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Developing a Framework for Wiki Terms in Knowledge Management

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ABSTRACT

The purpose of this paper is to study the existing wikis and the experiences of implementing wikis at the national and international levels. The result will be designing a specialized wiki in the field of knowledge management by describing the specialized terms of knowledge. The present study method is applied in terms of purpose, which was done by the documentary method. It should be noted that the Delphi method is used to document the framework. The findings described eleven cases of research related to the implementation of the wiki and its format, which was taxonomic. To provide a wiki framework, a review of previous sources and research related to the field of wiki building was done, and then the template was presented by studying the existing cases. Finally, a framework for creating the taxonomy of knowledge management in the form of a wiki is provided. Also, this research has two appendices: The first appendix provides the basic terms to be included in the taxonomic structure and be completed by users and professionals over time. The second appendix contains some examples of different wiki pages for patterning.

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1. Introduction

As intellectual capital, knowledge is considered one of the most valuable intangible assets in any organization, the management of which leads to competitive advantage in organizations (Dalkar, 2017). Since the 1990s, theorists have paid great attention to knowledge as a strategic resource and the primary source of competitive advantage in organizations; hence, organizations have become involved in implementing knowledge management systems. Despite the significance of technology, studies have documented that organizations have experienced challenges in using knowledge by technology in the early stages. However, with the advent of Web 2 and its technologies, including wikis, blogs, and forums, knowledge management systems have taken advantage of these technologies, especially wikis, to get away from their traditional approach (Alavi & Leidner, 1999; Davenport & Prosak, 1998; McAfee, 2006; McDermott, 1999; Walsham, 2002; Hassan & Pefaf, 2006 quoted in Kinney & Standing, 2013).

The knowledge management system (KMS) has not composed of only one specific technology; KMS is the result of a change in the naming of a group of technologies used in combination (Rampanahi; Nezafati and Siadat, 2016). One of the tools of the knowledge management system can be the wiki-creating of knowledge management and its processes. Because the role of wikis in meeting the information needs of users is undeniable. The results of the research show that the Wiki on the first page and first to third pages are placed, respectively, in 60 and 66% of search results (Shamsuddin Motlagh and Sangari, 2019).

The influence of social computing on knowledge management has made wikis a viable alternative to content management and document management systems today. Especially small companies due to having more cohesive interpersonal relationships, use this technology a lot (Moradi, 2009).

Wikis are considered because of features such as ease of content production and content placement, textual functions, and

internal social communication which their particular feature is that any person can provide, verify and update their information (Anthony, Smith and Williamson, 2009; quoted in Zheng, Nia, and Varscher, 2015). Wiki is a Hawaiian word meaning fast and is a web 0.2 tool that provides collaboration in the production or editing of content in online environments quickly (Biasuti, 2017).

The production of content in a group in the structure of wikis makes knowledge interconnected from different sources through interconnected pages, and therefore, the field for creating collective knowledge is obtained as a result of the interaction of individual knowledge. This causes new knowledge to be added to existing knowledge, which is one of the basic components of constructivist theory, and therefore this theory is one of the dominant theories in designing theories in designing and creating wikis, especially in the field of education (Higgs and McCarthy, 2005; Parker & Chao, 2007; Willis, Stevens, & Matthew, 1996; Sorovichki, 2004; Grant, 2006; quoted in Zheng, Nia, & Varscher, 2015)

Since traditional knowledge management systems have weakened points and researchers such as Hassan and Pfaf (2006) argued that these systems have difficulty in extracting implicit knowledge and are incapable in this regard, therefore, wikis are considered the next generation and replacement for these systems. Wagzer (2004) also argues that among web 2.0 technologies, Wiki has better features in capturing knowledge and maintaining it (quoted in Kiniti and Standing, 2013).

Although their value as a tool in the field of learning is still unknown, one of the applications of the wikis is in the field of learning and various research has studied wikis as a space for learning. According to this case, the educators have suggested that the use of wikis, whether inside or outside the university, is effective for participatory learning in distributing and sharing knowledge because collaborative writing provides a space for constructive learning

and creating common knowledge (Zheng, Nia, and Varscher, 2015).

Cooperation in the content production in Wikis by learners can also create the context of interaction of individuals. This leads to interactive learning, which provides the field of deep and enduring learning thinking. Because the interaction created in the wikis leads people to deep thinking. This feature is proportional to interactive web objectives or, web 2.0. This interactive web tool provides formal, subject-centric, and non-specific interaction (Liponen, 2002; Müller et al., 2005; Varscher & Grimes, 2007; Cited in Zheng, Nia, & Varscher, 2015).

The more advanced type of wikis, i.e semantic wikis, has been considered in various studies that usually focus on knowledge management. But a related field is also related to learning. Because knowledge management concentrates on results, but learning focuses on the process that leads to results. The connection between the two can be made in this way. Today, there is a focus on lifelong learning. In this type of learning, one has to constantly update his knowledge and adapt to progress. This type of learning requires a flexible learning environment. Therefore, social software and Web 2 tools such as blogs, wikis, e-portfolios, and instant messaging as well as Web 2 technologies play an important role in this regard (Scaffert, Biskoff, Berger, Gruber, Hilsenseuer, & Scaffert, 2006).

The purpose of this paper is to study the existing wikis and the experiences of implementing wikis at the national and international levels. The result will be designing a specialized wiki in the field of knowledge management by describing the specialized terms of knowledge management. Therefore, it can help people engaged in knowledge management activities in public and private organizations, as well as researchers and students in the field of knowledge management and since they easily become familiar with specialized and ambiguous terms and use them in the operational phase.

There has been a lot of research on the functionality of the wiki, but in this study, we are seeking what is the appropriate

framework for the terminology wiki in the field of knowledge management and what should be the taxonomic form of the wiki to representation?

2. Research Literature

Ward Cunningham in 1995, created the first wiki on the Internet, called WikiWiki Web. Usually, in wikis, texts are written using a simple markup language and can be edited by a rich text editor (Haghighat et al., 2020). Wiki is a type of social software. This software facilitates social interaction, participation, and information exchange, and even helps to strengthen communication-based on the activities of a group of users. One of the Wiki features is making the communication between several people and the content categorization. A wiki allows a group to collaboratively develop a website, such as a project, knowledge, or resource website. There are different types of wikis, including Wikipedia, T-wiki, Wiki suite, Medical wikis, Scholarpedia, and so on. Wiki Suite is a semantic wiki with a special approach that allows users to create, edit, and label pages using a shared and objective concept but behind the scenes and away from the mind. It is possible to observe the developing model labels and reorganize them for wiki experts. The name Wikipedia is derived from the two words wiki and the Latin equivalent of the encyclopedia. This project was launched in 2001 as a supplementary for a professional encyclopedia called Napedia, which has gradually become a serious competitor to professional encyclopedias and reference resources (Moradi, 2009).

There are other salient features of wikis including co-authorship, instant release, version management & simplicity of the compilation. Co-authorship means that different users can modify their content or create new content. The second feature implies that there is no examination or review in publishing pages on wikis. The third feature indicated there is a way to track the author and related information to prevent sabotage of content. The fourth feature signifies that users can easily create content

and do not need special expertise to do so (Kinney and Standing, 2013).

Scaffert, Biskoff, Berger, Gruber, Hilsenseuer, and Scaffert (2006) listed other features for wikis. Editing wiki content, for example, does not require any expertise or skills for HTML or utilities, but can be edited through a simple browser. Version management also allows the previous version to be preserved if a page is changed, so it is possible to compare the previous version with the modified version. Another feature is that the links between pages are possible through keywords. In this way, the words with different colors and in the form of hyperlinks connect to another page by clicking on them.

The structure of a wiki can be designed using Ontology. Ontology is a description of a set of concepts that represent real objects in the world. These concepts are defined and connected by relationships, which shows how these concepts relate. The main elements of ontology are concepts, relationships, and characteristics. That is, the ontology identifies the relationship between concepts in real-world documents, which makes the relevant documents processable and understandable by machines, and facilitates the sharing of information between agents (Bavkhani, 2015).

The Semantic wiki consists of the benefits of the wiki and the semantic web technologies. A semantic wiki allows users to make a formal description of a resource by annotating it on the relevant page. When a regular wiki enables users to describe resources in natural language, this is done in the official language of the semantic wiki. Formalized knowledge is provided using the Semantic Web Framework and, therefore, accessible and reusable by web tools. The wiki also provides features such as the direct search for margins, browsing the wiki with margins, and displaying background knowledge of the system. Today, semantic wikis are either built on a specific wiki engine and offer semantic web extensions, or are created from drafts that the designer has had in mind about semantic web technologies. In general, a wiki consists of four basic elements, including content,

template, wiki engine, and wiki pages (Moradi, 2009).

Wikis with all the potential benefits face a serious challenge and can be edited by different people. In fact, sometimes people try to abuse the editing feature in the wiki. Grant (2009) examined this issue among high school students. His research has shown that students in some cases try to remove the opinions of others or present aggressive ones against the others' viewpoints. Therefore, modeling social etiquette in making wikis is one of the important topics (quoted in Zheng, Nia, and Varscher, 2015).

One solution that can ease the burden of this challenge is to create a tutorial for the wiki. Cole (2009) reported in his study that one of the reasons students did not participate in wikis was due to the lack of explicit training for using wikis. Cowan and Jack (2011) also identified technical problems and lack of user-friendliness as factors that have caused this challenge (quoted in Zheng, Nia, and Varscher, 2015).

3. Methodology

The present study is applied in terms of purpose, which was done by the documentary method. To provide a wiki framework, a review of previous sources and research related to the field of wiki building was done, and then the template was presented by studying the existing cases.

Taxonomy was used to provide the framework. The advantage of using a taxonomy is that it categorizes relevant terms, thereby enhancing the possibility of finding a correct term in searching for or describing an object. It can help users to know whether the two terms are valid or whether they are related or not. This is what is often considered in hierarchical relationships (Samiei, 2009). In other words, using taxonomies in wiki design can be effective. It should be noted that the Delphi method is used to document the framework.

4. Research background in Iran

Quran Wiki is a wiki localized by the Deputy of Information Technology and Quran City of the Iranian Student Activities Association affiliated with the Academic Center for

Education, Culture, and Research. The Wiki was developed to attract public participation in producing a Quranic encyclopedia on the Internet and viewing and using the pages by non-member users. The members, after membership, can save their content obtained from contemplation in the verses of the Qur'an in the appropriate group. The users can also save articles previously written by others as a new page to make groups richer. Pages already added to the encyclopedia by users can be observed in the All Pages section. It is also possible to classify your desired page after creating it in the form of one of the existing groups (Nafei, 2007).

Shamsuddin Motlagh and Sangari (2019) in their research entitled The study of the use of library documentary data in Persian wikis (Case study of the Shia wiki) to investigate the use of documentary library data in the Shia wiki. The statistical population included all the entries of Persian Shiites in the wiki. Findings show that 88% of the surveyed entries are available in library document databases. Furthermore, information on more than half of these entries is available in more than five surveyed databases, and the difference between the averages of documented databases and the entries of the Shiite wiki is significant at 95%.

5. Research background outside Iran

Razmerita and Krichner (2011) reviewed the effect of Web 2.0 tools, including Wiki, on knowledge management. They also investigated the effects of using wikis and social networks in a sample organization. In their study, the concerned tools played an effective and multifaceted role in knowledge sharing and management, and the tools were considered a pastime for employees. This is while wikis are less popular among employees than social networks. However, employees' interest in using wikis does not motivate them, and organizations should support such methods and tools and create and promote

Kenety and Standing (2013) aimed to detect issues and challenges affecting the implementation of wikis as knowledge management systems. To this end, they reviewed previous empirical studies on

establishing wikis in organizations in databases such as ProQuest, ScienceDirect, Emerald, IEEE Library, and Academic OneFile. Reviewing 23 articles, they extracted six main challenges, including the lack of a specific purpose for the Wiki, the usability of the Wiki, the integration of wikis into established practices, social issues, the role of management, and the organizational culture supporting knowledge sharing and collaboration. After identifying these challenges and critically reviewing the resources, they developed a model to implement the wikis, which was based on the acceptance and use of wikis in-dash management. The model encompassed four main activities: goal setting for wiki building, wiki implementation strategy, user engagement, and certainty of acceptance and value. In general, to accept a wiki, you need to choose goals aligning with the organization's goals, select a strategy supported by management to be implemented, achieve user involvement by motivation, and ultimately create a culture of knowledge sharing. Another application of their model was to identify areas of research that needed to be addressed.



Figure 1. Kinetic and Standing Model (2013)

Biasouti (2017) carried out a comparative analysis of forums and wikis as tools for online collaborative learning. In this regard, this researcher analyzed the data from a project, including forum discussions, and designed the Wiki, quantitatively and qualitatively, using a coding scheme based on indicators such as inference, production, development, evaluation, summarization,

Table1. Comparison of features of wiki implementations

	Language	Ease of Install	Version control	Access control	File attachments	Data storage
Tipiwiki	PHP	Easy	No	No	No	Flatfile
WikiAsp	ASP	Easy	No	No	No	MS Access
Kwiki	Perl/Cgi	Fair	Yes, as option	Yes, as option	Yes, as option	Filesystem
JSPWiki	JSP	Fairly easy	Yes, as option	No	Yes	Filesystem
Instiki	Ruby	Very easy	Yes	Basic	Yes, as option	Filesystem
Twiki	Perl/Cgi	Fair	Yes	Advanced	Yes	Filesystem
Perspective	.Net	Fair (XP SP2 issues)	Yes	Yes	Yes	Filesystem
MoinMoin	Python	Moderate	Yes	Yes (ACL)	Yes	Filesystem
TikiWiki	PHP	Hard	Yes	Advanced	Yes	Database

organization, and support. Qualitative aspects were also assessed using an open questionnaire. The findings revealed that the forums mainly used inferencing, evaluating, organizing, and supporting discussions, and wikis mainly covered the production and development processes. The forums' goals were mainly useful for discussing and sharing ideas; however, wikis were used to create a shared document. Finally, access to forums was easier, and wikis had some challenges.

6. Findings

The findings described eleven cases of research related to the implementation of the wiki and its format, which was taxonomic (respectively, wiki research and then taxonomies with their date):

Tonkin (2005) suggests that a wiki for collaborative writing should possess a page lock system, a copywriting system, and the potential to delete the editability of a page temporarily. It should also have an efficient search function, effective navigation and

classification, and file management capabilities as a knowledge base. Tonkin (2005) compared some samples of the existing wikis (Tables 1 & 2).

Table 2. Comparison of external features of wiki implementations

	Syndication	Data export	Search	Locking	Suggested use
Tipiwiki	No	No	Yes	No	Simple applications
WikiAsp	RSS	XML	Yes	Collision protection	Small scale sites
Kwiki	RSS option	Not default	Yes, as option	Collision protection	Midscale sites
JSPWiki	RSS	No	Yes	Yes	Small-medium scale sites
Instiki	RSS	XML, TeX, PDF	Yes	Yes	Small-medium scale sites
Twiki	Extensive	Yes, as option	Yes	Yes	Intranet/internet site
Perspective	RSS	No	Yes	Yes	Intranet (good Office integration)
MoinMoin	RSS	No	Yes	Yes	Small-medium scale sites
TikiWiki	Yes	Yes, eg PDF	Yes	Yes	Intranet CMS

Scaffert, Biskoff, Berger, Griver, Hilsenseuer, and Scaffert (2006), in their study, aimed to introduce a semantic wiki, which is a combination of wiki technologies and a semantic web. They first described the common features of wikis and semantic wikis and then elaborated on different

aspects of semantic wikis. Afterward, they introduced their semantic Wiki, called IkeWiki, as an effective learning tool. The IkeWiki uses an interactive WYSIWYG editor as well as a structured text editor. This Wiki can have the immediate use of annotations. That is, as soon as the content is saved, it is made available to the public. Another feature of this Wiki is that it supports different levels of experience. That is, both learners and non-technical individuals, as well as professionals, interact with each other. The other feature is its support for various levels of authentication. That is, knowledge can be extracted from informal texts to formal ontologies. The IkeWiki also supports arguments that are effective in obtaining tacit knowledge. It is also compatible with Semantic Web standards and some other Wikis, such as Wikipedia. The following figure illustrates a sample entry in this Wiki (as described in their paper).

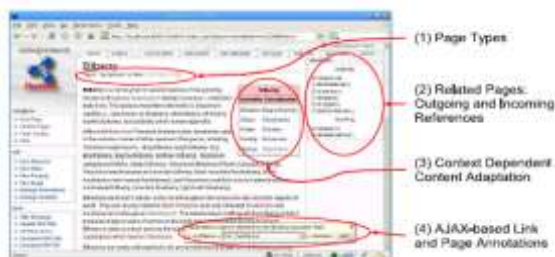


Figure 2. A sample page from IkiWiki

Kronian (2009) examined an experimental project on developing a marketing wiki by marketing management students, in which students created an interactive textbook using the wiki software. This wiki textbook should substitute for the textbook and help other students learn. In this research, two research questions were raised and answered: (1) Does the Wiki lead to the acquisition of common skills in marketing students? (2) Does the wiki help students actively learn course content?

In this project, students are allowed to edit weekly so they can edit other students' pages. The History option in the wiki programs allows the editor to be identified and lets anyone refer to the previous version if needed. Their instructor can monitor each student's activities separately. The software for this project was selected with the help of

the university's computing department, XWiki, which possesses a WYSIWYG editor. This editor is highly similar to the word processors familiar to the students. Incentive systems were defined for student work, and as the 300-page wiki book was planned, each student had to write 12 pages and edit a certain number of pages, and there were some rules and regulations for writing and editing. The author concluded that Wiki effectively improves student collaboration skills; however, its effects on learning cannot be measured.

Bebo et al. (2012) examined the effect of wikis on the organization's knowledge management, specifically NBC. In their study, the staff was encouraged to share their tacit and useful knowledge on the Wiki for other colleagues to view and use, and to be archived. The organization first developed the Confluence software to develop the Wiki. This program can create the desired hierarchical structure and provides a powerful search engine at the same time. More specifically, the organization launched two servers to run the wiki platform: a software server to display wiki pages and an oracle database server to handle structure and content, as well as user information and history. Gradually, as wiki status improved, the staff discovered the Wiki's enormous potential in improving knowledge management. A team was then formed, which needed to gather valuable staff knowledge, and they spent ten months accomplishing this task. To this end, the team first carefully analyzed the work processes based on its organizational structure. Finally, the study revealed that the Wiki successfully pushed key personnel toward knowledge sharing and became a core knowledge base, based on which everyone could add or modify wiki content by creating a valuable collective knowledge resource. The Wiki allows employees to collaborate efficiently in different time zones across different continents. Wikis can also be a powerful knowledge management tool for businesses, which must quickly adapt to changing market demands.

Zheng, Nia, and Varscher (2015) designed projects for students to do research on Web 2

tools and create a wiki accordingly. The project was an international collaboration between the United States and a university in China. The students were divided into groups by their geographical location, and each group was responsible for a learning section on Web 2. The students then expressed their ideas about the structure of the wiki face to face, and after being finalized by the instructor, they began to create content. The feedback then led to the design of a second activity in which the first-year graduate students in educational technology collaborated on Google Earth using the MediaWiki platform. The two modifications made in the second project were as follows: (1) The participants registered and were given a specific responsibility, and (2) Special training was offered. In the third stage and repetition, several male and female students started working again using the MediaWiki platform. In this stage, the group was formed using the feedback of the previous two stages, and the individuals registered for sub-topics. The instructor then presented some examples from the previous cases to justify the students, and the instructor played no role but as a facilitator in creating content. The students then participated in a structured discussion, with a focus on group structure and having a leader at this stage. Finally, in the fourth stage, individuals from different regions were selected to participate in this project. What was most noticeable at this stage was the further involvement of the individuals in the discussion groups to complete the project at different stages. Their findings led to three general strategies, each of which had three sub-strategies. The first strategy was to create a learning community with three sub-strategies (namely group formation, role setting, and social media support). The second strategy was to support knowledge building with three sub-strategies, including choosing a topic tailored to individuals' interests, using discussion pages, and evaluating the Wiki. Finally, the third strategy was cognitive internships, which included pre-activity, during-activity, and post-activity sub-strategies, in which the instructor used the scaffolding method in

different stages to teach students. In this project, wikis were used as a learning tool. In general, the findings were favorable, and the used model can be extended to other fields.

Nei, Ma, and Nakamuri (2007) conducted two studies to reach a comprehensive and better understanding of knowledge management. In their first study, they covered six key topics in knowledge management using domain analysis for reputable knowledge management journals. In the second study, knowledge management in a more general field, namely knowledge science, was examined, and they provided a description of how knowledge management is associated with other research areas. In the first study, they presented a taxonomy to understand knowledge management, as presented below.



Figure 3. Taxonomy of Ni, Ma and Nakamuri (2007)

Their taxonomy helps to make the following conclusion about knowledge management: The result of re-changes inside and outside the organization is that economic growth, globalization and the knowledge community outside the organization and organizational learning, change, and culture and society within the organization create knowledge management practice, thereby improving the organization's competitive advantage, competence, and others. Moreover, to deal with strategy-based knowledge, information-based knowledge, human-centered knowledge, process-based knowledge, soft methods such as knowledge staff, senior officers, and others, as well as complicated technologies such as information technology, information systems, knowledge management systems, and others to support knowledge are developing, and knowledge management has been adopted in many areas such as project management and product development.

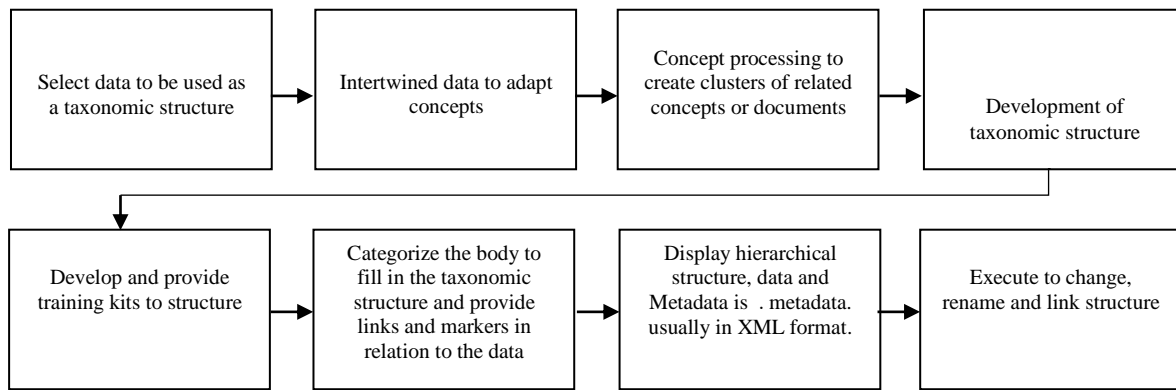


Figure 8. Samiei Taxonomy (2009)

Samiei (2009) describes a taxonomy and its concept, processes, principles, and theories, methodology, and its advantages. He also described different types of taxonomies and the benefits of taxonomy. The taxonomic process in his research is as follows.

In his paper, Krane (2013) presented a new taxonomy of knowledge management theory. This researcher critically reviewed some influential theories on knowledge management and offered a new approach to the study, practice, and theorizing of knowledge management, which developed the ecological perspective of knowledge management. Their taxonomy is presented below. It should be noted that each star in this figure represents a theory or framework, and they follow a chronological order to examine trends. Accordingly, in the sample under study and since the 1990s, knowledge management has focused more on organizational knowledge, and most current theories look at knowledge management as social action.

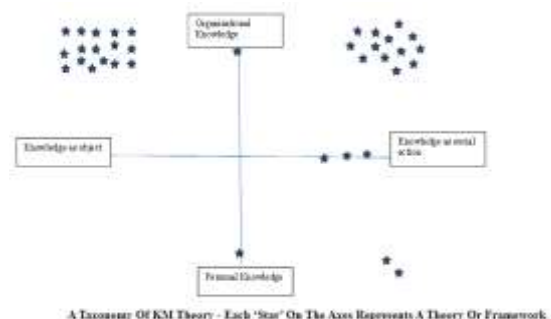


Figure 4. Cria Taxonomy (2013)

Al-Ama (2014) proposed a taxonomy of knowledge management technologies representing a list of these contributing technologies and processes. This researcher

developed his taxonomy by reviewing the literature in this field and analyzing various sources of knowledge in the municipality of Jeddah in Saudi Arabia for three years. The findings revealed that the taxonomy of knowledge management technologies could help strategists select the right tools to design effective systems. Their taxonomy is presented below.

	Knowledge sharing tools Enables employees to share the organizational knowledge	Knowledge storage tools Enables the flow of information throughout an organization and employees can access and benefit from it	Knowledge capturing tools Enables the organization to capture knowledge and create it from being lost and its immediate implementation to reuse it	Knowledge training tools Enables employees to learn with knowledge and to add it to the organization's knowledge base
Electronic databases and search engines	Yes	Yes	Yes	Yes
Group collaboration tools	Yes	Yes	Yes	Yes
Web 2.0 tools	Yes	Yes	Yes	Yes
Wiki	Yes	Yes	Yes	Yes
Flash technologies (such as RSS feeds)	Yes	Yes	Yes	Yes
Electronic threads	Yes	Yes	Yes	Yes
Forum	Yes	Yes	Yes	Yes
Electronic chat rooms	Yes	Yes	Yes	Yes
Videoconferencing	Yes	Yes	Yes	Yes
Office automation systems, including word processing and desktop publishing	Yes	Yes	Yes	Yes
Electronic management systems	Yes	Yes	Yes	Yes
Communication and collaboration systems	Yes	Yes	Yes	Yes
Blog	Yes	Yes	Yes	Yes
Electronic bulletin boards	Yes	Yes	Yes	Yes
Media libraries	Yes	Yes	Yes	Yes
Electronic document libraries	Yes	Yes	Yes	Yes
Organization maps	Yes	Yes	Yes	Yes
Event calendars	Yes	Yes	Yes	Yes
Virtual calendars and expert systems	Yes	Yes	Yes	Yes
Electronic support systems	Yes	Yes	Yes	Yes
Electronic repositories	Yes	Yes	Yes	Yes
Learning helpdesk and call center systems	Yes	Yes	Yes	Yes
Helpdesk and call center scripts	Yes	Yes	Yes	Yes
Virtual reality and modeling tools	Yes	Yes	Yes	Yes

Figure 5. Al Ama Taxonomy (2014)

Bolisani and Scarsoe (2015) aimed to identify possible approaches in strategic knowledge management planning to fill existing gaps. They were inspired by the classical literature on strategic planning and proposed a taxonomy based on two dimensions. The two dimensions encompassed the nature (rational vs. emergence) of the planning process and competitive factors (internal and external), which guided the formulation and implementation of knowledge management strategy. They also provided some example companies to describe the distinguishing aspects of strategic knowledge management planning approaches and then evaluate the

usefulness and compatibility of the proposed taxonomy.

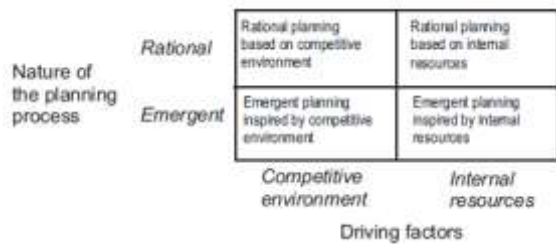


Figure 6. Taxonomy of Bolisani and Scarsu (2015)

Kerchion and Esposito (2017) examined the prevalence and intensity of using knowledge management systems in small and medium-sized enterprises (SMEs) and also proposed a taxonomy of strategies for using knowledge management systems in these companies. The following tables show their taxonomy of the knowledge management tools and methods supported by SMEs.

Table 5
Taxonomy of KM-Tools.

KM-Phase	Tools
Knowledge Creation	Data Mining Data Visualization Expert Systems Social Data Mining Text Mining Collaborative Filtering Crowdsourcing Systems Mash-up Prediction and Idea Markets Syndication Systems Trust and Reputation Systems Databases Data Management Systems Data Warehouse Document Management Systems Decision Support Systems
Knowledge Storage	Business Process Management Systems Configuration Management Systems Content Management Systems Product Data Management Systems Product Lifecycle Management Systems ERP Systems
Knowledge Transfer	Cloud Computing Learning Management Systems Peer-to-Peer Resource Sharing Podcasting/Videocasting Social Media Wiki Audio conference/Video conference Blogs Chat Conversational Technologies E-mail

Table 6
Taxonomy of KM-Practices.

KM-Phase	Practices
Knowledge Creation	Brainstorming Ideas Competition Knowledge Elicitation Interview Benchmarking Knowledge Filtering Rating
Knowledge Storage	Causal Mapping Knowledge Mapping Knowledge Modelling Problem Solving Process Mapping Social Network Analysis After Action Review Balance Scorecard Best Practice Contextual Inquiry Knowledge Office Lesson Learned
Knowledge Transfer	Case Based Reasoning Coaching/Mentoring Communities of Practice Communities of Sharing Focus Groups Job Rotation Learning by doing Project Teams Training Work Groups Facilitated Discussion Meeting/Task Force Informal Networks Knowledge Cafes Seminars Storytelling

Figure 7. Kerchion and Esposito Taxonomy (2017)

7. Conclusion

A review of literature on the effectiveness of wikis in learning has revealed positive findings. Moreover, it is revealed that wikis support thinking and knowledge management skills (Donnelly & Bonifeice, 2013; Biasouti & Al-Daqaeidi, 2012; quoted in Biasouti, 2017). As mentioned, template theory in developing wikis is a theory of constructivism because it adds new knowledge to individuals' existing and previous knowledge.

In general, the advantages of a wiki can be summarized as follows: a newer approach to knowledge management systems, meeting users' information needs, creating coherence in interpersonal relationships, facilitating content production and social communication, facilitating content production and information editing, producing group content, providing collective knowledge of individual interactions, extracting tacit knowledge, and distributing and sharing knowledge for deep thinking, participatory, interactive, and lifelong learning, lack of specialization, and others.

However, wikis also face challenges, the most important of which is the likelihood of abusing the potential for creating and editing content by the general public. Accordingly, this factor has made the content extracted from wikis have the necessary documentation among the scientific community. Technical problems and user-friendliness must include also the other challenges. Accordingly, it is of paramount importance for wikis to model the etiquette of socialization in creating a wiki and develop an educational guide.

Several wikis are used as knowledge management systems, the most popular of which are MediaWiki, Moinmoin, Oddmuse, Pmwiki, Phpwiki, Tikiwiki, TWiki, and Usemod. The wikis address targeted users, programming languages, database systems, and user interfaces (Yang, Wu, Ling, & Yang, 2008).

As reported by Tonkin (2005), the comparison of existing popular wikis suggests that wikis are written in various languages, the most popular of which are

PHP, Perl, Python, and others. Most wikis are easy to install; however, there are some cases with highly difficult set-ups; hence, this key point should be considered in choosing a wiki. Most of them also have version control, access control, and the potential to add attachments; however, some others do not. The same access control is another important point for a wiki since if access can be restricted and determined, it may be possible to have more control over the content authenticity created in the Wiki. Finally, the data files of most wikis are system files. The other features include a search feature in all wikis and a locking system in most wikis. The features of two popular wikis are explained below.

MediaWiki uses MySQL as the database system, making it easier to categorize and manage web pages. It is also more popular than other systems, and many users are familiar with this Wiki. It supports different operating systems, is easier to set up and install, has high flexibility, and supports many languages such as Chinese, English, and others. The default of MediaWiki is UTF-8 (Yang, Wu, Ling, & Yang, 2008).

TiddlyWiki was developed using JavaScript. It is portable and can be inserted into a USB drive or flash drive. For example, it can be used to manage personal knowledge using a web browser to open and edit content. Users can also upload and update content from their personal knowledge base on the update server. Accordingly, gathering information and knowledge is easy for users (Yang, Wu, Ling, & Yang, 2008).

Finally, the main problem with Wikis is that they support many languages. Although many Wikis offer full Unicode support that allows you to write content in any language, the vast majority of wiki engines and even internationalized engines can support one language on a particular site at the same time (Assiltz, Gonzalez, Paget, & Stojanovic, 2006). Accordingly, language issues are also among the important points in developing a wiki. Moreover, as stated in Tonkin's (2005) study, a wiki should have a page lock system, a copywriting system, and the potential to temporarily delete editable content for a page, and it, as a knowledge

base, should have an efficient search, navigation, and effective categorization function and the potentials to manage files. Accordingly, choosing an effective classification system to be used in wiki design is of great importance.

There are different classification systems; however, in the field of knowledge management, taxonomies are used.

Suggestions to create a knowledge management wiki

Samiei's (2009) proposal for creating a taxonomy was used to develop and create a knowledge management taxonomy in the form of a wiki.

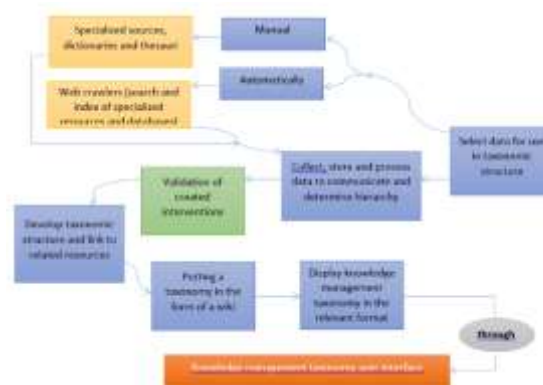


Figure 9. Pattern of creating knowledge management taxonomy in wiki format

First, the data for the wiki entries were selected manually or automatically by searching the web and specialized databases and resources such as knowledge management encyclopedia, knowledge management manuals, and other specialized knowledge management texts, as well as reputable sites on knowledge management frameworks, including APQC, APO, EFQM, Siemens, and others. The collected data must then be processed to create the required hierarchy. At this stage, the subject matter experts can annotate or comment to edit semantic content, and document specialized terms and concepts, or perform data validation by artificial intelligence automatically.

This takes the Wiki away from its format capability (i.e., speed in creating content) and requires remarkable human and financial resources. The positive, however, is that the content provided has the necessary credibility in this area of expertise and can be cited. Taxonomic concepts must then be

developed and continually enriched, and linked to relevant resources to provide search and access to related resources. Finally, the concepts have the ability to be included in the relevant wiki format, and the taxonomy can be displayed to users via the wiki interface.

It should be noted that users should be able to click on any option and taxonomic terms to connect to a set of relevant resources in the concerned field. The resources referred to in the taxonomy terms derived from specialized dictionaries can be labeled by examining the principles of relevance and its rules or, in the simplest case, by the author's keywords. Here are some suggestions on how to look or get an appointment for taxonomy on the first page of the wiki.

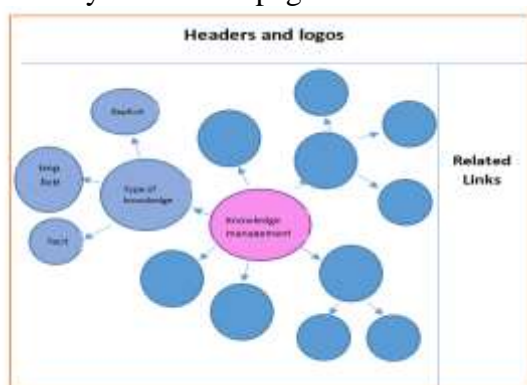


Figure 10. Suggested template for taxonomy the first page on wiki

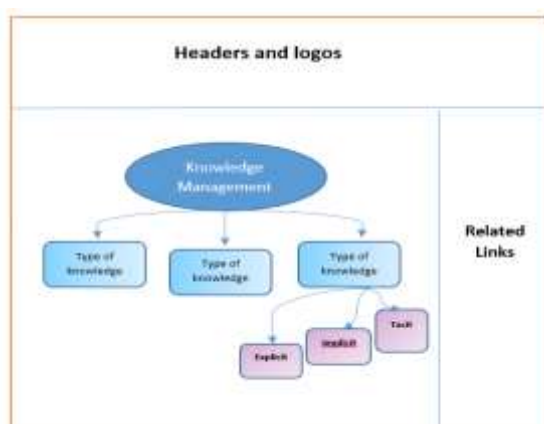


Figure 11. Suggested template for taxonomy the first page on wiki

As mentioned, the suggested items are related to the first page of the wiki interface, which shows the taxonomy at a glance, which, of course, is designed in the simplest case and can be enriched in the next step after the graphic dimensions.

The user can then search or click on any of the concepts to access a collection of relevant resources in that field. In this regard, it is suggested that the appearance of the resource page should be similar to the dominant items in the Wiki, as in Wikipedia or the IkeWiki.

Finally, this research has two appendices: The first appendix provides the basic terms to be included in the taxonomic structure and be completed by users and professionals over time. The second appendix contains some examples of different wiki pages for patterning.

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Appendix 1: Taxonomy of Knowledge Management

When we build a knowledge management system, the words and the relationships among them is one of the requirements of its knowledge map. Basically, the main result of the knowledge mapping process is to create a kind of hierarchical grouping of words acting as a benchmark for shaping the organization's knowledge management system. Knowledge taxonomy acts a classification of structured words representing the relationships among words (Libo Weitz, 2013).

➤ Knowledge Management

Best Practice

Business

- Value Chain
- Business processes
 - Information oriented
 - Decision-oriented
 - Labor flow
 - Participatory

Business models

- B-KIDL
- Calpic and Bernus
- delmeris
- Grona
- Hen Park
- Janak
- Kim
- KMDL
- Papavasilio
- Stromeyer and others
- Tavares Nunes and others

Change management

Chief Knowledge officer (CKO)

Community of practice (COP)

Competence

Competitive Advantage

Content management

Critical Success Factors (CSF)

- Budget and financing
- cultural factors
- Information and Communications Technology
- Knowledge content
- Linguistic factors
- Management factors
- Motivational factors
- Organizational context and structure
- Organizational strategy
- personnel
- Political
- psychological factors
- Social and environmental factors

Culture

- Organizational Trust
- credence
- obligation

Customer

- Customer attraction
- Customer development
- Customer Re-Interaction
- Customer retention

Domain of knowledge

Entrepreneur

Evaluation and monitoring

- performance evaluation

Experience

Failure

Finance and Assets

- Financial ownership
- Financial application
- Financial entrepreneur
- Financial Communications
- Financial change

Generations of knowledge management

- first generation
- second generation
- third generation
- Fourth generation

Intelligence

- Business Intelligence
- Competitive Intelligence
- Emotional Intelligence
- organizational intelligence

Knowledge agent

Knowledge Economic

- Commercialization of knowledge
- Demand for knowledge
- Knowledge supply

Knowledge hierarchy

- Data
- Information
- Knowledge
 - The opinion of philosophers on knowledge
 - ❖ Aristotle
 - ❖ Descartes
 - ❖ Hegel
 - ❖ Heidegger
 - ❖ Hyum
 - ❖ Kant
 - ❖ Locke
 - ❖ Plato

- Types of knowledge
 - ❖ Advanced knowledge
 - ❖ basic knowledge
 - ❖ Conceptual knowledge
 - ❖ Dedicated knowledge
 - ❖ Expected knowledge
 - ❖ explicite knowledge
 - ❖ Green knowledge
 - ❖ Implicit knowledge
 - ❖ indicative knowledge
 - ❖ Methodological knowledge
 - ❖ Procedural knowledge
 - ❖ public knowledge
 - ❖ Real knowledge
 - ❖ Tacit knowledge
 - ❖ Unique knowledge

- Wisdom

Knowledge innovation

- Idea generation
- brain storm
- Innovation network
- Open innovation
- Process

Knowledge Logistics

Knowledge map

- Knowledge visualization

Knowledge Network

- Actor Network (Latour)
- Innovation network
- knowledge network
 - Individual
 - Group
 - Organizational
 - Inter-organizational

Knowledge workers

Knowledge spillover

Knowledge security

- Access to knowledge
- Cloudy space
- Control
- Information Technology
- Knowledge guarantee
- Knowledge monitoring and evaluation
- Knowledge risk
- Knowledge storage
- privacy
- Restrictions

Knowledge translation

Key performance indicators(KPI)

History of knowledge management

Intellectual Capital

Lesson Learn

Maturity

Mission of the organization

Models

- Ashuk Jashapara
- Birkinshaw & Sheehan (2002)

- Boysut
- Whig (1993)
- Choi (1996)
- Bokotiz, Williams (1999)
- Hisik (2000)
- Rao Model (2003)
- Dalker (2005)
- Damarast(1997)
- Davenport and Prosak
- KMAT 6 Model (APQC)
- Knowledge conversion
- knowledge creation
- Knowledge spiral (helical model)
- Knowledge-creating companies
- Mayer and Zak (1996)
- McAlroy 1999
- Nonaka and Takeuchi (1995)
- Scandinavia (1996)
- Seven Thirty Model
- van croek & Ross (1995)

Objectives of the organization

Organization

- APO
- APQC
- BSC
- EFQM
- Siemens

Organizational knowledge management

Organizational learning

- Types of learning
 - Adaptive learning
 - ❖ Single loop learning
 - ❖ Double-loopd learning or Deuteron learning
 - ❖ Three-loop learning
 - Anticipatory learning
 - Practical learning
- Learning levels
- Learning skills
- Peter Senge
- Shayan
- Learn Bloom
 - Bloom's Taxonomy or Learning Pyramid
 - ❖ Cognitive
 - Remembering
 - Understanding
 - Applying
 - Analyzing
 - Evaluating
 - creating
 - ❖ Affective
 - ❖ psychomotor

Organizational memory

Organization vision

Personal knowledge management

- Methods of transferring personal knowledge

- story telling
- interview
- Observation
- Examining the objective knowledge of the individual
- Creat community of practice(cop)

Personalization of knowledge

Pillars of knowledge management

- Persons
- Process
- Technology
 - Hardware
 - Software
 - Customer management software
 - Data bases
 - Digital library
 - Ideation system
 - Knowledge management software
 - Organizational portal
 - Social Networks
 - Social network analysis
 - Public social networks
 - ❖ Facebook
 - ❖ Instagram
 - ❖ Twitter
 - ❖ Youtube
 - Specialized social network
 - ❖ Academy
 - ❖ Bibsonomy
 - ❖ CiteUlike
 - ❖ LinkedIn
 - ❖ Mendley
 - ❖ Research Gate
 - Social software
 - ❖ Telegram
 - ❖ Whatsapp
 - ❖ Skype
 - General technology
 - ❖ Wiki
 - ❖ email
 - ❖ weblog
 - Artificial intelligence

processes

- Knowledge recognition
- Acquisition and extraction of knowledge
 - Business Intelligence
 - Datamining
 - Gamification
 - Social networks
- Knowledge audit
 - Knowledge assessment
 - Knowledge assets
 - Knowledge flow
 - Knowledge gap
 - Knowledge map
 - Knowledge requirement
 - SOWT
- Organizing knowledge
 - Ontology of knowledge
 - Taxonomy of knowledge
 - Knowledge documentation
- Dissemination of knowledge
 - Reward

- Development knowledge
- Application of knowledge
 - Decision making
 - ❖ Simon model
 - ❖ garbage can model (GCM)
 - Problem solving
 - Skill
- knowledge creation
 - Socialization
 - Externalization
 - Combination
 - Internalization

Purpose and importance

- brain storm
- Competitive Advantage
- Continuous improvement
- Efficiency
- Idea generation
- Innovation
- learning
- Performance upgrades
- Value Added
- Perform missions to achieve the goals and vision of the organization

Quality management

Resource management

Risk management

Schools of knowledge management

- Organizational school
- School of Economics
- School of Strategic

Sense of knowledge

Smart City

Standards

- ISO standards
 - 30401

Strategy

Supply chain

Talent

- Talent development
- Talent identification
- Talent replacement
- Talent retention

Theoretical and philosophical foundations

- Epistemological perspective
- Ontological perspective
- Company theory
 - knowledge base
 - Source-based

Theorist

- Davenport
- Michael Polanyi
- Nonaka
- Peter Drucker
- Peter Singh
- Prusak

Appendix 2: Examples of Different Wiki Pages



Figure 1. TWIKI



Figure 4. WIKIDATA



Figure 2. SCHOLARPEDIA



Figure 5. WIKTIONARY



Figure 3. MEDIAWIKI



Figure 6. WIKIBOOKS



Figure 7. WIKIMEDIA