

Functional Need Analysis of Knowledge Portal Design in Higher Education Institution

¹Hilmi Aulawi, ²Muhammad Ali Ramdhani, ²Cepy Slamet,
³Hilda Ainissyifa and ⁴Wahyudin Darmalaksana

¹Department of Industrial Engineering, Sekolah Tinggi Teknologi Garut, Jawa Barat, Indonesia

²Department of Informatics Engineering, UIN Sunan Gunung Djati Bandung, Jawa Barat, Indonesia

³Department of Islamic Education Studies, Universitas Garut, Garut, Jawa Barat, Indonesia

⁴Department of Hadits Science, UIN Sunan Gunung Djati Bandung, Indonesia

Abstract: This article aims to analyze the functional need of knowledge portal design for lecturer (faculty/ lecturer) in knowledge management system concept-based college as part of the implementation of knowledge management. The methodology used in compiling this article is the development research oriented towards practical problem solving, with information resources of literature review, observation, interview, and researchers' experience. The result of this study requires that the knowledge portal must be able to cover portal knowledge management activities, such as knowledge acquisition/ creation, knowledge sharing, knowledge storage, and knowledge utilization. The conclusion that can be drawn from this study is that the existence of knowledge portal constitutes a support for the implementation of knowledge management in order to work effectively and efficiently.

Key Words: knowledge management; knowledge management system; knowledge portal

INTRODUCTION

Higher Education Institution (HEI) as an institution that has the task of knowledge dissemination and collection, has a very important role in managing its intellectual assets, so as to create innovative, adaptive, and superior HEI (Sopandi, 2016). Educational institutions can't develop optimally when the institutions do not have any strategy to manage and use the knowledge of their intellectual assets optimally (Ainissyifa, 2012) Due to the importance of knowledge, it is necessary to implement knowledge management (KM) as a pattern to manage the knowledge, such as the life cycle of knowledge, knowledge management framework, strategy of building systems that can be used to build up a culture of knowledge sharing in HEI.

The benefit principle of Knowledge Management for HEI is to empower the knowledge potential of HEI as intellectual capital to increase the added value of generated academic management and the others to maintain the position of HEI remaining in a constantly good condition in performing its primary (Ramdhani and Suryadi, 2005; Ramdhani et al., 2012). The implementation of Knowledge Management at HEI focuses on the learning process in the form of knowledge transfer based on sharing culture as its foundation. As an attempt process to always produce added value, the implementation of KM is change process in

realizing the results of innovation, that must be managed with human capital support factor and strong organization structure capital.

One approach can be used to optimize the learning process is the implementation of Knowledge Management System (KMS) from which one step can be done through creating Knowledge Portal. The aim of the knowledge portal is designing good learning environment for the virtual communities. Portals make people more effective by giving them the exact information they need. The knowledge portal is designed to transform unstructured information from the stakeholders into a competitive organizational asset (Pamoragung et al., 2006). In knowledge portal, there are several accessible relevant menu of knowledge to the implementation of higher education. Its content may involve articles about lecturer's profiles, articles on lecturer's expertise, research programs, training materials, management and governance of higher education, or articles of academic community experiences encountering certain problems.

The purpose of this article is to analyze the functional requirements of knowledge portal design for lecturer community in knowledge management system concept-based college as part of the implementation of knowledge management, which will facilitate the continuity of education, research, and scientific publication, community service, and performance report of lecturers. The product of this research is a knowledge portal framework.

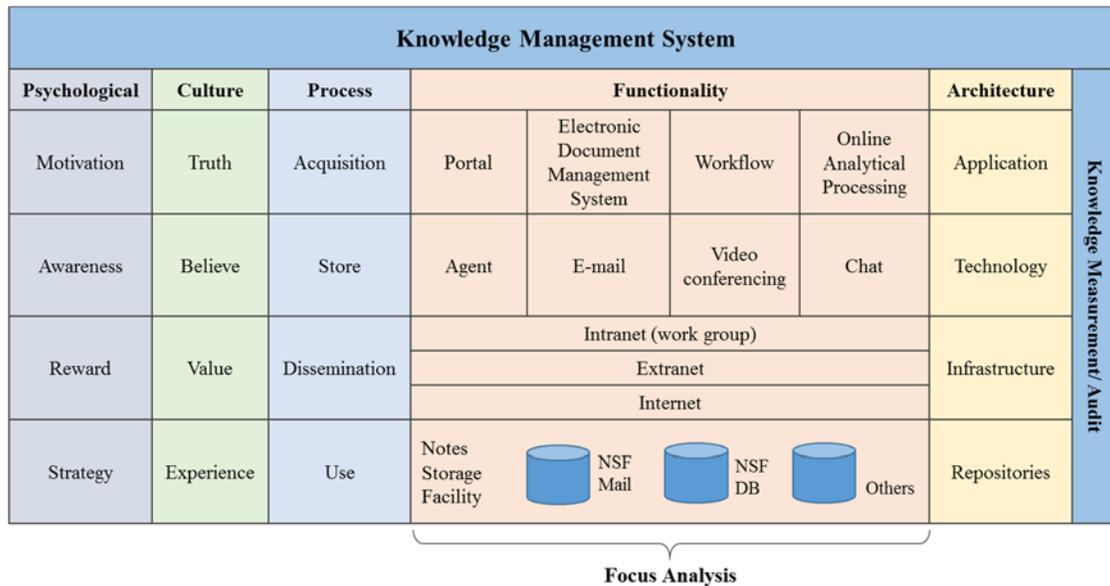


Fig. 1. Framework of Knowledge Management System for the Higher Learning Institution (Abdullah et al., 2005)

MATERIALS AND METHODS

The methodology used in compiling this article is the development research oriented towards practical problem solving. This article uses some reference sources such as literature review, and researchers’ experience while working at college. The analysis model in this article uses the discussion concept recommended by Ramdhani et. al. (2014), Ramdhani and Ramdhani (2014).

The discussion of this article focused on analysing functional requirements of knowledge portal design as part of the KMS, with development objects IHE organization. The concept of discussion is the adoption and development of the “Framework of Knowledge Management System for the Higher Learning Institution” developed by Abdullah, et. al. (2005) as shown in Fig. 1. Adoption and development are done based on requirement specificity of knowledge portal implementation in the research site. The discussion in this article is limited to the idea of problem solving concept, and not discuss further implementation.

RESULT AND DISCUSSION

HEI always competes in providing good service to community. There are challenges that must be responded in order to win the competition, namely: collaboration, innovation, adaptation, technology mastery, and intellectual assets management of educated and skilled academic community to be become increasingly valuable (Retnoningsih, 2013).

The level of knowledge availability does not guarantee that the KM in the organization has been working

effectively. There is still possibility for the knowledge has been already owned by college, including the new acquired knowledge is less effective in its utilization. The main objective of KM is to ensure availability of the required knowledge at the right time and for the right person (Retnoningsih and Utami, 2013). These challenges encourage the emergence of the need for Knowledge Portal implementation. Knowledge portal in simple definition is a portal functioning to document, classify, and disseminate knowledge.

Function of Knowledge Portal: The development in information technology field is getting faster and cheaper to encourage organization to take advantage of this technology to improve organizational performance (Aulawi et al., 2009). Organization can acquire and use this technology effectively and efficiently to support the organization’s activities (Wahjono, 2010). Information technology services need to be adjusted to customer needs. Management of information technology services is related to service quality and reliability and is related to business performance in organization. Service management is related to the provision of information technology service that fits the organizational need and supports organizational goals (Adelia and Surendro, 2015).

HEI utilizes information technology to support business process and activity. The information technology development and utilization has made information technology an integral part for the development of HEI. HEI that uses information technology in supporting its activities must pay attention to the process of information

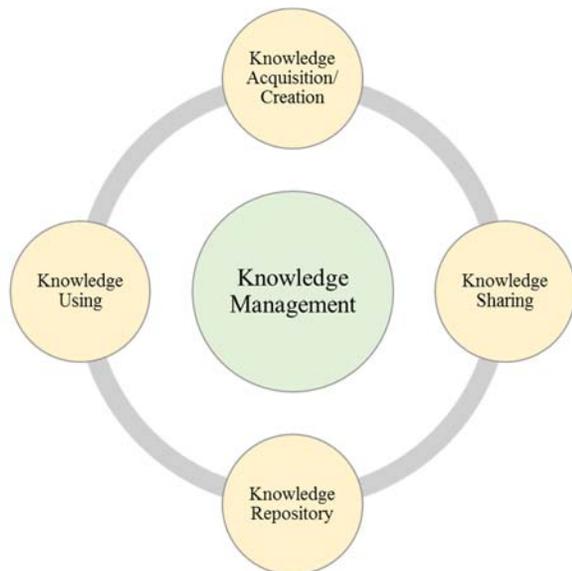


Fig. 2. Knowledge Management Activities

technology services provided to customers or users of information technology services. Information technology service is related to value provision to the user or customer (Adelia and Surendro, 2015).

KM that consists of creation, control, storage and maintenance management and knowledge rediscovery has relevance in improving the quality and competitiveness of education, through available and easy access to data/information/ knowledge of HEI (Sopandi, 2016). Knowledge Management as a process to improve the skills and expertise of organization members needs to be supported by information technology (Chong and Yeow, 2005). The KM implementation of knowledge portal will be beneficial for strengthening the entire academic community knowledge, on the other hand it will provide convenience to the lecturer/ faculty to create performance reports and compile document for accreditation, and others.

KM is a systematic approach that considers the overall utilization of organizational knowledge base combined with personal skill, competence, idea, innovation and ideas to make or create an organization more effective and efficient (Wibowo, 2015). Knowledge management is the process by which the organization generates wealth through intellectual assets or knowledge-based assets (Bukowits and Wiliams, 1999). Knowledge management can take place through the acquisition activities/ knowledge creation, knowledge sharing, knowledge storage, and knowledge utilization (Munir, 2008).

Knowledge acquisition: Knowledge is created when someone define new ways of doing things or creating know-how. Knowledge creation is not limited to internal knowledge, but the acquisition of external knowledge meaningful for institution (Alam and Irfan, 2011). Knowledge acquisition is an important activity for HEI because it is not sufficient to only utilize existing knowledge in the organization, no matter how good this knowledge is, to provide advantages that ensure the survival of the organization in dynamic environment (Ainissyifa, 2013).

Knowledge acquisition in the HEI can be done through some ways, for example through training, seminar, workshop, research, cooperation with other organizations, and informants (experts) recruitment from a similar organization, inviting consultants, and so on. New knowledge is identified as valuable knowledge and can be represented in a variety of ways (Alam and Irfan, 2011). Knowledge portal must have the ability to display information of HEI's knowledge ownership.

Distribution Process and Knowledge Sharing: A person's knowledge consists of explicit knowledge and implicit knowledge (tacit). To facilitate knowledge dissemination, it is necessary to make as many efforts as possible to transform knowledge to be disseminated in the explicit form. For example, the transformation may be in document form, formulas, standard operating procedure, instructional implementation, images, charts, and so on.

The knowledge that a person has possessed must be distributed to the academic community who need it and available any where and any time (Alam and Irfan, 2011). Technological condition of an organization contributes to the development of knowledge-sharing activity. Technological condition in knowledge sharing context can be defined as technological capability level in facilitating knowledge sharing activity (Brink, 2003).

Sharing knowledge can be seen as a manner by which a person voluntarily provide access to others on knowledge and experience (Aulawi et al., 2009). The process objective of knowledge sharing is knowledge dissemination mastered by a person to as many people as possible in the organization. Knowledge dissemination from one person to another, or from one work unit to another work unit is expected to improve the quality of knowledge of individuals, unit, and organization. The combination of new knowledge and prior knowledge will produce innovations.

Process of Knowledge Development and Utilization: New knowledge will be beneficial to human when they willingly implement the knowledge they possessed by the assimilation of new knowledge with their experience

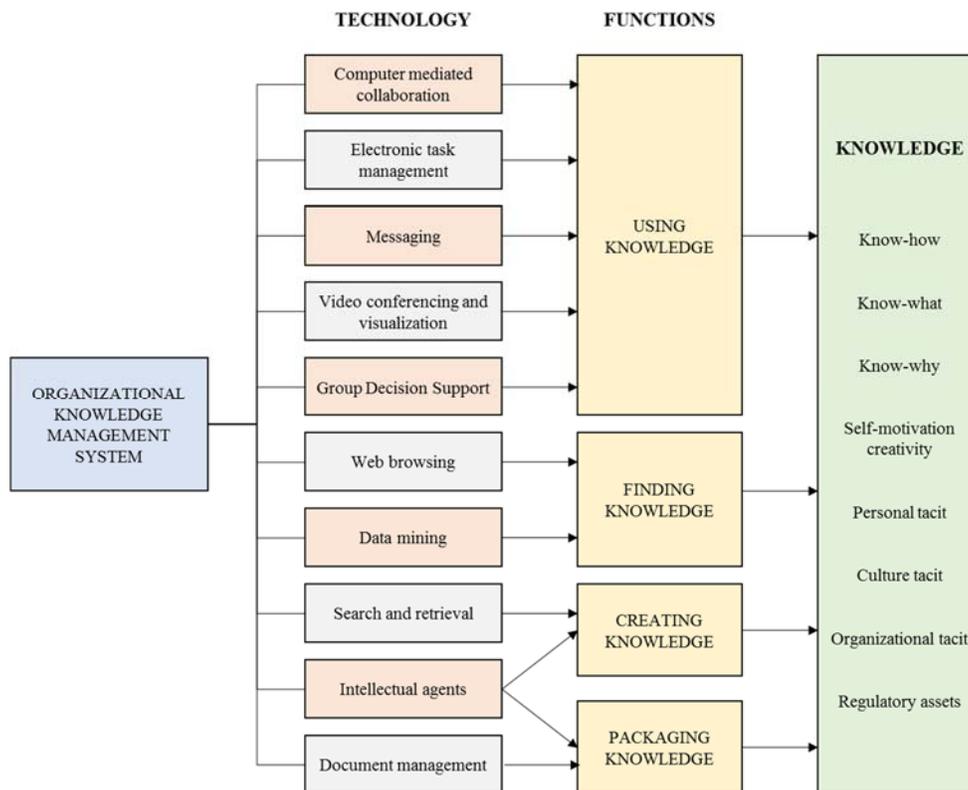


Fig. 3. Technical Perspective of Knowledge Management System (Abdullah et al., 2005)

(Ainissyifa, 2012). The process of knowledge utilization aims to assimilate or combine new knowledge with prior knowledge in new perspective, new way of work, or new policy. Learning process occurs when work unit receives new knowledge and try to use the new knowledge transmitted.

Process of Knowledge Maintenance and Storage: The process of knowledge storage is an activity intended to ensure that existing knowledge in organization maintained and stored in an easily accessible form for those who need it (Alam and Irfan, 2011). This activity also includes mapping the owner of the existing knowledge in organization, both individual and work unit. As a matter of fact, that not all knowledge should be stored, the organization must choose knowledge of many events, people and processes worth saving. Then it determines how to save them.

Knowledge portal as the application of information technology is the system and method infrastructure (*hardware, software, useware*) to acquire, transmit, process, interpret, store, organize, and use the data in meaningful ways. Therefore, the use of technology provides a lot of convenience in managing information i.e. storing, retrieving, and updating information (Warsita, 2008). Technology support is often a prerequisite of KM

success, technology serves to facilitate communication between lecturers/ faculty without being limited by distance and time difference, to support the knowledge flow that can be accessed quickly and easily, and to facilitate cooperation between the academic community.

Meanwhile some functions of information technology in education can be divided into seven functions, namely: as knowledge repository; as learning tool; as educational facility; as competence standard; as supporting administration; as tool for school management; and as educational infrastructure (Warsita, 2008).

In the context of KM, the main function of technology infrastructure is to facilitate knowledge sharing and to save the explicit knowledge in digital format into a knowledge repository organization. Knowledge repository can be accessed via the intranet or internet. Meanwhile the transfer of tacit knowledge is more effectively done through personal interaction, even if it is still done through on-line, then the tacit knowledge must be converted first into explicit knowledge in digital data form, and then distributed through the media and available network (Tobing, 2007). In the implementation of HEI, Abdullah, et. al. (2005), presented Technical Perspective of Knowledge Management System as shown in Fig.3.

Functional Need of Knowledge Portal. Functional need analysis conducted in this article discussion is a need

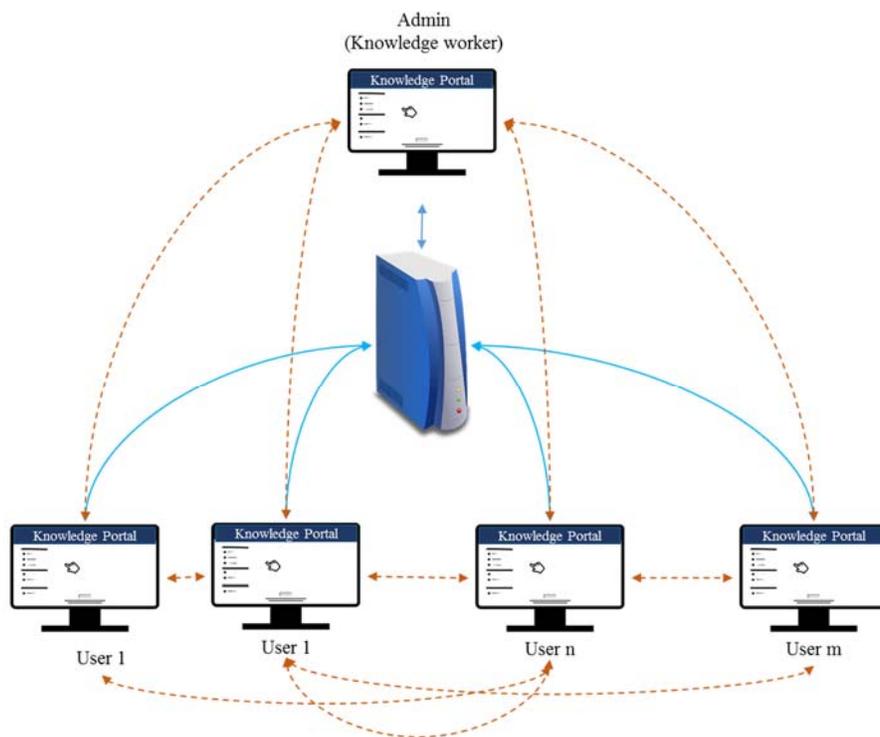


Fig. 4. Design of Knowledge Portal

analysis process that includes a process that can be performed by Knowledge Portal, and contains existing information and produced by Knowledge Portal.

Need for Knowledge Portal: The ability of the KP is required to be able to meet the individual needs and the needs of HEI in managing knowledge relevant to the implementation of the vision and mission of the HEI.

The ability of knowledge portal should be able to resolve multidimensional problems (as a result of several studies) as stated by Saade, et. al. (2011). The five most important issues as the result of research on the learning process through Internet include:

- The learning environment: What learning principle does the web site support (collaborative learning, learner-centered, constructivism, situational learning)
- The learning tools used: That addresses the aspects of communications (such as chat rooms, bulletin boards, and discussion), videos, animation, and practice problems and quizzes.
- The use of Learning-oriented objects: This includes decision support systems for learning such as teaching agents, expert systems, adaptive learning systems, internet mediated agents, and simulation systems.

- Content: Educators: not only do they have to address the amount of content to include as part of the requirements for a course but also how it will be delivered online.
- Support: This issue acknowledges the fact that not all learners learn alike. The majority of learners are not accustomed to learning over the internet. Learners should be given support and provided instructions on how to learn over the internet.
- The effectiveness of internet learning: This includes proper assessment and evaluation of internet learning with two regards: learner satisfaction, and learner acceptance.

Design of Knowledge Portal: KMS functions to optimize knowledge in the database so that the system has ability to adapt to knowledge mapping based on certain features (Retnoningsih, 2013). The built system is an academic digital dashboard in Knowledge Portal form. Knowledge Portal focused on mapping knowledge, KM strategy, operating models and architectures, and KM tool. In general, the system chart is shown in Fig. 4.

Prototype of Knowledge Portal: Prototype contains several information relevant to knowledge-sharing activities that include:

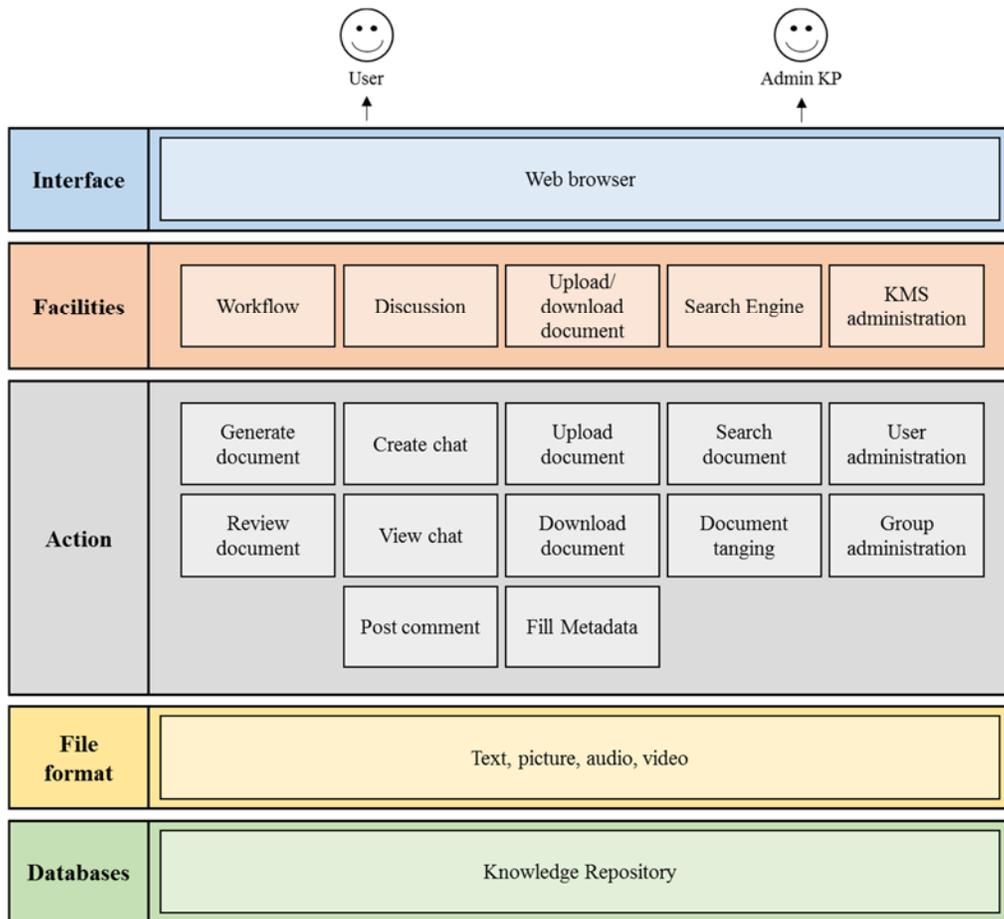


Fig. 5. Prototype Model of KMS (Retnoningsih, 2013)

- Lecturer Profile
- Lecturer Activity
 - Teaching activity
 - Research activity
 - Community service activity
- Regulations and working mechanism
- Patent Ownership/ Intellectual Right
- Discussion forum
- Reporting/ evaluation of lecturer activities

Prototype Model of KMS designed for Knowledge Portal can be done by adopting a prototype model of KMS proposed by Retnoningsih (2013) as presented in Fig. 5. One menu that needs to be informed through Knowledge Portal is a lecturer profile that covers his activity profile in performing his duties as academics that make people easy to see the lecturer profile and make lecturer easy too to make Lecturer Performance Report. One proposed display in Knowledge Portal is presented in Fig. 6.

Architecture of Knowledge Portal: Technology facility support in organization has an important role in

encouraging knowledge-sharing activity in the organization (Aulawi et al., 2008). Technological development nowadays possibly provides convenient facility for knowledge storage, retrieval and communication. Here is an example of technological facility that support organization, like providing groupware, on-line databases, intranets and virtual community. Based on HEI needs approach, Knowledge Portal architecture can adopt the system architecture proposed by Triwana (Tiwana, 1999). (Fig. 7).

Interface Layer: An application to be used in Knowledge Portal is a web-based application, users must use a web browser to be able to run the application.

Access and Authentication Layer: Knowledge Portal Application is only accessible for those who are concerned with so that the application is equipped with authentication. In addition to using the facility authentication, there is also facility for access right to the data and the action in the Knowledge Portal. To keep

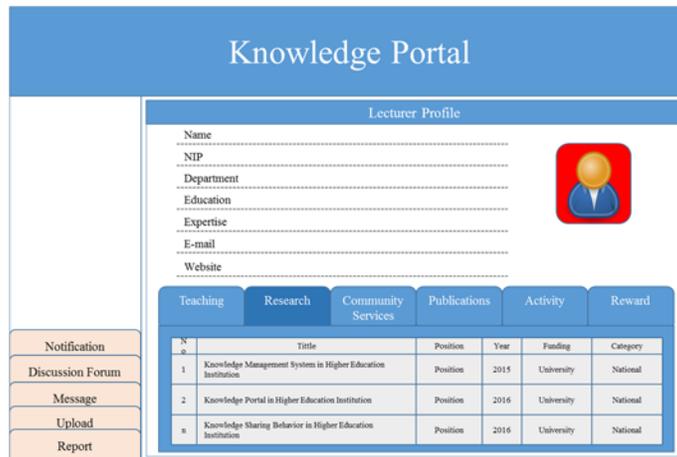


Fig. 6. Example of Lecturer Profile Dashboard

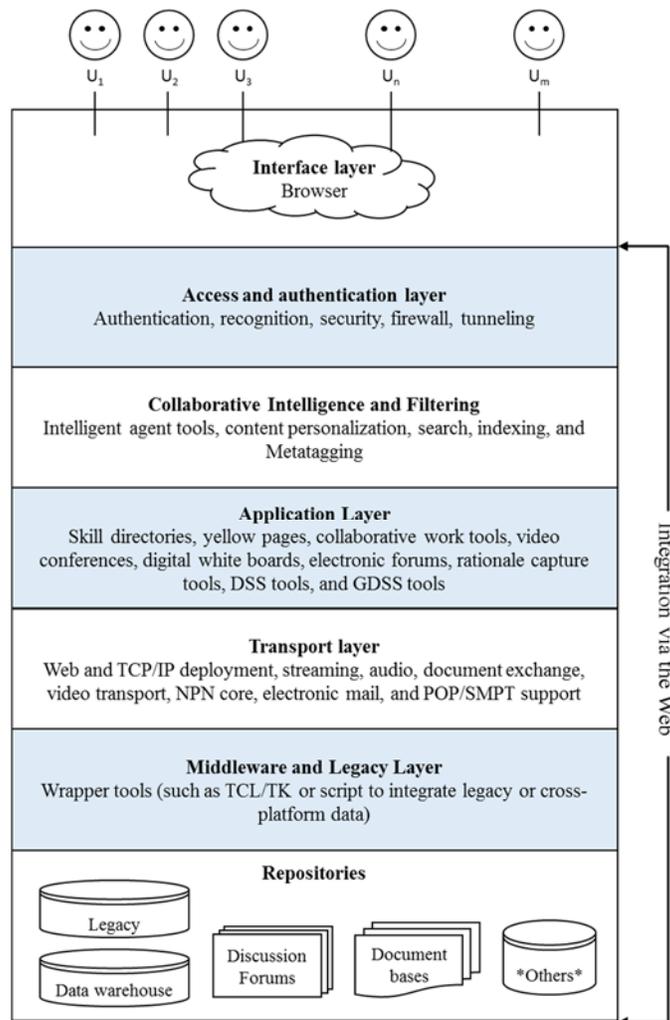


Fig. 7. Knowledge Management System Architecture (Tiwana, 1999)

Knowledge Portal safe from outside interference it requires firewall.

Collaborative Filtering and Intelligence Layer: Academic community can utilize this facility in the research discussion.

Application Layer: In order to run Knowledge Portal, it required a webserver and for storing data it can use MySQL application.

Transport Layer: Knowledge Portal will use TCP/IP as a medium to transmit data in the transport layer. The data transmitted through Knowledge Portal can be text, picture, audio and video.

Middleware and Legacy Layer: Middleware and legacy layer for Knowledge Portal are bridging between other applications.

Repositories Layer: MySQL is a database that serves to store Knowledge Portal settings, comments or discussion and a list of users and their access rights.

Benefits of Knowledge Portal Implementation: Knowledge management within an organization requires professional support that can become agents of change, where they are expected to be directly involved in the process of knowledge sharing to ensure the success of knowledge management (Koenig, 1998). Some benefits of KSM implementation through knowledge portal are as follow:

Individual:

- Doing a good job and being able to save time in decision making and problem solving (Supriyanta, 2013; Suryadi and Ramdhani, 1998).
- Acquiring new skills that can improve his work ability (Aulawi et al., 2009).
- Building a sense of community bond within organization
- Helping people learning, and to keep up to date Aulawi et al., 2009; Tsabit et al., 2012; Ainissyifa, 2012; Ramdhani and Wulan, 2012)
- Providing challenges and opportunities to contribute
- Increasing services quality and lecturer satisfactions (Setiawardi et al., 2013; Ramdhani et al., 2011).
- Being able to make lecturer performance reports faster and more precise

Community:

- Developing professional skill
- Promoting peer-to-peer mentoring

- Providing more effective consensus, networking, and collaboration (Aulawi et al., 2009; Ramdhani and Suryadi, 2005)
- Developing a professional code of ethics that members can follow
- Developing a common language

Organization:

- Helping drive strategy
- Solving problems quickly (Supriyanta, 2013)
- Diffusing best practices
- Improving knowledge embedded in product services (Aulawi et al., 2009)
- Cross-fertilizing ideas and increasing opportunities for innovation (Supriyanta, 2013)
- Enabling organization to stay ahead of better competition (Aulawi et al., 2009)
- Building organizational memory (repository)
- Increasing service quality to stakeholders (Ramdhani et al., 2006)
- Making performance report of HEI quickly and precisely that make it easier to account for HEI activity in the accreditation process and accountability to vertical institution.

CONCLUSION

Knowledge portal is designed as an information system in order to improve performance and support knowledge management at HEI. Knowledge portal is a system that facilitates knowledge acquisition activity/ knowledge creation, knowledge sharing, knowledge storage, and knowledge utilization as an additional factor for the HEI's success in performing his mission in building human civilization

REFERENCES

- Abdullah, R., Selamat, M. H., Sahibudin, S., and Alias, R. A. (2005). A Framework for Knowledge Management System Implementation in Collaborative Environment for Higher Learning Institution. *Journal of Knowledge Management Practice*, 6(1).
- Adelia, and Surendro, K. (2015). Perancangan Model Pengukuran Layanan Teknologi Informasi pada Perguruan Tinggi. *Jurnal Teknik Informatika dan Sistem Informasi*, 1(2), 142-150.
- Ainissyifa, H. (2012). The Influence of Human Resources toward Knowledge Management Implementation on Secondary Education Institution. *Advances in Natural and Applied Sciences*, 6(6), 789-792.

- Ainissyifa, H. (2012). The influence of knowledge management implementation toward the quality of high schools. *International Journal of Development and Sustainability*, 2(1), 79-84.
- Ainissyifa, H. (2012). The Influence of Organizational Culture Toward Knowledge Management Implementation on Secondary Education Institution. *International Journal of Research in Management*, 2(3), 134-139.
- Ainissyifa, H. (2012). The Influence of Technology Utilization toward Knowledge Management Implementation on Secondary Education Institution. *Journal of Applied Sciences Research*, 8(4), 2133-2136.
- Ainissyifa, H. (2012). The Vital Pillar of the Implementation of Knowledge Management on High Schools . *International Journal of Scientific & Technology Research*, 1(4), 132-138.
- Ainissyifa, H. (2013). Pengaruh Sumberdaya Manusia, Budaya Organisasi, dan Penggunaan Teknologi Terhadap Aplikasi Manajemen Pengetahuan dalam Rangka Peningkatan Mutu Pendidikan Formal Lingkungan Pesantren. Bandung: UIN Sunan Gunung Djati Bandung.
- Alam, C. N., and Irfan, M. (2011). Pengembangan dan Pemanfaatan Sistem Informasi Berbasis Knowledge Management untuk Membentuk Sharing Culture pada Fakultas Sains dan Teknologi UIN SGD Bandung. *Jurnal ISTEK*, 5(1), 19-34.
- Aulawi, H., and Govindaraju, R. (2008). Identifying the Relationship Between Knowledge Infrastructure, Knowledge Sharing and Innovation Capability: System Dynamics Approach. *Knowledge Management International Conference 2008* (pp. 310-316). Lengkawi, Malaysia: Universiti Utara Malaysia.
- Aulawi, H., Govindaraju, R., Suryadi, K., and Sudirman, I. (2009). Hubungan Knowledge Sharing Behavior dan Individual Innovation Capability. *Jurnal Teknik Industri*, 11(2), 174-187.
- Aulawi, H., Sudirman, I., Suryadi, K., and Govindaraju, R. (2009). Knowledge Sharing Behavior, Antecedent and Their Impact on the Individual Innovation Capability. *Journal of Applied Sciences Research*, 5(12), 2238-2246.
- Aulawi, H., Sudirman, I., Suryadi, K., and Govindaraju, R. (2009). Literature Review towards Knowledge Enablers which is Assumed Significantly Influences KS Behavior. *Journal of Applied Sciences Research*, 5(1), 2262-2270.
- Brink, P. V. (2003). *Social, Organizational, and Technological Conditions that Enable Knowledge Sharing*. Delft : Delft University of Technology.
- Bukowits, R. W., and Wiliams, L. R. (1999). *The Knowledge Management Fieldbook*. New York: Prentice Hall.
- Chong, C. W., and Yeow, P. H. (2005). An Empirical Study of Perceived Importance and Actual Implementation of Knowledge Management Process in The Malaysian Telecommunication Industry. *Proceedings of ICTM 2005 Challenges and Prospects* (pp. 182-192). Melaka: Multimedia University.
- Munir, N. (2008). *Knowledge Management Audit: Pedomani Evaluasi Kesiapan Organisasi Mengelola Pengetahuan*. Jakarta: Penerbit PPM.
- Pamoragung, A., Suryadi, K., and Ramdhani, M. A. (2006). Enhancing the Implementation of e-Government in Indonesia Through the High-Quality of Virtual Community and Knowledge Portal. 6th European Conference on e-Government (pp. 341-347). Marburg: Academic Conferences Limited.
- Ramdhani, A., Ramdhani, M. A., and Amin, A. S. (2014). Writing a Literature Review Research Paper: A step-by-step approach. *International Journal of Basic and Applied Science*, 3(1), 47-56.
- Ramdhani, M. A., and Ramdhani, A. (2014). Verification of Research Logical Framework Based on Literature Review. *International Journal of Basic and Applied Science*, 3(2), 11-19.
- Ramdhani, M. A., and Suryadi, K. (2005). Consensus Method Development on Analytic Hierarchy Process. *International Conference on Quantitative Sciences and Its Applications* (pp. 1-10). Penang: Universiti Utara Malaysia.
- Ramdhani, M. A., and Suryadi, K. (2006). Analisis Faktor-faktor Kunci Keberhasilan dalam Penerapan Knowledge Management pada Perguruan Tinggi. The 4th Indonesian Symposium on Analytic Hierarchy Process. Jakarta: Universitas Trisakti.
- Ramdhani, M. A., and Wulan, E. R. (2012). *International Journal of Scientific & Technology Research*. The Analysis of Determinant Factors in Software Design for Computer Assisted Instruction, 1(8), 69-73.
- Ramdhani, M. A., Jamaluddin, D., and Aulawi, H. (2012). Knowledge Management as the Catalyst of Human Resources Development in Higher Education Institute. *International Conference on Islam in Malay World II*. Kuala Lumpur: Malaysia.
- Ramdhani, M. A., Ramdhani, A., and Kurniati, D. M. (2011). The Influence of Service Quality toward Customer Satisfaction of Islamic Sharia Bank. *Australian Journal of Basic and Applied Sciences*, 5(9), 1099-1104.
- Ramdhani, M. A., Suryadi, K., and Susantosa, P. (2006). Telematic Policy Analysis in Developing Countries: A Case Study in Garut District-indonesia. *Journal of Applied Sciences Research*, 2(1), 58-66.
- Retnoningsih, E. (2013). Knowledge Management System (KMS) dalam Meningkatkan Inovasi LPPM Perguruan Tinggi . *Evolusi*, 1(1), 76-85.
- Retnoningsih, E., and Utami, D. P. (2013). Penerapan Knowledge Management pada Perguruan Tinggi

- (Studi Kasus AMIK BSI Purwokerto). SNST (pp. 152-158). Semarang : Universitas Wahid Hasyim.
- Saade, R., Nebebe, F., and Mak, T. (2011). Knowledge Management Systems Development: Theory and Practice. *Interdisciplinary Journal of Information, Knowledge, and Management*, 6, 35-72.
- Setiawardi, A., Ramdhani, M. A., and Ikhwana, A. (2013). Pengaruh Bauran Pemasaran Jasa Terhadap Loyalitas Pelanggan di Taman Air Panas Darajat Pass. *Jurnal Kalibrasi*, 11(1), 1-10.
- Sopandi, O. D. (2016). Implementasi Manajemen Pengetahuan pada Perguruan Tinggi. Bandung: Universitas Pendidikan Indonesia.
- Supriyanta. (2013). Knowledge Management untuk Peningkatan Pelayanan Akademik pada Perguruan Tinggi. *Jurnal Bianglala Informatika*, 1(1), 62-68.
- Suryadi, K., and Ramdhani, M. A. (1998). Sistem Pendukung Keputusan. Bandung: Remaja Rosdakarya, Bandung .
- Tiwana, A. (1999). *The Knowledge Management Toolkit*. New York: Prentice Hall.
- Tobing, P. L. (2007). *Knowledge Management; Konsep, Arsitektur, dan Aplikasi*. Jogjakarta: Graha Ilmu.
- Tsabit, A., Ramdhani, M. A., and Cahyana, R. (2012). Pengembangan Ganesha Digital Library untuk Membuat Situs Jurnal. *Jurnal Algoritma*, 9, 1-10.
- Wahjono, S. I. (2010). *Perilaku Organisasi*. Jogjakarta: Graha Ilmu.
- Warsita, B. (2008). *Teknologi Pembelajaran: Landasan dan Aplikasinya*. Jakarta: Rineka Cipta.
- Wibowo, T. J. (2015). Pengukuran Faktor-faktor yang Mempengaruhi Keberhasilan Implementasi Knowledge Management. *Jurnal Industrial Services*.