

# Knowledge Management System at ELFE

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**Abstract:** The goal of the paper is to present a concept for a knowledge management system (KMS) to be developed as a pilot project at the English Language Faculty of Engineering (ELFE) of the Technical University – Sofia (TU). The authors initially provide a brief overview of the research discussions on KMS in university environment and the convergence between them and the learning management systems. On bases of an analysis of the technologies used in TU and ELFE, the concept for the new KMS is derived.

**Keywords:** knowledge management, e-learning, knowledge management systems

## 1. Introduction

Last decades are characterised by high speed of development of new Information and Communication Technologies (ICT) causing deep changes in everyday work and life. First, there is a significant improvement of communication technologies providing access to information via cable, wireless or satellite connection. Second, information and knowledge organization technologies have experienced large changes [1]:

- Integration of traditional and object-oriented databases;
- Complex data support (audio, video, images);
- Object management;
- Improvement of technologies for access and searching of information;
- Use of modern information compression technologies;
- Increase of data transfer speed and use of broadband technologies.

The technology advancement on its side has influenced large changes in organisations and their business models, paving the way for e-learning, e-business, e-government, etc.

Universities are taking advantage of ICTs and many are offering distance education opportunities or changing internal processes and communication channels by building learning management systems (LMS). Sophisticated Knowledge management

systems (KMS) are also considered for university environment [2]. Similarly to other organizations, introducing Knowledge Management (KM) faces universities with several challenges. Some of them are linked to the need to overcome the resistance to changes of leaders and staff. Others are linked to financial deficits and ICT skills shortages. In Bulgaria, for example, the limited public funding for universities, the lack of state-of-the-art ICT infrastructure, and dedicated ICT staff are among the main problems for implementing comprehensive KM solutions. Most universities in Bulgaria are developing online databases and information repositories, while some of them have developed information portals for ensuring access to the university intellectual assets and educational services. However, these are only some initial steps towards KM. There is a need to raise first the awareness on KM benefits and create a knowledge sharing culture. Second, appropriate hardware and software should be acquired and advanced ICT infrastructure build. Last, but not least, special emphasis is needed on human resources – training and motivating them for using the KMS [2].

The main goal of the paper is to present a concept for a KMS at the English Language Faculty of Engineering (ELFE) of the Technical University – Sofia (TU). It provides, first, an insight into research

discussions on the common features of KMS and LMS. Second, the paper presents briefly the technologies used at ELFE and the methodology for building a KMS within an ongoing EU Structural Fund project. Finally, it introduces the concept for KMS at ELFE highlighting the needs for integrating the available ICT with new features.

## 2. KMS at universities

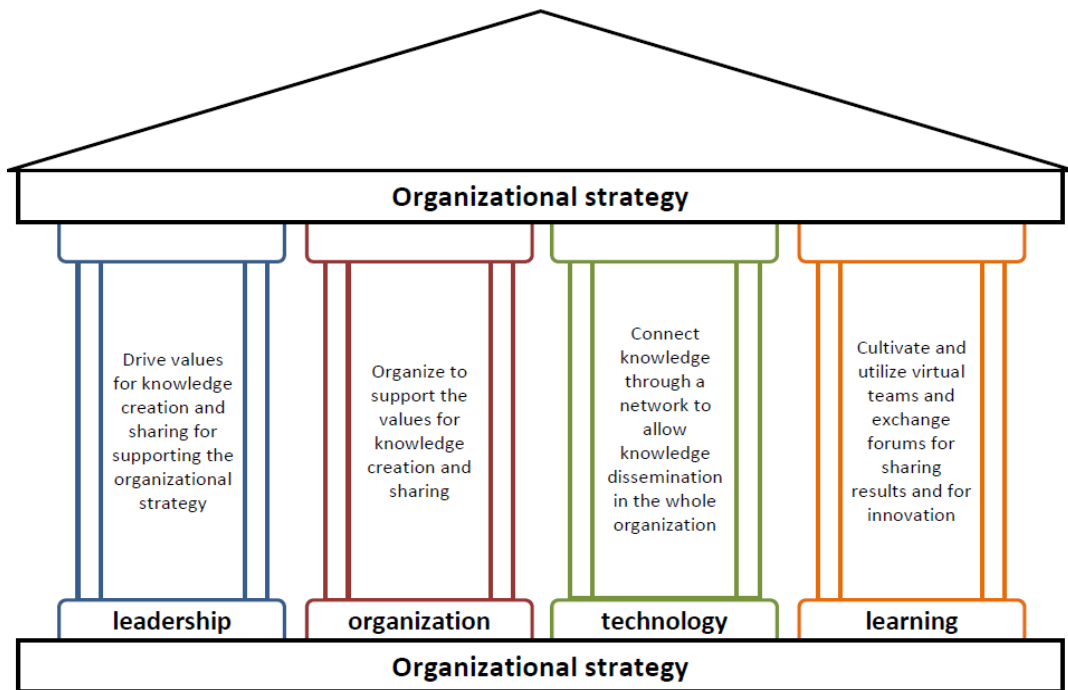
Universities are a key actor in the triangle of knowledge – involved in generation (research), dissemination (education) and application of knowledge (innovation). Metaxiotis and Psarras [3] outline three major missions of universities:

- *Teaching - to prepare students to become successful lifelong learners,*
- *Research - to expand the frontiers of human knowledge and to promote creativity;*

- *Service - to serve communities, and to participate in outreach activities that serve the local, national, and international communities.'*

Rowley [4] points out that, the universities should consciously manage the processes related to the creation of new knowledge and its transfer to interested stakeholders in order to fulfil much better their mission in the triangle of knowledge.

Mohayidin et al. [5] considers that the KMS should comprise three layers – infrastructure, info-structure and inforculture. The authors stress that any of this layers could influence the success or failure of a KM project, as well as may determine the overall performance of the university in fulfilling its functions as knowledge provider. More specifically, the success of KM at universities requires some basic pillars such as leadership, organization, technology and learning (Figure 1) [6].



**Figure 1:** KM Pillars to Enterprise Learning, adapted [6]

While as essential factors for KM success are generally acknowledged leadership, organisational culture and technologies [1], learning is rarely explicitly stressed in research and practice. However, in a learning organisation like university the KMS should be the base of organisational knowledge

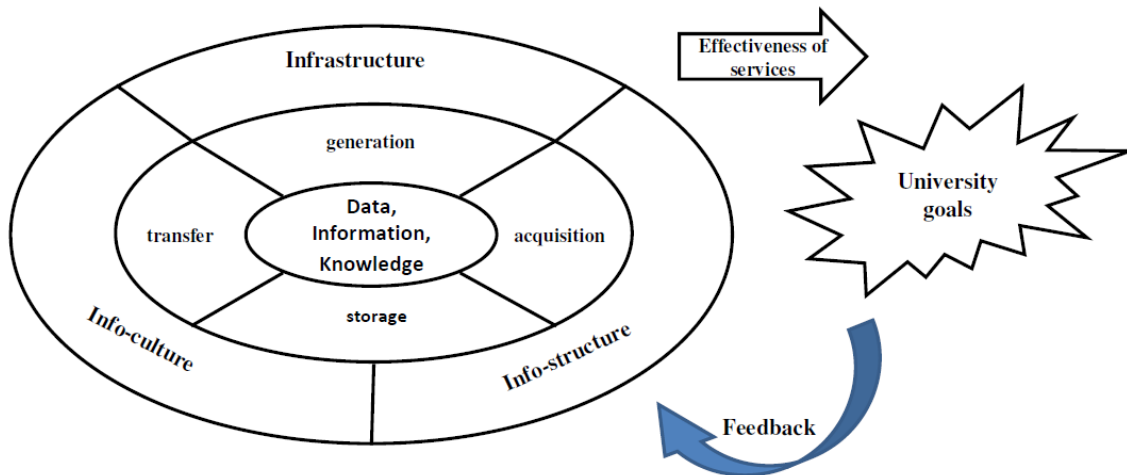
enhancement, and should foster learning and sharing of knowledge among employees, researchers, students, and other interested stakeholders. Therefore, many researchers believe that e-learning is a key technology and tool supporting KM. It also facilitates the transformation of tacit knowledge into

explicit [2], [7]. Other key technologies for KM are business intelligence, knowledge bases, groupware, content management, knowledge portals, customer relationship management, data mining, searching and workflow management [8]. As Zhang et al. [9] point out some factors are driving the convergence of KM and e-learning.

- both are focused on knowledge acquisition and sharing, including equivalent technology infrastructures;
- both require organizing and maintaining knowledge for higher efficiency;
- both allow users to access knowledge and generate new knowledge.

The core business processes of any university comprise teaching and learning. Therefore, the KM framework proposed in [10] shows the relationships among several factors important for university functions (Figure 2). It emphasizes the need for personal KM, and in particular, the management of the main knowledge processes: knowledge

generation, acquisition, storage, and dissemination. The respective knowledge infrastructure should represent a platform with advanced knowledge services, integrated on the basis of a shared ontology and personalized for the networked participants [11]. The design of a KMS requires considering appropriate KM tools and organizational design (e.g. knowledge tasks and processes, roles and responsibilities), deciding upon knowledge topics and structures (e.g. type of knowledge, structures, taxonomies, ontologies and meta-data), as well as ICT tools and systems in support of KM (processes, structure and interaction of knowledge infrastructures). A special attention should be paid to people and their equipment with appropriate skills and competencies, as well as ensuring support to their communication and collaboration in various networks and communities, both internal and external.



**Figure 2:** KM framework for university [10]

When designing a KMS in university environment, it is essential to take into account also the specific features of LMS. As pointed out by Avgeriou et al. [13], LMS are specialized learning systems based on advanced web technologies, which offer organizational, administrative and learning features. The main LMS users comprise [13]:

- learners – using the LMS within the educational process;
- instructors – tutors or their assistants

using the LMS for teaching, mentoring, support of learners, as well as assessment and control;

- administrators – ensuring the proper LMS functioning and access to other users according to their role.

In case of developing a complete KM solution for university, in addition to LMS users should be considered also researchers, knowledge workers, administration, and external stakeholders. The latter should be

added in case that the KMS aims also at knowledge transfer and serves as a platform for collaboration with external users interested in university knowledge assets.

When developing its KMS the university should first clarify the scope of the KM initiative, and its main objectives. It is often suggested to start first with a pilot project, and then extend it to comprise the whole organization [14].

Greengard [12] considers that '*an organisation aiming to develop a knowledge base first needs to identify the sources of knowledge available, and then to capture and manage these resources properly*'. It should be taken into account that the organizational knowledge comprises individual and group knowledge assets, integrated in various knowledge objects. The first step by developing an organizational knowledge base is to identify the existing knowledge, both explicit and tacit, to systematize, organize and make it easily accessible. Subsequently, specific tools should be considered for knowledge transfer and use in the business processes of the organization [1].

In fact, researchers at universities generate various explicit knowledge resources (e.g. research papers, books, training materials, project results, etc.) which just need to be collected, organised and made available in the knowledge base. In addition, it should contain also all organizational knowledge assets (e.g. internal regulations, strategic documents, etc.)

More difficult is to capture the tacit knowledge available at universities. Normally, as a first step the sources of such knowledge in the community should be identified. Yellow pages or social network sites could help to visualise the existing competencies and individual or group expertise. Alumni networks could also provide access to external university partners and stakeholders, facilitating, thus, the collaboration and finding external expertise.

### **3. Concept for a KMS at ELFE**

Within an ongoing project the ELFE team made a survey of the research literature and practice in the areas of KM and LMS. In

parallel, an analysis was made of the available ICT infrastructure at ELFE and the university as a whole. Both analyses provided a base for developing a concept for the KMS to be designed at ELFE.

ELFE is aware of the challenges of the knowledge-based society for research and educational organizations nowadays, and aims at providing access to its main stakeholders to the available knowledge resources on its site. However, the present site has a static structure, and does not provide a single entry to all university resources. Besides, a LMS is missing, and students have access only to general information for programmes, courses, lecturers and learning schedules on the site. On the other side, the common TU technologies supporting students' and teachers' administration, and the educational process management use different ICT solutions managed by different TU units and are not linked to each other [15].

It is obvious that the ELFE site needs an update of its content and available functionalities in order to better serve the needs of its users. Taking into account the strategic plan developed for ELFE within a past project proposal [14], and the state-of-the-art of ICT at ELFE, some of the goals of the new KMS could be derived:

- ensuring appropriate knowledge needed for all university business processes (e.g. strategic management, students administration, teaching, research);
- ensuring access to individual knowledge resources;
- facilitating collaboration and knowledge and technology transfer among internal and external stakeholders.

Subsequently, the KMS should ensure [15]:

- Learning processes management – for courses selection, assessment, thesis management, etc.
- Human resources management – for career promotion, training, evaluation of lecturers' performance;
- Knowledge and technology transfer – access to TU research data bases, external scientific data bases, partners' search, etc.

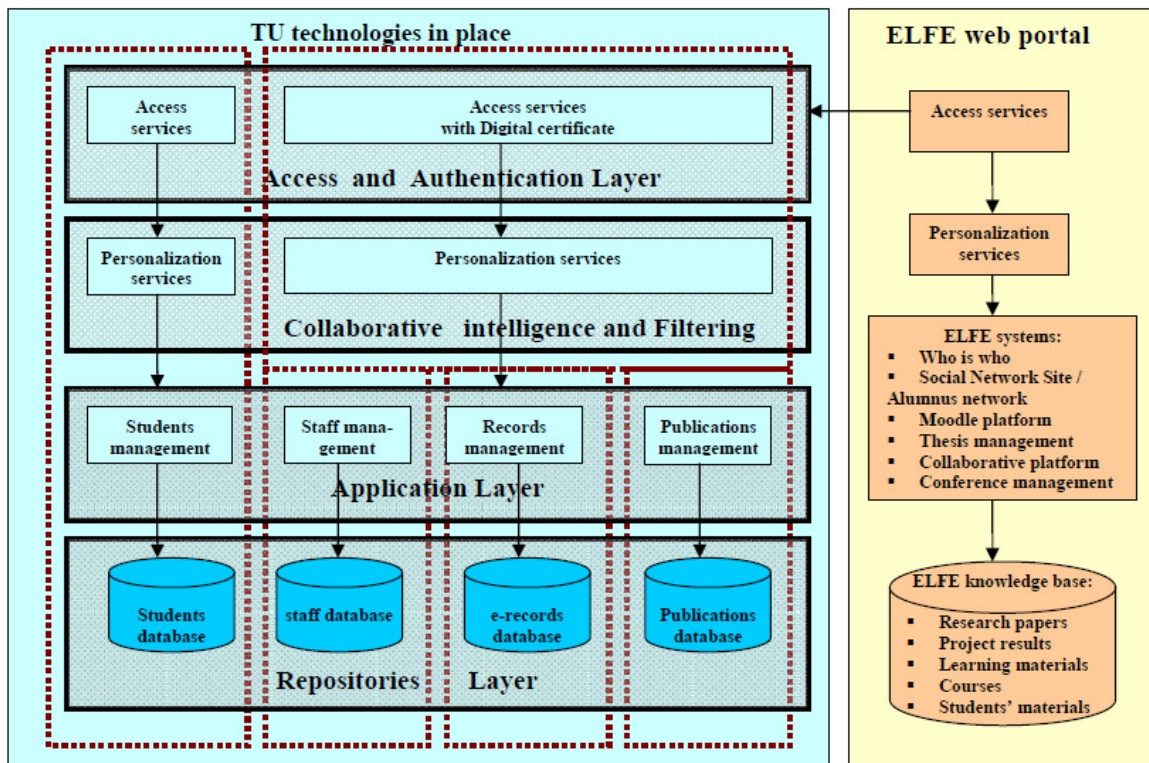
- Collaboration facilities – for internal and external communications, alumni fora, social networks, etc.

Some of the requirements of the KMS, critical for its success, are to ensure scalability, knowledge reuse, efficient searching and retrieval [9]. In addition, it is essential to provide single entry point to all knowledge and administrative resources of the university, and an intuitive interface.

In fact, the present situation does not allow building a common ELFE knowledge base due to the usage of distributed data bases of TU (Figure 3) with different access options. The only possible solution is to facilitate the access of ELFE stakeholders to these knowledge assets, and start building additional own systems. Here, an important task is to develop a LMS decided to be on a Moodle platform. Second, it is essential to provide on-line solutions for management of

BSc and MSc thesis of ELFE students. Some available ELFE resources – ongoing and completed projects, the annual ELFE conference need restructuring in order to allow better searching and automation of workflow. Building Yellow pages (who is who data base) could facilitate searching of internal (ELFE researchers) and external expertise (interested stakeholders and ELFE partners). It is essential as well as to take advantage of Web 2.0 technologies and facilitate collaboration using social networks (e.g. for ELFE alumnus), blogs or wiki.

Building an ELFE knowledge base will facilitate the access to the knowledge assets at the faculty. The good structure and organization of all available resources, as well as adding tags could facilitate the search and retrieval of information and knowledge.



**Figure 3:** Concept for KMS at ELFE and its link to TU information technologies

As shown on (Figure 3), the concept for KMS of ELFE integrates the basic features of a LMS extended with KM opportunities. In comparison to traditional LMS, it needs to satisfy some requirements for digital content

presentation (to be used on both, mobile devices and desktop computers) and the opportunity for different type of content – text, audio and video. The most essential for the system is to ensure device-independent

applications, modular structure of courses, extensibility and reusability of content. Some additional features could be added such as reminders, location services, and campus navigation. The functionalities of the KMS should ensure that it is easy-to-use (in terms of access, content management, presentation and navigation), intuitive and supports all users' profiles, educational needs and roles.

#### 4. Conclusion

The presented concept needs a validation among ELFE staff and developing several technology details in order to be later implemented. For the success of the KMS it is essential the technology developers to be aware of the real needs of the expected users, and to provide an integration of the KM tools with the business processes in place in ELFE. The choice of technologies should facilitate the fast and easy search and retrieval of knowledge and information, as well as provide intuitive and user-friendly interfaces. Last, but not least, the success of the KMS depends on the proper training of its main users, and ensuring committed leaders and champions to drive the change.

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