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

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Abstract. In global engineering enterprises, information and knowledge sharing are critical factors that can determine a project's success. This statement is widely acknowledged in published literature. However, according to some academics, 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 provides 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 main focus is on the improvement of collaboration and knowledge sharing amongst product development engineers in order to improve the whole product development cycle.

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

1 Introduction

Knowledge is the key to innovation and staying competitive in today's engineering world. It is a crucial asset for organisations that enables them to gain a sustainable competitive edge over their competitors [1]. By improving and creating new ways in which enterprise knowledge is captured and shared amongst engineering teams, will determine if they are capitalizing on this valuable, readily-available company resource. Organisational competitiveness is rooted in the mobility of knowledge that is realized through knowledge sharing and knowledge transfer. It has been identified in literature that knowledge sharing provides individuals, teams and organisations with the opportunity to improve their work performance as well as create new and innovative ideas [2]. This clearly shows 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 organisational antecedents to ensure a smooth knowledge flow [4].

Innovation consists of successfully implanting creative ideas within an organisation [5] and is, therefore, closely related to organisational 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, organisational learning, the development of new skills and capabilities, increased productivity and maintaining a competitive advantage [8, 9].

This paper presents ongoing work to develop a knowledge sharing environment within a product development testing facility using advanced Web tools. The project is in collaboration with a global power generation company and the objective of the project is to provide a knowledge sharing environment that enables knowledge to be captured, documented, created and shared using a combination of Information and Communication Technologies (ICT), such as rich multimedia content, social media and video sharing. The developed framework will be driven by the knowledge user, rather than knowledge administrators, based on the users' day to day knowledge requirements. The framework is aimed to assist 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 organisation’s intellectual capital” [10]. With the current economic climate, companies need to know what they know, and must use this knowledge effectively. The size and dispersion of global organisations 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 organisation, 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 around the globe is enormous; tapping in to that pool of knowledge is a problem due to the sheer size of it. Corporate knowledge only becomes of value if people in the organisation can gain access to it. If there isn't a KM system available, employees would make do with what they already know or the knowledge that is most easily available. 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 costs a lot of money and the effort to setup and maintain is labour intensive. However, knowledge can provide a sustainable advantage to a company. Eventually, competitors can almost always match the quality and price of the market leader's current product or service. By the time this happens, the knowledge rich and good knowledge managing company will have moved on to a new level of quality, creativity and/or efficiency. The knowledge advantage is sustainable because it generates increased returns and continuing advancement [13]. Successfully embedded 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 that it 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]. Thus, 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 on 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 learner gains a greater understanding of the information. Active learning is normally achieved by methods which reinforce knowledge; this can be achieved through discussion of the subject matter with peers or supervisors, practicing the knowledge you have gained or by teaching it to others within a group or team. These methods allow a person 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 focuses on the instructor, not the student. The standard teaching method used is the traditional lecture, whereby 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 which is transferred to the student only if they are willing to learn. Fig. 1 shows the learning pyramid which illustrates the order of the different learning mediums and their effectiveness.

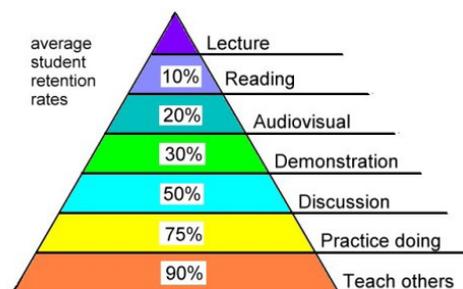


Fig. 1. The learning pyramid [19]

As anticipated, passive techniques are not as effective as discussing a topic or teaching a topic to peers, because passive learning, for it to work, needs the student to engage with the material, otherwise he/she won't gain anything from the lecture or the book which they are reading. While active learning, if the student needs to teach a

topic to his/her peers, they will make extra effort to understand the subject matter in order for him/her to convey what they have 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 whereby students working in small groups to help one another learn academic materials. This methods provides a sense of individual accountability and interpersonal communications, which provides a deeper learning experience [21]. Research has shown that these small groups produce higher achievement and healthier achievements than with 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 each another, with tools such as Facebook and Twitter being readily available. These tools have emerged as main stream communication channels for people to communicate and share their daily experiences all over the world like never before. They have, however, changed the way our planet communicates. Macaskill and Owen [24] 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] provided a more precise definition of Web 2.0, stating that it is web sites which people can share content on. Web 2.0 is a vast improvement from Web 1.0 which only conveyed static information. With Web 1.0, only web programmers were able to modify and post contents. In contrast, with Web 2.0, anybody with minimal ICT skills can contribute and share their information [25].

According to Moron-Garcia [26], the use of web-based technologies can facilitate the creation of student-centred learning environments. Learning environments, designed with reference to constructivist theories of learning, will embed in students the critical and cognitive skills that higher education aims to develop [26, 27]. E-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 traditional learning techniques, rather than trying to replace them [23].

2.3 Video Sharing and Storytelling

It has previously been mentioned that tacit knowledge is difficult to capture and share, due to the personal understanding of the subject matter [28]. 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 the best way to transfer tacit knowledge, being that you are able to convey information and context in a form that is easy for other people to understand. According to LeBlanc and Hogg [29], stories make information meaningful, making tacit knowledge more explicit and allowing information to be organised into learnable chunks. This methodology was also suggested by Martin-Niemi [33] who utilised storytelling with new generation Web 2.0 technologies, providing an individualized and customizable user experience which included 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 a Web 2.0 environment, 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 connection 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 in-depth industrial investigation was carried out with an industrial partner operating in the manufacturing industry, through observational and hands-on study, including a questionnaire investigation with engineering staff at different levels of the organisation. This provided an overview of management and employee views [30].

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 entire engineering teams 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, proposed in this paper, should provide a theoretical method that gives users the opportunity to easily capture and document the knowledge that they have acquired during their years of service. The framework provides the possibility to store this knowledge so that it can be easily searched, shared and disseminated, both locally and globally, throughout the organisation, using knowledge mediums that can deliver knowledge quickly and provide high learning impact to the knowledge receiver. The framework is also cost effective as it reduces the amount of administrative effort required to manage knowledge and minimize the cost of knowledge capture; this makes the knowledge sharing system more attractive to business.

4 Proposed Knowledge Framework

The proposed knowledge framework to support the product development team and its stakeholders, is shown in Fig. 2. The diagram represents the proposed knowledge cycle required to capture and share knowledge, but also to create new knowledge and build upon pre-existing company knowledge.

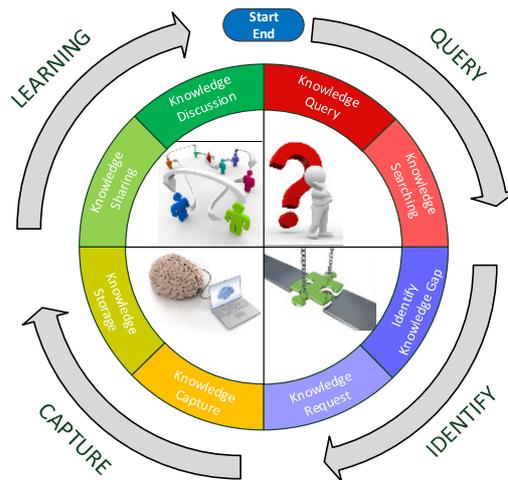


Fig. 2. The Knowledge Framework to Support the Product Development Team

The framework is made up of four main quadrants: Query, Identification, Capture and Sharing, with each quadrant divided into a further two sections. The cycle begins with the knowledge query quadrant where a user submits a question, from which they will need to search the knowledge database for an answer to their question. If an answer is not found the user moves to the next quadrant, knowledge identification, which contains the identification of the knowledge gap. They then stipulate the knowledge requirement and request it through the system for a knowledge expert to complete.

In the third quadrant, knowledge capture involves the evaluation of the knowledge request and the selection of a knowledge expert who could contribute towards the new knowledge contribution. The selection criteria of the knowledge expert is categorised in to 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 knowledge in order to contribute towards a knowledge request. Once the knowledge is captured, it is stored on an electronic database. The final quadrant of the framework is that of knowledge sharing, which is divided into sharing and knowledge discussions. Knowledge sharing consists of a searchable database from which knowledge can be identified and accessed for learning. At this point, the user has the opportunity to question or even challenge the available knowledge through the discussion facility; this brings us back to the start of the cycle where a user can create

new knowledge by submitting further knowledge questions that need to be addressed through another knowledge cycle. Each knowledge cycle is aimed at creating both the database of knowledge and, at the same time, the autonomy of the system determining the knowledge direction depending on end user interests and knowledge needs.

The proposed framework targets the knowledge experts to create the knowledge contribution, removing the need of additional personnel / administrators to support and create the system content and, therefore, reducing the cost of its management.

4.1 Selected medium for knowledge capturing and sharing

The medium selected to capture and share knowledge needed to be in a format that is easy to use and one which provides the ability to capture complex content. Knowledge should be quick to create, absorb and allow for different technical levels of competence to understand and use with minimal training. The medium selected was that of social media and video sharing. The main motivation in using these tools was due to its mass popularity, which in the last decade, has seen social media and video sharing explode exponentially into our everyday lives. It is also available via multiple routes, including computers, tablets, and smart phones, making it an ideal tool to be adopted, while also providing a guarantee of user acceptance due to its pre-existing familiarity with the end user; this is also supported from a previous end user investigation carried out by the authors [31]. The social media techniques are also being used to generate knowledge discussions from the content created which it is hoped will also identify new knowledge gaps and create new knowledge and content. The main benefits of the framework are:

- People contributing to the Knowledge base system will learn more about the subject, by reinforcing their own knowledge;
- Knowledge will be documented and, therefore, available to other staff to learn from and can also be used for training existing or new staff;
- The social discussions / comments will generate further clarifications and also further knowledge to both the sender and receiver;
- Generation of new ideas; and
- The Social discussions will promote teamwork, with the added advantage of improving social interaction 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 [32]. However, it appears that universities generally rely either on professional media companies 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 use of their smart phones and when creating media content for social media platforms. Therefore, the proposed framework will allow the authors to investigate if this social phenomena can be exploited by employees with readily available skill sets, to capture knowledge using rich media content and determine the effort, effectiveness and quality of the captured knowledge. To develop such a framework a tangible tool was required, which employed the following components:

- A knowledge repository that provides easy access to corporate knowledge;
- A process to request and manage, user knowledge requests;
- A formal methodology to capture and compose knowledge contributions by knowledge experts;
- Guidelines of the developed knowledge framework for use for further system development and replication; and
- Training material for end-users both in text format and rich media format using the develop methodology to guide users in the use of the developed tool.

5 Conclusions

In today's globally dispersed marketplace, time is a luxury that top companies are scarce of, with each activity taking time out of a project development cycle [33]. Companies often face the problem that knowledge sharing activities are usually not an integral part of an official job description and, therefore, no time resource is allocated for this kind of activity. Furthermore, project teams suffer from time pressures to reach project goals and consequently do not have free time to create new knowledge or share it [34]. This is for both capturing knowledge and looking through readily available knowledge. The principle aim of the developed framework is to utilize social media tools, which are commonly used in our everyday lives, 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 of: "Can social media tools be used effectively, at a relatively cheap cost, for companies to capture and share tacit knowledge inside their employee's minds?"

Initial feedback from knowledge contributors participating in the case study have provided positive feedback to both the developed framework and the ongoing development of the tool, which aids them in their task of capturing knowledge.

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- The percentages represent the average “retention rate” of information following teaching or activities by the method indicated. .
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