms

Tools in the category *publishing* can be used to easily create content yourself and publish it online.

e.g. web notebooks, blog, wiki

Tools of the category *distributing* offer the possibility to make any artifacts (e.g. documents, presentations, pictures, music, videos) or references to artifacts publicly available on the net. Most of these tools also contain a "like" button and an input field for short comments.

e.g. public folders for knowledge objects, streaming services (live, music, video etc.), audio/video podcasting, sharing platforms (pictures, videos, music etc.)

Tools in the *learning* category offer support in the production of learning content according to pedagogical-didactic principles (authoring systems).

e.g. authoring tools for online learning cards, online quizzes etc., test tools, learning analytics tools, learning platforms

Tools of category *gaming* permit the development and making available of educational games.

e.g. development tools for interactive rally, video animation, role-playing game etc., learning and gaming platforms

Tools of the category *survey* allow the creation, execution and evaluation of online surveys.

e.g. computer assisted telephone interview, online survey, multimedia survey

Tools of the category *visualizing* facilitate data manipulation, visual structuring and/or presentation of content.

e.g. data mining, data analyzing, spreadsheets, 2D/3D graphs, mapping, process visualization, infographic, augmented reality (AR), virtual reality (VR)

Tools of the category *searching* support the retrieval of required information in databases and on the Internet.

e.g. search engines, special search engines, meta search engines, social bookmarking, social tagging

Tools in the category *curating* assist in selecting, sorting, and reprocessing information.

e.g. team bookmarking, RSS feeds, abstract services, social media monitoring, curation services

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Some tools offer functionality that covers multiple categories. Such "universal tools" are generally preferable to specialized individual ones because they help to avoid unnecessary interfaces.

## Digitalization Procedure for KM Methods

In organizations, many KM methods are in practical use with varying degrees of digitalization. Some do completely without technical support (see e.g. "metaphor" in Mittelmann 2011, p. 169), some use IT tools in single process steps (see e.g. "Ontology Development - step implementation" in Mittelmann 2011, p. 198), a few require overall IT support (see e.g. "Serious Games" in Mittelmann 2011, p. 34).

The following procedure (see Figure 3) can be used to investigate the possibility of using IT tools within the framework of a KM method application and to prepare it if necessary.

1. Use or develop a description of the method in process steps, if none could be found.
2. Examine each single process step or the description as a whole to determine whether the use of an IT tool would be possible, appropriate and beneficial. The descriptions of the tool categories can be used for this purpose.
3. Describe the application of the selected tool category(ies) in this process step as concretely as possible (= requirements for the tool) as a sound preparation for the subsequent implementation.
4. When putting it into practice, a tool or tools from the corresponding category suitable for the use case must first be selected, purchased or developed and implemented.
5. Subsequently, the prototypical implementation of the tool takes place within the framework of the utilization of the KM method. Experiences from these first applications are collected and used to improve the digitalized method. Only if a stable operation is given, the application of the method to the entire organization or to the appropriate target groups can be considered.

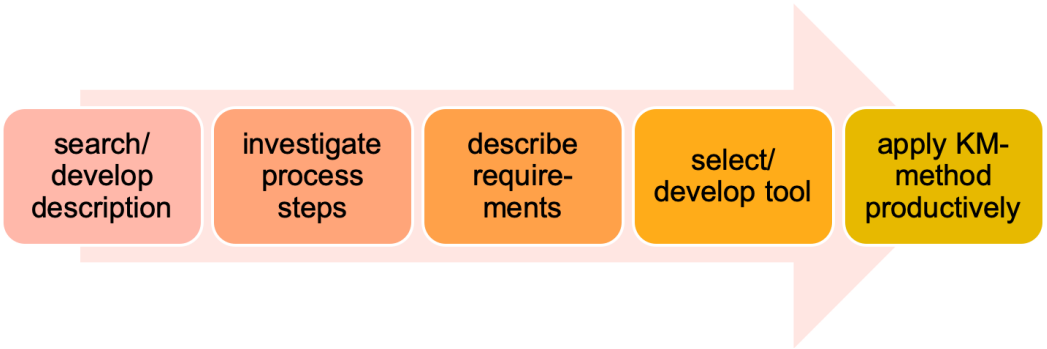


Figure 3: Digitalization Procedure for KM-Methods

Based on the objectives for the digitization of the method (e.g. increase in efficiency or productivity, greater range, improved availability of success-relevant experience knowledge), the result of the utilization of the method is evaluated after an appropriate period of time. This is best achieved by questioning the users of the method. The results of this survey provide valuable information for the further optimization of the application of methods (see Mittelmann 2019, pp. 20-21).

## *Implementation Supported by Accompanying Change Management*

The successful digitization of a KM method in an organizational environment requires tight cooperation between decision-makers, method users, KM and IT experts as well as personnel management during the entire implementation process. Experienced method users play a key role in this group. They are the ones who know the KM method inside out and use it with enthusiasm in their daily work. Therefore, they are predestined for the role of "knowledge ambassadors" in the change process.

Ideally, knowledge ambassadors have a certain affinity for IT and a keen interest in knowledge management. They are also valued by their colleagues and can explain complicated content well. They accompany their colleagues during their first application of methods directly at the workplace (training on the job) and are the contact persons for all further questions or problems.

If the method in question is not yet described, the knowledge ambassadors are the first contact for formulating the process steps. Whether the use of an IT tool is worthwhile is then examined jointly in the entire implementation group in order to incorporate as many perspectives as possible into the decision. A rough initial cost estimate makes it easier for those responsible for resources to decide how to proceed.

The IT experts also involve the knowledge ambassadors in the requirement specification of the planned IT tools in order to cover the user perspective as well as possible. The benefit is that the knowledge ambassadors gain a feeling in advance for how the IT tools will support the implementation of the methods and which benefits or difficulties the real application will entail. If an IT tool for the method application is newly developed or an existing one is adapted, the knowledge ambassadors are consulted in the development process for the same reasons.

During this phase, personnel management examines whether and to what extent future users have the necessary competencies for the use of the digitized method. If deficits are identified, they develop appropriate training initiatives jointly with the knowledge ambassadors. Depending on prerequisites, these can range from simple training at the workplace to the development of e-learning units.

Even the best accompanying measures cannot completely prevent resistance to the application of methods. In this case, the knowledge ambassadors convince through their role model and good accompaniment. The responsible managers investigate the causes for the resistance of the individual employees in order to be able to set tailor-made initiatives. In any case, it is important that they use the digitized KM method themselves.

If digitization is still in its beginnings in the organization in question, it is helpful to gradually increase the level of digitization of the methods concerned. The steps that can be taken to achieve the smoothest possible transition are described below.

## *Stepwise Digitization of a KM Method*

A KM method currently used entirely without tool support does not necessarily have to be digitized immediately in its entirety. The degree of digitization can also be increased step by step in order to facilitate the changeover for all stakeholders. The steps can be taken as follows:

**Level 0:** The method does not require any tool support. The use of a word processing or spreadsheet system is to be assigned to this level.

**Level 1:** At most one process step of the method is carried out with the help of an easy-to-use tool.
Easy-to-use tools are found in the categories *communicating*, *searching*, *networking*, and *distributing*. Using tools in these categories is more or less self-explanatory and requires no training.

**Level 2:** More than one process step of the method is tool-supported. The tools used require more application knowledge than in level 1.
Here you will find tools in the categories *sharing*, *publishing* and *visualizing*. The setup, the text input and the use of these tools require some basic knowledge, which can be conveyed by short video clips or brief trainings.

**Level 3:** In more than half of the process steps of the method, tools from different categories are used and their use require sound application knowledge.
Tools of this level are located in the categories *survey* and *collaborating*. For tools in the *survey* category, knowledge is required to create qualitatively appropriate questionnaires. *Collaborating* category tools offer a variety of functions for virtual teamwork. Therefore, training is essential to use these tools productively in all group processes.

**Level 4:** All process steps are supported by tools, i.e. the method is fully digitized. Tools that require expert knowledge are also applied.
Here you can find tools in the categories *learning*, *gaming*, and *curating*. The adequate use of tools from the categories *learning* and *gaming* requires profound knowledge in software development. In the category *learning* knowledge of media didactics is also essential, in the category *gaming* special knowledge of game programming is mandatory. Tools of the category *curating* require knowledge of the information economy and basic knowledge in journalism.

There are methods that cannot be completely digitized for a variety of reasons. In these cases, only the relevant steps are digitized and justified, which stands in the way of further use of tools. For example, when exchanging experience and knowledge the quality of the results significantly increases in the case the participants meet in person. The reason lies in the increased neuronal activity of cerebral regions during direct personal contact.

## *Example for the Digitization of a KM Method*

The "simple" method "FAQ" (see Mittelmann 2011, p. 177; Mittelmann 2019, pp. 346-350) should serve as an example for digitization at this point.

### Use Description

1. collect for some time (depending on the level of specialization of the knowledge domain) similar questions and the corresponding answers
2. paraphrase similar questions in their simplest and most understandable form into one single question
3. supplement the best answer or answers if there are several alternatives
4. publish the FAQ list in an appropriate place (intra- or internet, as a document in a public folder, etc.)
5. add questions if necessary
6. change the answers when better ones are given

### Investigate Process Steps

This method can be investigated as a whole because the individual process steps are easy to handle. Questions and answers can be found mainly in social networks and in help systems of product providers. Searching these networks and help systems can be automated by searching and summarizing the results in text files.

According to the current state of the art, the wording of the questions and answers for the FAQ cannot be completely digitalized because there are still no sufficiently intelligent systems available for simple and understandable phrasing. Human interaction is indispensable at this point, as is the case with the revision in process steps five and six mentioned above. The publication can be completely digitized.

### Describe Requirements

Depending on the objectives and situation in the organization in question, tools of the categories *searching*, *publishing*, *curating* or *collaborating* may be deployed.

When implementing the digitized form of the FAQ, both the creators and the users of the FAQ must be supported. The former may require help in defining search queries, creating reports and entering finished question-answer pairs into the selected tool. The latter must be enabled to find the answers they need using the tool, or motivated to use the tool for their open questions.

### Stepwise Digitalization

**Level 0:** The question-answer pairs are collected in a text file and stored in a public folder.

**Level 1:** For the search of relevant (new) questions, answers and findings a tool of the category *searching* is used.

**Level 2:** For the authoring and publishing of the FAQ an additional tool of the category *publishing* is used.

**Level 3:** All collaborative process steps (initial creation, revision of the FAQ) are supported by a tool of the category *collaborating* and instead of a simple search engine, a tool of the category *curating* is applied.

This method cannot be fully digitized because there are not yet sufficiently intelligent systems available for the comprehensible and precise phrasing of FAQs.

## Summary

With the help of the procedure presented, each KM method can be checked for its digitization potential and further developed in the direction of a higher degree of digitization. However, it is very important that the employees concerned are **able** and **willing** to use these digitized methods. A gradual increase in the degree of digitization and corresponding support of implementation by management and "knowledge ambassadors" is indispensable and ensures long-term success.

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