# KM SOFTWARE SOLUTION AT VARNA FREE UNIVERSITY – COMPARATIVE ANALYSIS

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## ABSTRACT

The role of Knowledge Management (KM) in the educational institutions is of great importance and the main function of educational organizations is the KM. KM includes the process of capturing, creating, disseminating and applying all forms of knowledge within an organization in order to fulfill institutional goals. The use of the KM solutions and principles can lead to more flexibility in teaching and learning processes and in university management. This paper presents findings of a case study conducted at Varna Free University (VFU). KM solution has to optimize the processes of development, dissemination and storage of knowledge at the Institute of Technology. Comparative analyses are provided to outline proper software for implementation and a prototype of KM system to be designed. The focus is to connect people, processes, and technology for the aim of leveraging knowledge. The success of this project depends on the active participation of the whole team of the Institute of Technology. This solution will allow for the creation of a common knowledge base to be developed in cooperation. The loss of personal knowledge can be prevented by sharing implicit knowledge in a wiki module. By accessing the organizational knowledge base, valuable information can be extracted and thus reduce the problems of leaving staff and training new staff. By linking structured content, it is possible to optimize search processes and support joint and individual research, training and administrative activities. Interdisciplinary references to additional information can improve the quality of learning processes, research and project activities, as well as administrative management.

## KEYWORDS

KM, Educational Organization, Software Solution

## 1. INTRODUCTION

Nowadays Higher Educational Institutions (HEIs) face great challenges and KM has increased in credibility as a management tool. There are numerous definitions describing KM as a systematic process of capturing, creating, structuring, disseminating and applying all forms of knowledge throughout an organization in order to fulfill some objectives such as to optimize work, reuse best practices and reduce costs (Nonaka & Takeuchi, 1995; Ruggles & Holtshouse, 2001; Dalkir, 2011).

The transfer and reuse of tacit knowledge is important in every organization. As universities are an important part of our society and play a significant role in the transfer of tacit knowledge, it is vital that teaching staff engage in transferring tacit knowledge not only to their students but also amongst their peers too (Chugh et. al, 2015). The findings have revealed there is a high level of discontent towards making tacit knowledge transfer mandatory, particularly because it can be challenging to measure.

Cranfield & Taylor (2008) presented the initial findings of a case study conducted at seven HEIs within the United Kingdom with perceptions of KM and its challenges for implementation within the HEI sector. Priti Jain (2012) presented an empirical study of KM in University Libraries in SADC (Southern African Development Countries) and concluded that the majority of the participating librarians have recognized the importance of KM by distinguishing the practicing KM.

Te Fu Chen (2011) developed practical KM 3.0 System Model with Semantic Web 3.0 Technology. The semantic Web provides an approach that fosters richer repositories with better and smarter tags. Focus should no longer be on simply collecting or sharing everything and anything, but rather on use to avoid information overload.

HEIs are highly involved in business of knowledge; however, they are taking responsibility for knowledge creation, sharing, transferring, storing, dissemination, reuse and learning. In a review of KM in HEIs Nishad Nawaz (2014) analyzed how knowledge is managed and useful in HEIs. He studied in details two of the highly discussed models: Strategic Knowledge (SK) and Innovations Knowledge (IK). Strategic Knowledge states that the basic source of knowledge is tacit and explicit, while on the other hand Innovations Knowledge (IK) describes that basic source of knowledge is Strategic Knowledge. Finally, the conceptual models of Strategic Knowledge (SK) and Innovations Knowledge (IK) are compared emphasizing how KM adds value to the HEIs.

The Impact of KM on Organizational Performance is investigated by Mohammad Ahmad Al-Qarioti (2015) in an Empirical Study of Kuwait University. The research shows how faculty members evaluate KM influence on organizational performance. Study findings provide insights into the infrastructure and process capabilities needed to provide knowledge support for organizational activities. The study was based on a stratified random sample consisting of (355) faculty members from various colleges at Kuwait university. Study results show that faculty members evaluate KM as "very good" with a (3.52) mean score in a Likert five-point scale, which indicates that KM components are highly related to organizational performance.

Omotayao (2015) defines KM as a key driver of organizational performance and a critical tool for organizational survival, competitiveness, and profitability. According to him, attention must be paid to three key components - people, processes and technology. In essence, to ensure an organization's success, the focus should be to connect people, processes, and technology for the purpose of leveraging knowledge.

Educational organizations are the main instruments of society for the constant pursuit of knowledge. The role of KM (KM) in the Educational Institutions (EIs) is critical and important. Examine the promises and potential pitfalls, challenges and opportunities of KM in education and educational institutions, especially the role of KM in teaching and learning processes (Abbas Khakpour, 2015). Every academic institution contributes to knowledge. The generated information and knowledge is to be compiled at a central place and disseminated among the society for further growth. It is observed that the generated knowledge in the academic institute is not stored or captured properly. It is also observed that many times generated information or knowledge in the academic institute is not known to anyone and remains as grey literature, which might be useful if proper recoding is maintained in the organization. In fact, the academic environment is a treasure of knowledge but it is not organized properly and hence utility is also lacking and cause for the repetitions of the activity (Sangeeta 2015).

Asrar-ul-Haq & Anwar (2016) elaborated a systematic review of KM and Knowledge Sharing (KS) to highlight the possible antecedents and factors that facilitate or impede KM and Knowledge Sharing in organizations. The review includes both quantitative and qualitative studies related to antecedents and barriers to KM and Knowledge Sharing. Cooperation bias was the most frequent limitation in most studies included in this meta-review as the respondents were likely to overestimate their participation in KM and KS.

However, universities have been slow to adopt KM. Agarwal & Marouf (2016) came up with a 10-step process and a framework for initiating KM in universities. The steps were organized within 4 phases of plan, design, implement and scale-up. After getting top management support, forming a KM team, and identifying KM goals and priorities, the third step of their process (within the design phase) was determining the extent to which the university is ready for KM i.e. an assessment of its current state of readiness. Agarwal & Marouf propose design and a research model, a survey instrument, and an interview protocol for KM readiness assessment in universities. Readiness assessment could mean individual faculty readiness as well as organizational readiness.

The role of HEIs as knowledge providers has been scrutinized and challenged by the various stakeholders. Therefore, HEIs, especially in developing countries, are putting efforts to manage their knowledge based strategic assets. To answer this challenge, KM tools and techniques have been proposed to make use of HEIs knowledge assets in accordance with the demands of the time. Different factors affect the main agents of KM in the context of their professional practices as faculty, administrative staff, librarians, and information professionals in HEIs (Nunes Jose, Kanwahl & Arif 2017).

Global mobility of professionals and the transfer of tacit knowledge in multinational service firms is investigated by Ying Guo, Pavlina Jasovska, Hussain Gulzar Rammal, Elizabeth Rose, (2018). Using Nonaka and Takeuchi's SECI model of knowledge transfer, the authors study the intra-organizational knowledge transfer practices of an Indian multinational service firm. Semi-structured interviews were conducted with 20 key informants involved with the organization.

Soile Hakkarainen, Outi Saramäki & Jenny Makkonen (2018) analyzed the transfer of tacit knowledge in organizations. This small survey in four different organizations in Finland reveals the lack of knowledge in management procedures. None of the work places had a system for collecting, storing, and sharing tacit knowledge that the interviewed employees were aware of.

## 2. KM SOFTWARE SOLUTION AND ANALYSIS

### 2.1 Background

The Institute of Technology at VFU is responsible for the software and hardware provision of the university management and the educational process. It conducts research, and supports coordination in administrative tasks related to the central university and faculties' administration.

There is a need for a KM solution in the tasks of the internal distribution of knowledge and of the departmental administration. Staff turnover and the need to train new staff are a major reason for using a KM solution.

KM processes could be supported by all categories of tools presented in the Figure 1.
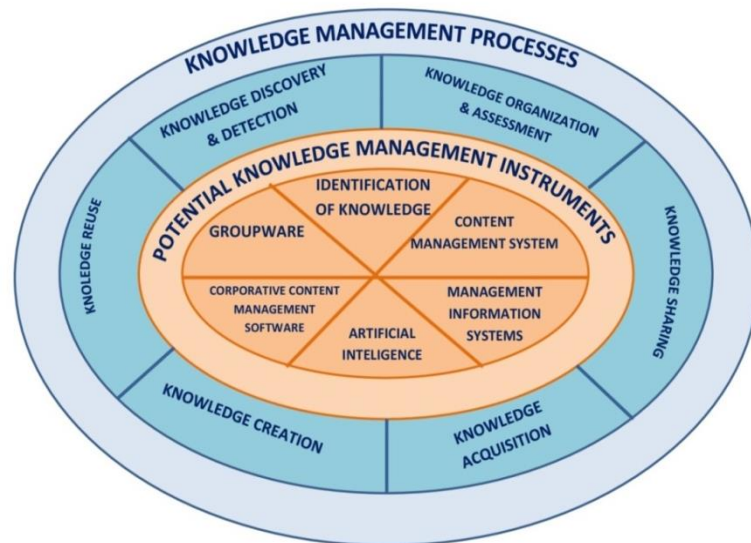


Figure 1. Tool Categories for KM Processes Support

The implementation of KM system starts with development of a central information storage platform in which employees store and retrieve information. The organizational knowledge base could include topics in the areas of research, training, and administration. The knowledge platform can provide information on working processes, procedures, job descriptions, and guides with possible comments on content. KM system must also be available on mobile devices and outside the university network. Friendly user interface should help broad acceptance and staff involvement. At administration level, full management of the rights to extract, create, and edit content is required.

It should also be possible to back up the organizational knowledge base. All administrative tasks need to be executed as quickly as possible, and when an administrator leaves, the assignment of an editor's rights must be immediately compensated. The proposed KM solution should be as cost-effective as possible, be easy to expand and integrate into the information architecture of the university.

## 2.2 Observations and Discussions

According to the above mentioned requirements a structural model of KM system is developed. (Figure 2):
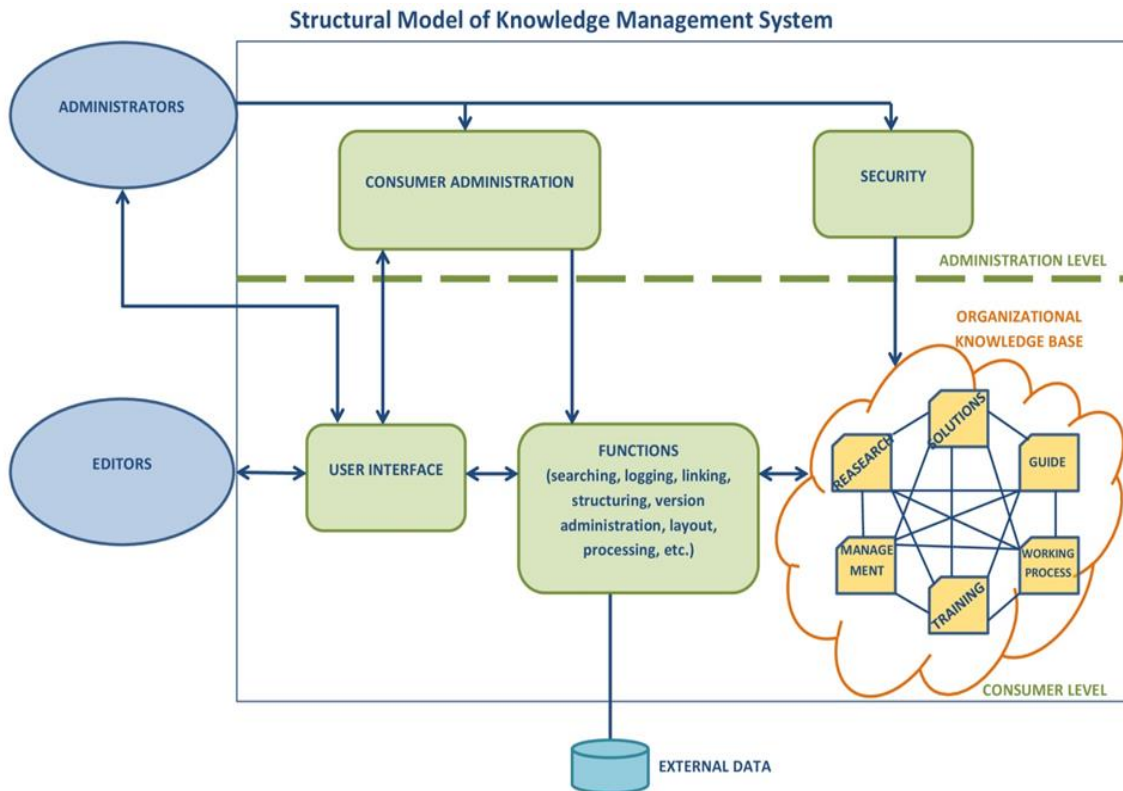


Figure 2. Structural Model of KM System (Author Illustration)

Employees act as an editor or administrator. On the one hand, editors need to be able to create content on their own and keep it in the organizational knowledge base. On the other hand, they must be able to extract content from the organizational knowledge base, modify it if necessary, and store it in the common knowledge base and link it to other content. Administrators have the same rights as editors. In addition, their tasks include consumer administration (including roles and rights management) as well as data backup.

The user (consumer) level includes the user interface, features, and organizational knowledge base.

User access (both by editors and administrators) must be through a graphical user interface that represents the interface between users and the KM system. Users are identified by their user ID and password. Upon successful identification, the user is allowed to call certain features.

These functions provide users with the ability to search, store, connect, structure, and refine information. All modifications of the knowledge base must be documented to track the changes by identifying exactly which user they are made by and in case of inconsistencies to be reset. These contents must be interconnected through links and stored according to intelligible structuring schemes.

Thus, the content of the knowledge base should form a semantic network. In addition, it should be possible to extend the organizational knowledge base through external system data. The data stored within the institute and the university or even outside the university units must be able to be integrated into the knowledge base.

User administration and archiving must be provided at administrative level. Guest and extension access must be possible through new user roles. Archive function guarantees back–up copies of the organizational knowledge base.

## 2.3 Results

For optimal choice, Typo3 applications, Moodle wiki features, and Alfresco Community Edition are analyzed.

Freeware CMS system Typo3 has been chosen since Typo3 is already being applied in a number of universities. Wiki module in Moodle as an open source learning platform is also a possible solution. It is possible to use entirely own development as a central SQL database together with Microsoft Access, but with alternatives as Typo3, Wiki and Alfresco is not cost-effective. Efforts to develop a separate solution, especially with regard to the integrity requirements and strict security measures, appear to be unprofitable as compared to the adaptation of a ready-made system. The final choice is made through a cost-benefit analysis (Table 1).

Table 1. Comparative Analysis of Typo3, Moodle Wiki and Alfresco According Criteria (Author Illustration)

| Tool / Criteria | Relative weight (w) | Typo3 CMS | | Moodle Wiki | | Alfresco Community | |
|---|---|---|---|---|---|---|---|
| | | Utility (u) | w x u | Utility (u) | w x u | Utility (u) | w x u |
| Functionality | 0.35 | 2 | 0.7 | 2 | 0.7 | 2 | 0.7 |
| Easy-to- use | 0.25 | 2 | 0.5 | 2 | 0.5 | 3 | 0.75 |
| Costs | 0.25 | 2 | 0.5 | 3 | 0.75 | 2 | 0.5 |
| Integration | 0.15 | 2 | 0.15 | 3 | 0.45 | 1 | 0.15 |
| Total benefits (Σ w x u) | 1 | | 1.85 | | 2.4 | | 2.1 |
| Ranking | | | 3 | | 1 | | 2 |

Typo3, Moodle Wiki and Alfresco are evaluated using criteria: Functionality (weight w = 0.35), Easy-to-use (w = 0.25), Costs (w = 0.25) and Integration (w = 0.15). The most important functionality criterion describes the extent to which requirements are met and the ability to expand the KM system (Expandablity). The second criterion includes the ease of use, as this is essential in order to increase the motivation of users to participate actively. This criterion includes aspects such as intuitive control, easy operation, single input, user-friendly interface, and more. Costs include the necessary operating costs, such as costs for purchasing new hardware, licensing costs, and total operating costs. The latter criterion refers to the efforts to implement and adapt the software tool in the existing system.

During the benefit analysis, the four target criteria for functionality, easy-to-use, costs and integration for the three alternatives Typo3, Wiki and Alfresco are evaluated using a scale ranging from 0 (insufficient) to 3 (very good). Then the utility is multiplied by the weight of the criterion under consideration (w x u). The sum of the results obtained gives the total benefit (Σ w x u). Results go from 1 (highest) to 3 (lowest) total benefit.

### 2.3.1 Functionality

Key features include: web based access of a group of users to a common knowledge base; roles and rights management; content structuring options; workflow management; data integration; ability to comment; backup.

Typo3 CMS offers web-based administration of an organizational database through workspaces. Role and rights management, as well as content structuring are supported. Data archiving is possible through additional extensions, and data entry is limited to Typo3-specific data. Integrating software features such as commenting on features or discussion forums is only possible through the additional use of extensions. The wide range of extensions increases the scope of CMS (TYPO3 2017).

Although it is possible to meet the requirements, using extensions, there are security risks. Extensive safety checks are centrally performed, but there is no guarantee of safe and flawless work on extensions. Overall, the functionality of Typo3 CMS is assessed with two points.

The wiki in Moodle also provides shared access to the knowledge base over the Internet and includes roles and rights management. Backups of the knowledge base can be created. In addition, many software features can be used (e.g., comments, audio, discussion forums).

Content may be structured as desired. External data can be linked to the knowledge base through links. Like Typo3, there are freely available extensions for Moodle. Also, the use of wiki in Moodle is assessed by two points, as extensions are needed here to achieve optimal performance.

The alternative edition "Alfresco One Edition Community" also includes a wiki feature as well as many other social software elements, rights management, web-based access and workflow management. The use of open standards and interfaces allows the integration of non-systematic data and applications and provides extensibility. Additional features (such as automated data backup) are only available using add-ons. The functionality of Alfresco One is also evaluated with two.

### 2.3.2 Easy to Use

Typo3 looks intuitive and easy to use. In some cases, additional knowledge is required to create pages, as well as TypoScript knowledge or the use of TypoScript templates to adapt the layout and content. In an intranet, Typo3 can be linked to LDAP (Lightweight Directory Access Protocol) directories through extensions, so a centralized single entry is possible. The ease of use is estimated at a value of two.

Moodle is known to all members of the university as it is often used in education. Employees can log in through their usual user account. Interacting with users in some places can be more meaningful and making content easier. The usability of wiki is categorized based on integration into the familiar environment and the simplified user input and is valued at 2.

Alfresco Community Edition is a simple and clear software. Because of the functional and graphical reference to common applications, users must be able to work with Alfresco as intuitively as possible. Alfresco can be synced to specific LDAP directories to enable single sign-on. In this case, it will also be necessary to check if synchronization with the university's user directory is possible and allowed. The easy use of Alfresco is assessed at 3.

### 2.3.3 Costs

Since Typo3 is licensed under the GNU General Public License version 2 (http://www.gnu.org/licenses/gpl-2.0.html), including later versions, there is no license or acquisition cost for the application (https: // typo3.org/typo3-cms/). For the operation of Typo3 CMS, it is necessary to install a new virtual machine on a VFU server, hosted by the Institute of Technology. Due to these additional operating costs, the value of this alternative is attributed to the value of two.

The use of wiki functions through Moodle will get the highest result on the target cost criterion because wikis lack any additional installation, hosting, and licensing costs, and only need operational costs for administering wikis that are actually part of the administration of the entire e-learning platform.

Alfresco Community Edition is distributed under the LGPLv3 license (https://www.alfresco.com/alfresco-community-editions), there are no license fees. Like Typo3 CMS, operating costs and hardware costs need to be taken into account. That's why two points are awarded to this alternative.

### 2.3.4 Integration Activities

Typo3 CMS has difficulty in multi-user work. In case of using Typo3 application hosted by the Institute of Technology it is necessary to create its own environment. If a separate server is used, it must be integrated into the system environment of the Institute.

Integration of wiki gets three points because only administrative settings (such as user registration, roles assignment, and rights) need to be done. This is a sufficient condition for the wiki to be structured and gradually filled with content.

The integration of the Alfesco Community Edition is complicated compared to the wiki version, as it is necessary to install and integrate a new server or an additional virtual machine.

Typo3 CMS offers the lowest total benefit. Possible self-use of the instrument has a negative effect on individual utility values. However, since the overall benefit differs significantly from other alternatives, the use of Typo3 system, managed by the Varna Free University data center, will not be a big change in overall benefit.

Using Moodle's wiki functionalities is the most common benefit. Especially in terms of cost and integration efforts, this solution is best.

The software of Alfresco Community is second, but the software solution is inappropriate due to relatively high licensing costs.

Since the use of a wiki promises the most common benefit, this alternative is chosen.

## 2.4 Future Development

The main framework of the KM solution will be a wiki on the Moodle central platform, developed and maintained by the Institute of Technology.

Users will have access to the virtual campus via regular Internet browsers by entering their URL. This will allow web-based access via mobile devices. After successful authentication with their universal user ID and password, users will be redirected to their personal platform page. Employees enrolled in the KM course can call the KM decision. Authorization will be done automatically according to the user role in the central user administration.

All wikis integrate a search function to find all content according to the search term you entered. Users can load and format wiki pages themselves, as well as insert images, videos, pre-formatted texts and graphics. Pages can be linked to each other so that they become part of the semantic knowledge network. Links can also be used for external data. It is also possible to integrate other features and elements that are usually available in the Moodle system. Audio, galleries, chats, or databases can be integrated. In addition to the organizational knowledge base, editors and administrators can also create personal wikis that can not be accessed by other users.

Administrators can archive the course and, as a result, wiki data and metadata are stored centrally on servers. These archive files can be imported later to restart the wiki.

## 3. CONCLUSION

The implementation of the proposed KM solution in the form of a wiki is the basis for developing a common knowledge base at the university. The initial phase includes content preparation and its integration into the platform. Subsequently, it is necessary for all staff of the Institute of Technology to document each new information, such as descriptions of working processes and current projects, guidelines for a specific task and to share them with their colleagues.

An advantage in the KM process is the extraction of tacit (hidden) knowledge and its sharing. The success of KM solutions depends on the usability of KM tools. Additional factors increase the chances of success of KM systems, such as developed technical infrastructure, team discussion of potential benefits, incentives and motivation.

Organizations and companies have access to many different IT tools, but most instruments support specific KM objectives and as a rule cannot be used as a universal step to build, maintain and develop an organizational knowledge base. Therefore, it is necessary to carefully examine and balance the potential of the possible tools with regard to the job profile and the objectives pursued.

The success of KM solution depends to a large extent on the active participation of all members of the organization. The task of the high level management is to take measures to enable an exchange of information. This can help to create a corporate culture based on knowledge and to overcome individual barriers to implicit knowledge.

Universities have different fields of application of KM systems - in research, training and administration. There is a wide range of IT tools for developing, distributing, using, preserving, evaluating and acquiring knowledge. However, there are often unused opportunities to optimize joint research, educational and administrative activities and thus meet current requirements.

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