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A Small-Scale Knowledge Management System for a Service-Oriented Department

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***Abstract*—**This paper demonstrates an effort of a service-oriented engineering department in improving the sharing and transfer of knowledge. Although the department consist of only six employees, but it provides services in various chemical application in an oil and gas business. The services provided span across Asia Pacific region mainly Indonesia, Myanmar, Vietnam, Brunei, Thailand and Singapore**.** Currently there are no effective tools or integrated systems that support the sharing or transfer and maintenance of knowledge so the department has considered preserving this valuable knowledge by developing a Knowledge Management System (KMS). This paper presents the development of a KMS to support the sharing of knowledge in a service-oriented engineering department of an oil and gas company. The embedded features in the KMS like blog and forum will encourage iterative process of knowledge sharing among the employees in the department. The information and knowledge being shared, discussed and communicated will be then achieved for future re-use. The re-use of the knowledge allows the department to reduce redundant efforts in providing consistent, up-to-date and cost effective of the best solution to the its clients.

***Keywords*—**Knowledge management, knowledge management system, knowledge barrier, knowledge sharing.

I. Introduction

A. Knowledge Management and Knowledge Management System (KMS)

In [1] KM can be defined as doing what is needed to get the most out of knowledge resource and in [2] it is information that can be used by individuals to make things happen effectively. Whereas Knowledge Management System (KMS) can be considered as IT-enabled system that supports KM processes by utilizing a variety of KM mechanisms and KM technologies [1]. KMS may come in a variety of implementations such as expertise databases, discussion lists and context-specific retrieval systems [6].

B. Knowledge Management in an Organization

Knowledge is considered one of the most important assets in an organization. Managing and retaining knowledge in an organization is crucial for the success of organizations since many activities; economically and socially are driven by knowledge [8]. Even though organizations comprise of individuals or people, however organizational knowledge is not simply a collective sum of these individuals knowledge. It is formed through unique pattern of interactions between technologies, techniques and people and these interactions are shaped by the organization's unique history and culture [9]. This provides the motivation of this research paper.

Currently there are no effective tools or integrated systems that support the sharing or transfer and maintenance of knowledge in the chosen organization. The department members are geographically dispersed due to the nature of their work and knowledge sharing is communicated verbally in an office setting and in meetings when they are at the main office or through emails or telephone when they are not able to meet face-to-face. There is also a centralized server where all the documentations are maintained. For the knowledge that is communicated verbally i.e face-to-face, there is no forms of documentation available for future reference except for personal notes taken by individuals. Emails provide a limitation as the individual users need to maintain their own email accounts and there is a possibility that old emails are deleted for housekeeping. In addition, emails do not provide knowledge sharing capability except between its sender(s) and receiver(s). Thus a tool or an integrated system is needed so that the knowledge and experience retained by these departmental personnel can be shared across the department more effectively in order for the organization to maintain its competitive advantage.

The objective of this paper is to present a developed Knowledge Management System (KMS) that can suitably support the sharing or transfer and maintenance of knowledge in a service-oriented engineering department of the organization.

Section II of the paper is the introduction to the department of organization. Section III discusses the methodology that is used to develop the KMS and Section IV discusses the knowledge management components of the department which are also the results of the observation, interviews and review of available documents. Finally Section V discussed the developed KMS and Section VI concludes the paper.

II. Company Background

The proposed solution is designed for a department of an engineering company that provides ranges of chemical application services in oil and gas business. It is a service-oriented department that provides services in the areas of corrosion control, sand control, pipeline service and

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maintenance, seawater injection and scaling control. The services provided span across Asia Pacific region mainly Indonesia, Myanmar, Vietnam, Brunei, Thailand and Singapore. Some of their clients are PETRONAS Carigali, Talisman, Murphy Oil, Shell and Exxon Mobil.

The department consists of six technical members which is lead by a technical director. Years of experience for the team members range from one year to 26 years.

III. Methodology

This research is conducted in several phases. Phase one consists of several activities such as literature study, identification of the departmental activities and work processes i.e. how the personnel in the department perform their daily tasks as well as how information is being communicated and how knowledge is being transferred or shared among them. The methods used during this phase are observation, interviews and review of available documents. Interview method is chosen because there are only six members in the department and each member performs different tasks. Requirement gathering for the KMS is also done during this phase. The purpose of the first phase is to identify the business processes, knowledge management activities and knowledge barriers that prevent knowledge sharing in the department. From the knowledge gaps identified, further analyses are done to recognize KMS features that could address or minimize the knowledge gaps.

The second phase is to come up with a logical design of the system such as the use case diagram that depicts the overall functionality of the system. The architectural design, databases design, interface design are also developed. The logical design is improved through direct feedback of the six departmental members of the organization. The structure and design of the KMS should satisfy all the people in the department.

In the third phase the KMS prototype is developed using collaborative technology and groupware and scripting language.

Finally the developed system is vetted by the same members of the department.

IV. Knowledge Management of the Department

A. Knowledge

The main resource of knowledge for the department comes in the forms of tacit knowledge of the technical director or the senior chemical technologist. Knowledge also comes from the experience of other engineers that are involved in other projects. [2] states that knowledge is personalized in which one person‘s knowledge is the source of another person knowledge and this knowledge needs to become accessible to another individuals.

The documentation resources of the department also come in various forms. This is the source of explicit knowledge. Documents such as project reports and schematic drawings that detail out the project itself as well as jobs that are done for the project can be found. There are also documents that are not specifically provide information on particular projects such as formula sheets and procedure and work process documents that state procedure on work and equipment safety and work flow. There are also documents on application information (i.e corrosion control, sand control, pipeline service and maintenance, seawater injection and scaling control). These basically are the documents on the services provided by the department. Finally, there are also data analysis documents that contain data that are collected from various projects. All these documents are archived in one centralized server which is administered by an application engineer. All the documents are considered confidential and any request should be sent to the application engineer. This archive of documents is considered the central of explicit knowledge of the department.

Since the engineers are also required to keep abreast of new technology related to their field of work, there are also books and online references kept at the department. The engineers are using the books and online resources to study new theory and technology to keep up with the business and the demand of their clients.

B. Knowledge Transfer

In [2] it is stated that it is not the creation of knowledge that is the challenge but the capturing and integrating of it. There are various conventional ways of knowledge transfer that includes face-to-face interactions, mentoring, job rotation and staff development. [2] also states that these conventional ways of transferring knowledge may prove to be too slow and less effective and a more efficient ways to transfer knowledge by electronic means needs to be used.

There are several means of how knowledge transfer happens within the department. Besides email communication and phone conversation the department still relies on conventional, non electronic means of transferring knowledge. One is through individual face-to-face communication. Normally only three people are involved. The technical director or the senior chemical technologist is the main reference point. Together with the engineers, they would have discussions in which the engineers get direct teaching lessons from either of these two expert personnel. Maintaining the technical director and the senior chemical technologist is crucial since they are the pivotal point of implicit knowledge resource.

The other method of knowledge transfer is through direct exposure of the engineers in the projects that they are involved in. A project is lead by a more experienced or senior engineer. A leader of the project is also chosen based on his performance on previous projects. Experiences gain through project involvement is one of the factors that rise up the value of the engineers. The more projects that the engineers are involved the higher the labor charges that the department can charge their clients.

There are also ongoing trainings given to the engineers. There are several types of training such as project

management training (i.e HSE training, Microsoft Office training) and operational or procedural training. These trainings are made compulsory for new engineers.

C. Knowledge Barriers

In [3] various form of knowledge barriers is discussed at Siemens Medical Engineering Group. These barriers are classified into 3 levels; personal barrier, collective barrier and structural barrier. At Siemens, different types of barrier at each level, different IT solutions are suggested. This section describes three barriers that hinder the sharing and flow of knowledge within the department.

Since person to person knowledge transfer is the method used to get implicit knowledge, location is the main constraint or restriction. This type of knowledge barrier is label as contextual barrier in [7]. The services provided by the department ranging across Asia Pacific region and normally the engineers are scattered based on the location of the projects. The face-to-face communication can only be done when the project director or senior chemical technologist and the engineers are at the head office.

Time is also a barrier for face-to-face knowledge sharing and transfer since the manager and the senior chemical technologist only have limited time for a lengthy discussion or teaching lessons. At Siemens as discussed in [3], time is grouped into personal barrier level in which too much time and effort are required in order for knowledge sharing and transfer to happen.

Lacking of IT technology such as suitable application that is accessible via intranet or internet is also a hindrance. Currently only emails and telephones are used as means of electronic communication. At Siemens as discussed in [3] this type of barrier is grouped into structural barrier.

V. Knowledge Management Systems (KMS)

The motivation behind developing this department KM solution is because according to [4] there can never be an out-of-the-box solution for KM. It is about creating an environment that is both culturally and technologically viable to enable knowledge sharing. According to research done in [5] there are 2 emerging complementary KMS models; the network model and the repository model. The former utilizes directories and communication technologies and the later utilizes information technology to capture, organize, store and distribute explicit knowledge.

The developed KMS is a web-based application that is accessible via the Intranet and Internet. According to [2] 90% of the technology used in KMS development is by the used of a web browser. This is due to ease of use in which documents can be linked and made available to anyone with Intranet and Internet connections.

Since this is a purely service oriented department, knowledge in the forms of reports and schematic design documents, procedure documents and formula sheets are important. This is where the repository model of a KMS is used in which the storing and retrieving of these documents are part of main functionalities of the system. Even though there is an existing archive in a central server maintained by the department, the developed KMS provides an integrated approach in which the people can share implicit knowledge as well as uploading and downloading of documents.

The KMS is also designed to communicate implicit knowledge effectively in which it employs the network model where human interactions with information and knowledge are delivered through information and communication technologies. Fig. 1 depicts the main components of the developed KMS and Fig. 2 depicts its information workflow.

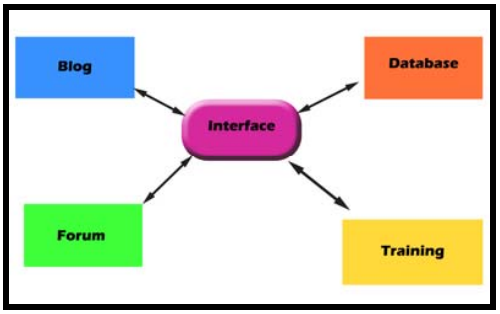

Fig. 1 Main components

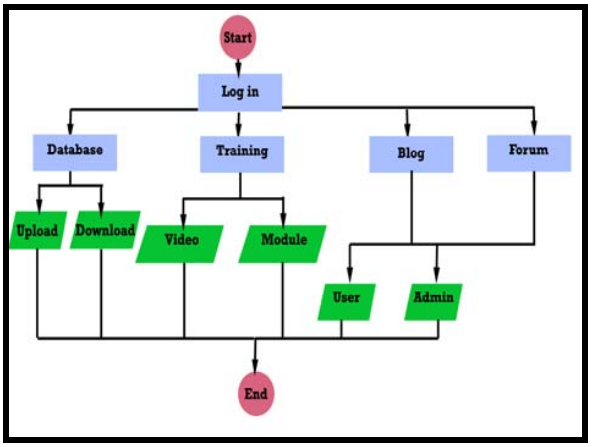

Fig. 2 Information Architecture

Virtual discussion room or board forum as shown in Fig. 3 is one of the features of the KMS that allows the user to have two-way communications. User may post question, suggestion, comment, shout out as well as response to questions posted by other users. By having virtual discussion room or board forum such as this, the technical director or the senior chemical technologist and engineers can have online discussion at time that is convenient to them. The engineers especially can post any questions or enquiries to the technical director or the senior chemical technologist at any time and wait for their response. Even though emails may be used for this purpose, this feature is better because other engineers from different projects may also benefit from the knowledge that is being communicated publically thus other engineers

may also use this feature to gain new knowledge of other engineers that work on different projects.

Similar to virtual discussion room or board forum, blog can be used by the users at any time. Questions can be asked and answered. This is also a good avenue for the engineers to share their experience handling different projects as shown in Fig. 4.

Training feature provides the engineers to go for online training, as shown in Fig. 5 and Fig. 6. Training modules can be downloaded and there is also video training for training that is procedural in nature. It is also very convenient since it can be done at any time. The trainers and the trainees do not need to be at the same physical location at the same time and also there is no need to schedule training sessions. This feature can certainly overcome the limitation of face-to-face interactions.

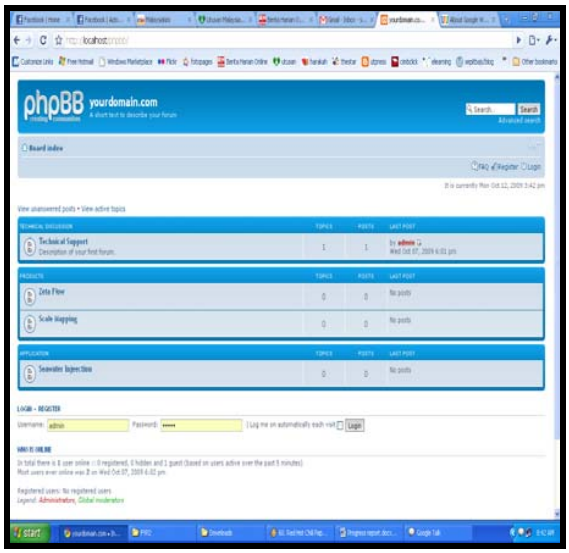

Fig. 3 Virtual discussion room or board forum

Fig. 4 Blog

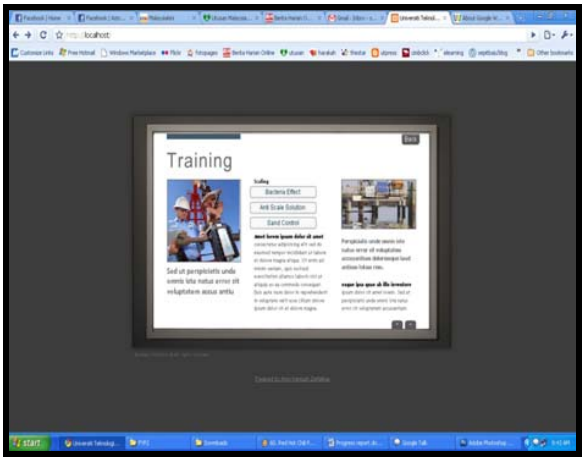

Fig. 5 Module Training

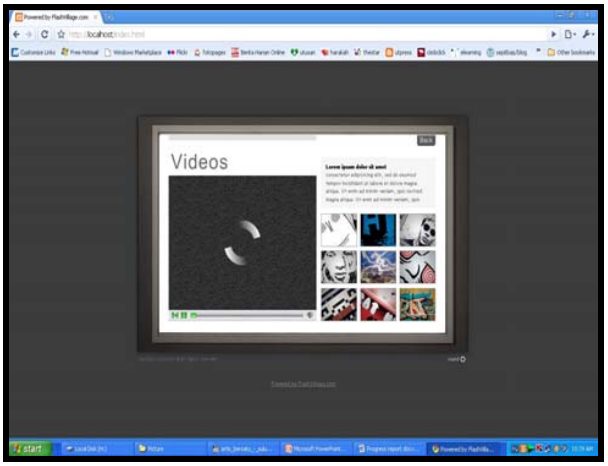

Fig. 6 Video Training

The database is the source of the explicit knowledge. It contains all the documentation resources such as project reports and schematic drawings and so on. The content of the database is the same as the application server that stores the documentations. The only different is it is now in one knowledge portal. The users can download the documents that they want as well as upload documents based on the category of the documents.

The developed KMS may be used as a supplement to existing knowledge sharing practice. It is convenient to use by all members of the department as long as they have internet connection. No meetings need to be scheduled and there is no need for them to check the availability of other employees.

The developed system has been vetted by the members of the department and they are all agreed that the components such as virtual discussion room and blog are very useful for them to ask questions or gain knowledge of other engineers. The central repository also proved to be an effective way to store and upload documents. Even though the members of the department still resort to the current method of transferring knowledge i.e meetings, emails and phone conversations, the

developed KMS provides an effective supplementary ways for communication of knowledge.

VI. Conclusion

For a service-oriented department that has no integrated and effective way of sharing and transfer of knowledge, a KMS that can be used as a tool for information resource and also for communication is needed. This type of tool facilitates teamwork for members of the group that are geographically dispersed. Besides a KMS that can be used as a communication tool among its engineers, it also provides a central repository of documents that can easily be accessible by its users.

As a conclusion the developed KMS can be used by the department of the organization as a supplement to its current method of knowledge sharing and knowledge transfer. It is an integrated technological solution that is meant to overcome the knowledge barriers within the department.

References

[1] I. Becerra-Fernandez, A. Gonzalez and R. Sabherwal, *Knowledge Management Challenges, Solutions, and Technologies*, New Jersey: Pearson Prentice Hall, 2004
[2] S. Barnes, *Knowledge Management Systems: Theory and Practice*, London: Thomson Learning, 2002
[3] T. H. Davenport and G. J. B. *Probst, Knowledge Management Case Book*, Germany: John Wiley & Sons, 2002
[4] G. Natarajan, S. Shekhar, *Knowledge Management: Enabling Business Growth*, Singapore: McGraw-Hill, 2001
[5] M. Alavi and D. Leidner, "Knowledge Management Systems: Issues, Challenges, and Benefits," *Journal of Communications of the Association for Information Systems*, 1(2), 1999
[6] J. Hahn and M. R. Subrami. "A Framework of Knowledge Management Systems: Issues and Challenges for Theory and Practice," *Proceedings of the twenty first international conference on Information systems*, 302-312, 2000
[7] C. Lin, B. Tan and S. Chang. "An exploratory model of knowledge flow barriers within healthcare organizations," *Journal of Information and Management*, 45, 331-339, 2008
[8] F. Horible. *Managing knowledge workers.* Ontario, Canada: John Wiley & Sons, 1999
[9] G. D. Bhatt., "Knowledge management in organizations: examining the interactions between technologies, techniques, and people," *Journal of Knowledge Management,* 5(1), 68-75, 2001