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A knowledge framework to capture and share knowledge using storytelling and video sharing for global product development

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Abstract. In a global engineering enterprise, information and knowledge sharing are critical factors that can determine a project's success. This statement can be found in the vast literature available on the subject. However, according to the literature, tacit knowledge is derived from a person's lifetime of experience, practice, perception and learning, which makes it hard to capture and document in order to be shared. This project investigates if social media tools can be used to improve and enable tacit knowledge sharing within a global engineering enterprise. This paper first gives a brief background of the subject area, followed by an explanation of the industrial investigation, from which the proposed knowledge framework to improve tacit knowledge sharing is presented. This project's mainly focus is to improve collaboration and knowledge sharing amongst product development engineers in order to improve the whole product development cycle.

Keywords: Knowledge Management, Tacit Knowledge, Product Development, Product Validation and Testing, Social Media Tools.

1 Introduction

Knowledge is the key to innovation and staying competitive in today's engineering world. It is also a crucial asset for organizations that enable them to gain a sustainable competitive edge over their competitors [1]. Improving and creating new ways, in how enterprise knowledge is captured and shared amongst engineering teams will determine if they are capitalizing on this valuable, readily available company resource within the organization. Organizational competitiveness is rooted in the mobility of knowledge that is realized through knowledge sharing and knowledge transfer. It has been shown through the literature that knowledge sharing provides individuals, work teams and organizations with the opportunity to improve their work performance as well as create new and innovative ideas [2]. This clearly indicates that sharing

knowledge is a social, interactive, and complex process that includes tacit and explicit knowledge [3]. The challenges for knowledge management initiatives are finding solutions to people-centric problems, such as motivations and personality factors and creating organizational antecedents to ensure a smooth knowledge flow [4].

Innovation consists of successfully implanting creative ideas within an organization [5], and is therefore closely related to organizational learning. Innovation is conceived as an individual and collective learning process that aims to find new ways of solving problems [6]. The reason why knowledge sharing receives considerable attention [7], is that it is vital for innovation, organizational learning, the development of new skills and capabilities, increased productivity and maintaining a competitive advantage [8, 9].

This paper presents the ongoing work to develop a knowledge sharing environment within a product development testing facility using advanced Web tools. This project is in collaboration with a global power generation company and the objective of the project is to provide a knowledge sharing environment that enable knowledge to be captured, documented, created and shared using a combination of Information and Communication Technologies (ICT), such as rich media content, social media and video sharing. The developed framework will be driven by the actual knowledge users rather than knowledge administrators, based on the users' day to day knowledge requirements. The knowledge sharing framework is aimed to aid in reducing product development time and costs by avoiding task repetition and reinventing the wheel during new product development projects.

2 Research Background

Knowledge Management can be defined as “the ability to harness and build upon an organization’s intellectual capital” [10]. With the current economic climate, companies need to know what they know, and must use their knowledge effectively. The size and dispersion of many of them make it especially difficult to locate existing knowledge and get it to where it is needed. According to Davenport and Prusak [13], the maximum size of an organization, in which people know one another well enough to have a reliable grasp of collective organizational knowledge, is two hundred. The vast amount of knowledge found in a global enterprise which has offices and plants spread out around the globe is enormous. Taping into that pool of knowledge is a problem due to the sheer size of it. Corporate knowledge only becomes of value if people in the organization can gain access to it. If there isn’t a KM system available, employees would make do with what they know or most easily available knowledge. This knowledge could be of good quality, but in today’s market sometimes, good quality is not good enough [11, 12].

A lot of companies can argue that KM systems cost a lot of money, and the effort to setup and maintain. However, knowledge can provide a sustainable advantage towards a company. Eventually, competitors can almost always match the quality and price of the market leader’s current product or service. By the time that happens, the knowledge rich and good knowledge managing company will have moved on to a new level of quality, creativity, or efficiency. The knowledge advantage is sustainable

because it generates increasing returns and continuing advantages [13]. Good KM systems pay for themselves by creating new innovative ideas which are transformed into products, services and sales for the company.

The difficulty with tacit knowledge is derived from a person's lifetime of experience, practice, perception, and learning [3]. This type of knowledge is highly abstract and closely relates to know how [14]. Therefore, one may acquire tacit knowledge in one context and apply and stimulate this knowledge in another context [15, 16].

2.1 Learning Methods

Learning is divided into two categories: active and passive learning [17]. Active learning emphasises the intrinsic motivation and self-sponsored curiosity of the learner who fashions content and is actively involved in its formation. Active learning shifts the focus of content structuring from the teacher to the learner. By being actively involved in the shaping of content the learners gain a far better understanding of the information than they would otherwise have. Active learning is normally achieved by methods to reinforce the knowledge you have, this can be achieved by discussing the subject matter with your peers or supervisors, practicing the knowledge you have gained or by teaching it to others within your group or team. These methods allow you to gain a better understanding of the subject matter and from the interaction with others new ideas on the subject can be developed.

The opposite of active learning is passive learning. Passive learning has as its learning focus the instructor over the student. The standard teaching method is the traditional lecture, whereby the students are in effect bench-bound listeners, passively consuming the content presented by the instructor according to the structure that he or she created [17]. This approach is most effective to increase knowledge and skills that do not involve interaction with others [18]. However, as the name implies, "passive" knowledge is one transferred to the student if they are willing to learn. Fig. 1 is the learning pyramid which shows the order of the different learning mediums and their effectiveness.

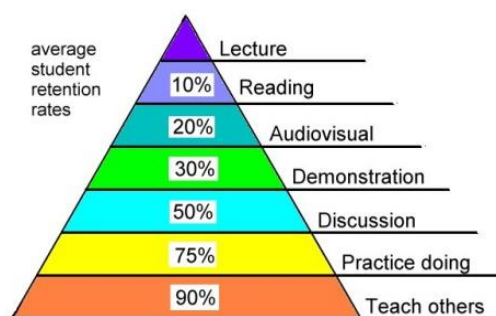


Fig. 1. The learning pyramid [19]

As anticipated passive techniques, such as lectures and reading are not as effective as discussing a topic or teaching a topic to your peers, because passive learning for it

to work the student needs to engage with the material, otherwise he/she won't gain anything from the lecture or the book he/she is reading. While active learning, if the student needs to teach a topic to his/her peers he will make an extra effort to understand the subject matter in order for him/her to convey what he/she has learned.

An antidote for learning is to engage learners in active, constructive, intentional, complex, cooperative and reflective learning activities [20]. These are the main goals of having a constructive learning environment. Constructive learning emphasizes the learning process, and the learner's thinking is encouraged and nurtured. The student's acquisition of knowledge is an outcome of the process focused on thinking, discovery and reflection [21]. Making it a unique experience to each one of us.

Cooperative learning is a teaching method where students working in small groups to help one another learn academic materials, these methods gives a sense of individual accountability and interpersonal communications, which provides a deeper learning experience [21]. Research has shown that these small groups produces higher achievement and healthier achievement than competitive or individual experiences [22]. Electronic learning as a concept is associated with consistently higher levels of student satisfaction but it is generally accepted that online learning works best when blended with more traditional learning techniques, rather than trying to replace them [23].

2.2 Advanced Web and Social Media Tools

Today, Web 2.0 and social media tools are widely used in our daily lives to share and communicate with one another, with tools such as Facebook and Twitter. These have become main stream communication tools for people to communicate and share their daily experiences all over the world like never before. This brought a communication and information sharing revolution in its own right shrinking further our planet and the way we communicate. Macaskill and Owen defined Web 2.0 as a 'web-based platform which allows users to gain access, contribute, describe, harvest, tag, annotate and bookmark Web mediated contents in various formats, such as text, video, audio, pictures and graphs [24]. Stuart [26] gave a more straight to the point definition of Web 2.0 as web sites which people can share stuff on. Web 2.0 is a vast improvement from Web 1.0 which only convey static information, and only Web programmers were able to modify and post Web contents. With Web 2.0, anybody with minimal skills can contribute and share information.

According to Moron-Garcia [25], the use of Web or Internet based technologies can facilitate the creation of student-cantered learning environments. Student-cantered learning and learning environment designed with reference to constructivist theories of learning will produce in students the critical and cognitive skills that higher education aims to develop [25, 26]. Electronic learning as a concept is associated with consistently higher levels of student satisfaction. However, it is generally accepted that online learning works best when it is blended with more traditional learning techniques, rather than trying to replace them [23].

2.3 Video Sharing and Storytelling

It has already been mentioned previously that tacit knowledge is difficult to capture and share, due to the personal understanding of the subject matter [27]. Only tacit knowledge that can be transformed into explicit knowledge can be successfully shared. As suggested by Hislop [30], tacit knowledge can be captured and shared by 'direct communication among individuals' by means of 1) stories, 2) observing others, and 3) learning by doing within a community.

Reamy [31] suggested that storytelling is arguably the best way to transfer tacit knowledge, in that you are able to convey information and context in a form that easy for people to understand. According to LeBlanc and Hogg [28], stories make information meaningful, tacit knowledge more explicit and allow information to be organized into learnable chunks. This methodology was also suggested by Martin-Niemi [33] to utilise storytelling with new generation Web 2.0 technology which provides an individualized and customizable user experience including virtual social interactions, shared collaborative portals and communications tools, but it was not put into action.

One medium to capture and share storytelling as part of the Web 2.0 technologies available is video sharing. Balcikanli [34] concluded that YouTube - a video sharing website can be integrated as an effective online tool for learning due to its ease of use and its connections to an abundance of video clips that not only teach, but also demonstrate the cultural context in which the material can be properly applied.

3 Industrial Investigation

An extensive industrial investigation was carried out with the industrial partner through an extensive observation and hands-on period, and a number of questionnaire studies with engineering staff at different levels of the organization, providing an extensive picture from managements and employee point of view.

The main outcome from the initial investigation was to explore and develop a cost effective knowledge sharing tool that allows for the capture of existing company knowledge and for it to be disseminated throughout the entire engineering team in order to improve employee understanding of in-house engineering practices and avoid reinventing the wheel when knowledge is already available but not properly documented and ready for reuse.

The knowledge framework should provide a theoretical method that allows users with the opportunity to easily capture and document the knowledge that they have acquired during their years of service. The framework should also provide the possibility to store this knowledge so that it can be easily searched, shared and disseminated both locally and globally throughout the organization, using knowledge mediums that can deliver knowledge quickly and provide high learning impact to the knowledge receiver. The framework should also be cost effective by reducing the amount of administrative effort required to manage the framework and minimize the cost for knowledge capture, in order to make the knowledge sharing system more attractive to a business.

4 Proposed Knowledge Framework

The proposed knowledge framework to support the product development team and its main stakeholders (product design), is shown in Fig. 2 below. The diagram represents the proposed knowledge cycle required to capture and share knowledge, but also to create new knowledge, build up the already existing company knowledge.

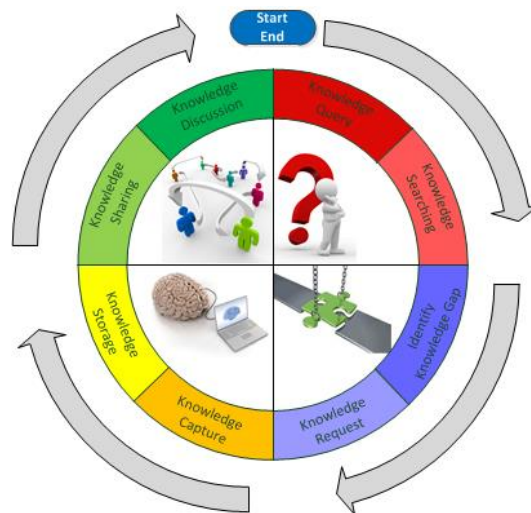


Fig. 2. The Knowledge Framework to Support the Product Development Team

The framework is made up of four main quadrants that of query, identification, capture and sharing, with each quadrant divided into a further two sections. The start of the cycle begins with the knowledge query quadrant where you have the actual question from the user, from which he will need to search the knowledge database for an answer to his knowledge question. If an answer is not found the user needs to go to the next quadrant that of knowledge identification, contains the identification of the knowledge gap from which he stipulate the knowledge requirement he needs and requests it through the system for a knowledge expert to reply to.

In the third quadrant, knowledge capture involves the evaluation on the knowledge request and the selection of the knowledge expert to contribute towards the new knowledge contribution. The selection criteria of the knowledge expert are classified into three fields: (1) having the perfect match between the knowledge expert and the knowledge requested, (2) a knowledge expert in a similar field to the knowledge requested, and (3) enthusiastic knowledge contributor that is willing to learn new thing in order to contribute towards a knowledge request. Once the knowledge is captured this is stored and on an electronic database. The last and final quadrant of our knowledge framework is that of knowledge sharing which is divided into sharing and knowledge discussions. The knowledge sharing consists of an easily searchable database from which knowledge can be identified and accessed for learning, from

which the user has the opportunity to question or even challenge the available knowledge through the discussions functionality which brings back to the start of the cycle. Creating new knowledge by creating new knowledge questions that need to be addressed through another knowledge cycle. Each knowledge cycle is aimed at creating both the database knowledge content and at the same time the autonomy of the system determining the knowledge direction depending on the end users interests and knowledge needs.

4.1 Selected medium for knowledge capturing and sharing

The medium selected to capture and share knowledge needs to be in a format that is easy to use, able to capture complex content, quick to create, during sharing quick to absorb and also allows for different technical levels of competence to understand and use with minimal training. The medium selected was that of social media and video sharing techniques. The main motivation in using these tools was due to its mass popularity, which in the last decade social media and video sharing have exploded exponentially into our everyday lives and can be found on our computers, tablets, and smart phones. Making it an ideal tool to be adopted, while also providing a guarantee of user acceptance due to its familiarity with the end users. The social media techniques are also being used to generate knowledge discussion from the content create which is hope will also identify new knowledge gaps and also create new knowledge and content. Some of the main benefits that this framework is hope to bring with it are;

- People contributing to the Knowledge base system will learn more about the subject, by reinforcing their own knowledge.
- Knowledge will be documented, therefore available for others to learn from and can also be used for training existing or new staff.
- The social discussions / comments will generate further clarifications and also generate further knowledge to both the sender and receiver.
- Generation of new ideas.
- Social discussions will promote teamwork, with the added advantage of improving social interactions between different departments.

The idea to use rich media and video sharing content as a mean for knowledge transfer has already been used by universities to some degree as a method to supplement the student learning processes [29]. However, it seems that universities generally rely either on professional media people to develop the knowledge content or rely on readily available content found on the internet. There is a gap in the literature on knowledge content created by the actual knowledge expert. In today's high tech and socially connected world people have been extensively exposed to digital cameras through their smart phones and creating media content through the use

of social media, therefore the proposed framework will investigate if this social phenomena can be exploited by as readily available skill base to capture knowledge using rich media content and determine the effort, effectiveness and quality of the captured knowledge.

5 Conclusions

In today's market, time is a luxury that top companies are scared of each activity taking times out of the project development cycle [30]. Companies often face the problem that knowledge sharing activities are usually not part of the official job description, and therefore no time resources are allocated for this kind of activity. Furthermore, project teams suffer from time pressure to reach the project goal in time and consequently do not have free time resources [31]. This is for both capturing knowledge and looking through the ready available knowledge. The principle aim of the developed framework is to utilize social media tools, which have become commonly used in our everyday life, to simplify both the capture and sharing of enterprise knowledge. The framework is now being developed into a tool which will be validated by means of a case study in conjunction with the industrial partner, and will answer the research question: "can social media tools be used effectively at a relatively cheap cost for a company to capture and share tacit knowledge inside there employees minds.

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