Implementing Research Recognition Award Knowledge-based System (R2AKS)

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ABSTRACT

In an effort to recognize the contributions of outstanding researchers within a university, a private university in Malaysia had introduced a Research Award. The process of identifying the candidates to be evaluated by a Selection Committee is currently carried out manually by personnel from the university's Research Enterprise Office (REO). Although the selection criteria are well-established, the manual process is tedious and time-consuming and more importantly it is subject to the discretion of the panel on the Selection Committee. The prototype implemented in this study is called Research Recognition Award Knowledge-based System (R2AKS) which aims to assist the REO personnel to select the winner for the Research Award. At the same time, R2AKS is able to capture the valuable knowledge residing in the researchers and REO personnel as well as from the university's policies, procedures and templates. The prototype does not only serve as a DSS tool for helping REO personnel in the selection of the winner for each category but also for the capture of valuable insights, intuition, historical experience, judgments and know-how of the REO personnel when they are performing the selection process. Finally, the R2AKS is modest effort by the university to leverage their existing knowledge while at the same time ensuring the knowledge capture is well-documented, reused, and accessible to the public and distributed throughout the organization.

Keywords

Decision Support Systems (DSS), Knowledge Management (KM), Knowledge Management Technology (KMT)„ Knowledge-based System (KBS)

1.0 INTRODUCTION

The nature of work in the workplace has dramatically changed over the years. Organizations have now moved from the industrial economy to the knowledge economy [1]. When organizations shifted their focus to knowledge economy, they adopted the paradigm that knowledge together with land, labor and capital must be considered as factors of production [2]. In the knowledge economy the knowledge becomes the source and asset which needs to be managed like the other assets in the organization. A good example of an organization that falls into this category is the university. Universities are selling 'knowledge' as their main product. And this knowledge needs to be well managed in order to add value and maintain its effectiveness to the university.

The focus of this study is to look into how the Decision Support System (DSS) can help manage and reuse both tacit and/or explicit knowledge to add value to the organization which allows it to maintain its competitive advantage. The Research Recognition Award Knowledge-based System (R2AKS) has been developed to assist the employee to select the most suitable candidates for the research awards introduced by one private university in Malaysia. This proposed list of candidates becomes the input which is then coupled with rule-based inference engine in order to produce a more accurate result which in this case the award winner. The main problem of the previous selection process is that it is done manually by staff from the Research Enterprise Office (REO) and the process is tedious and time consuming. The current selection method does not capture and codify the knowledge that is being used and created such as the skills, historical experiences and common sense during the process and there are no proper means to organize and capture the applicant's expertise.

This paper is organized as follows: section 2 presents the related works, section 3 presents the methodology used in this study and section 3 presents the results and discussion on the Research Recognition Award Knowledge-based System (R2AKS) prototype.

2.0 RELATED WORKS

The baby boomers are retiring but the birth rate are continuing to plummet in the recent years (World Population Prospects – the 2006 Revision Population Database, 2007). When these baby boomers leave the company, they also walk out with valuable knowledge and experience that they have gained throughout the years in the organization. When this situation which is also known as brain drain happens, organizations will lose the valuable knowledge and in worst case scenario lose out their competitive advantage. As a result, organizations should consider preserving this valuable knowledge in ensuring their future sustainability and competitiveness.

According to Nickols (2000), the knowledge is divided into two categories, tacit and explicit. Tacit knowledge is difficult to articulate because it resides in people's minds. As stated by Polanyi (1997), tacit knowledge can be evidenced when we know more than what we can articulate. Polanyi (ibid.) used the example of being able to recognize a person's face but being only vaguely able to describe how that is done. The judgment, insights, intuition, lesson learned and rules of thumbs are several types of knowledge that falls under this category (Bollinger & Smith, 2001). As compared to tacit knowledge, explicit knowledge is easier to store and manage since it is in the form of written documents, policies, emails, procedures and technical reports (Crawford & Strohkirch, 2006). The combination of both knowledge may help the organization to understand organizational issues better and make better decisions based on the knowledge.

The idea of embedding the DSS elements as part of the Knowledge Management Systems is not new. In agile organizations such as automobile manufacturing, the input gained from the intelligent systems are used as one of the elements to ensure that knowledge artifacts are fairly distributed in the organization using indirect monitoring distribution (Weber & Kaplan, 2003). Therefore, the proposed result generated by the DSS is used as the input for the intelligent system to apply the inference engine and finally produce a better and accurate result. As a result a knowledge-based DSS is introduced. Equipped with certain production rules to suggest a solution to the users, the DSS is considered as a knowledge-based system (Becerra, Gonzalez & Sabherwal, 2004). Strictly speaking, knowledge-based systems are systems that use knowledge to solve problems. A knowledge-based DSS refers to systems that solve semi-structured problems which rely on the combinations of standard solution procedures and human judgment in making decisions (Turban & Aronson, 2001). The DSS element helps improve the quality of information gained from the system but not to replace the human role in decision making process.

In order to capture, store, organize, categorize, share, disseminate and retrieve the knowledge, the IT infrastructure is needed. The IT infrastructure acts as the enabler that supports these KM process but not the only key factor that determine the successful rate of KM initiatives. As explained by Irma Becerra (2004), these KM initiatives focus more on people compared to the technology (Becerra, Gonzalez & Sabherwal, 2004). Zack (2007) states that the technology infrastructure acts as the medium that provides simultaneous flow of explicit knowledge in the organization. The technology is also needed to capture, store and define the knowledge (Duffy, 2000). There are a variety of technologies that support the KM initiatives for example intranets, videoconferencing, intelligent agents, hypertext, executive information systems (EIS), expert systems in support of call centers and help desks, data and knowledge warehouses (along with data mining) and search engines. Even e-mails and discussion lists can be used to support knowledge management initiatives (Nickols, 2000).

3.0 METHODOLOGY OF STUDY

The analysis of the organizations' knowledge management and their current practice is conducted by using a combination of observations of the existing system and process and individual interview session with knowledge workers. The idea of involving users in this study is to ensure that the prototype built is according to user requirements, fix predicament in the current business process and create the sense of ownership to the system.

Our first approach was to observe the current processes involved in the selection and determination of the most suitable researcher to win the award. This was done by observing

and analyzing all existing documents or policy regarding this awards system, which includes the university's policies, best practices, and databases. The observing method approach allows the authors to study the manual selection process carried out by the REO personnel. A few REO employees were selected for the observation. After the observation of the manual short-listing process was completed, the authors participated in the selection committee meeting. These observations were conducted in order to get the overall picture on the current practice and current workflow done by the workers. The findings of this approach were then be used to plan for the features or functionalities as well as the user requirements.

Our second approach was to conduct a few interview sessions with the REO personnel. The interviews were conducted in an informal session in order to avoid the situation of 'knowledge hoarding' from the interviewees side. The questions asked were related to the workflow of the existing award process that they conducted. This approach was also intended to capture best practices, tips, judgment if any that they applied when selecting the winners.

4.0 RESULTS AND DISCUSSIONS

Based on the findings obtained from the methodology, several requirements were outlined when designing the prototype.

- *Target users of the system* – from the observations done, there are two main target users of the system; researchers and REO personnel. The REO personnel uses the system as a tool to help them in determining the best candidates for each award – Best Research & Innovation Team and Best Researcher - while researchers will use it to capture their lesson learned, tips and techniques and best practices that they gained throughout the project implementation. The idea to capture this knowledge is the lesson learned can be reuse and can avoid the other researcher to repeat the same mistakes again in the future. These two sets of target users are not only use the system but also contribute, acquire and consumes the knowledge.
- *Weightage* – the criteria in determining the winners are used as the determinant factors. These criteria such as funding amount, number of projects that researchers involved and the number of publication are given a weightage. These weightage are determined based on university's policy and rules.
- *Able to help in decision making process* – the system need to be able to suggest most suitable candidates to the REO personnel in order to ensure the selection is more accurate and faster. This is done by embedding the rules at the back-end of the system.
- *Knowledge capturing tools* – since there are two sets of target users for this system, different approach are to be used when capturing knowledge of researchers and the REO personnel.
- *Reusability of knowledge* – codifying the knowledge is important for the preservation and whenever possible regeneration and enrichment of the existing knowledge by the other workers.
- *Knowledge accessibility* – one of the key ideas of having knowledge-based systems is to allow the enrichment and dissemination of knowledge to the others when they need it. As the prototype is developed using the intranet, it can be distributed effectively throughout the organization.
- *Ease of use* – the user interface act as a bridge between users and the systems. It needs to be simple and separate the complexity of the system from the user's view.
- *Proper platform for communication* – a web based system was considered for the implementation of the system. Running on the intranet helps the system to become accessible by both target users.
- *Search function* – allows the user to find information regarding researchers, research projects details and which research clusters that the researchers belongs to.

Activity diagram

The following diagram shows the activities involved in the system as shown in figure 1, 2 and 3.

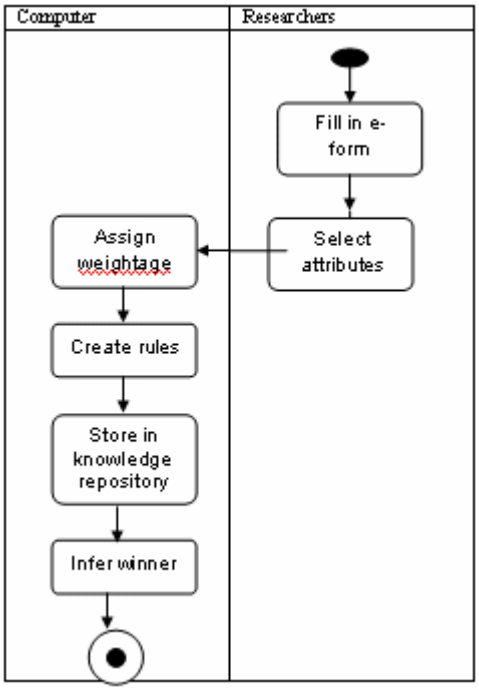

Figure 1: UML diagram for capture researcher details

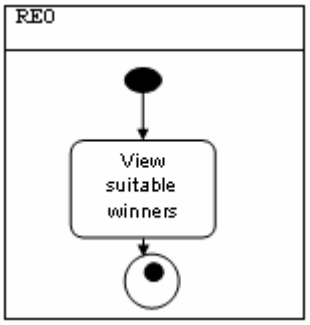

Figure 2: UML diagram for view the suitable winners

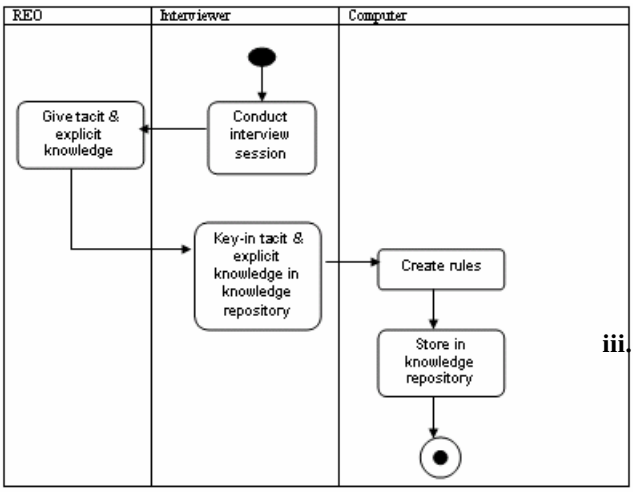

Figure 3: UML diagram for capture researcher's tacit and explicit knowledge

As a result a prototype was implemented. Since it is a pilot project, the prototype is accessible to a group of authorized users via the intranet. The implemented prototype was developed based on the user requirements gathered earlier of the study.

The prototype is divided into several sub-sections – user -interface, inference engine, knowledge capture tool, knowledge repository and search engine.

i. User Interface

The user interacts with the system through a simple user interface which was developed using PHP scripts. The user interface separates the complexity of the system from the user. It is the starting point of the system. It is the first entry point to the system as it allows the authenticated users to login into the system.

ii. Inference Engine

The implementation of the inference engine refers to two different sets of input from users. Firstly, it is retrieved from the historical experience of the REO personnel, from the documented policies, rules and regulations as well as the judgment of the REO personnel. Additional to that, the criteria that need to be fulfilled by the researchers when filling up the form are also other additional rules that determine the selection process. These rules are embedded within the PHP scripting at the back end. These rules are used by the system to infer the knowledge residing in the knowledge repository in order to come out with solutions. It acts as the interpreter of the knowledge stored in the knowledge repository. The rules are developed to cater for several different situations and scenarios hence a different result is retrieved for each different scenario. The system returns a result in the form of a better answer or suggestion for the user.

iii. Knowledge Capturing Tool

This module is divided into two sub-modules, one to capture the knowledge from the REO personnel while the other sub-module is capture knowledge from the researchers that involve in the application process. Kind of knowledge to be captured in this sub module is tips, experiences, and

skills or techniques which gained throughout the project implementation. The idea of capturing this knowledge is to make it available and accessible to other researchers thus the other researchers are not going to repeat the same mistakes or to share new tips which then can be used by the other researchers perhaps in the other domains. As for capturing the REO personnel's knowledge, sets of standardized forms, templates, business process documents and reports were used as the capturing tool. This approach was used to capture the past and present knowledge, historical experience and best practice that applied during the selection process. However, to capture the researcher's knowledge, a different approach was chosen that is through application forms. As a result, these captured criteria can be easily be transformed into sets of individual expertise and knowledge will be stored in the knowledge repository. This module helps the system to transform tacit knowledge into explicit knowledge so that it can be properly stored and accessed by other users.

iv. Knowledge Repository

All knowledge that had been captured from the worker is stored and organized in the knowledge repository. The knowledge repository acts as a bridge between the capture and retrieval process. It contains the knowledge that is to be managed and reused by the knowledge seekers whenever they need it. This repository is used to transform the tacit knowledge into explicit knowledge and organize it in a logical manner.

v. Search Engine

It allows users to search for details of researchers, their projects details, their past projects, collaborations and the costing. It also allows the REO personnel to find the researchers by their research cluster hence whenever there is a new project or collaborators available, it is easier for the REO personnel to find the potential candidates to take up the project. This module also allows the discovery if there is any employee that working on similar project with the potential to collaborate.

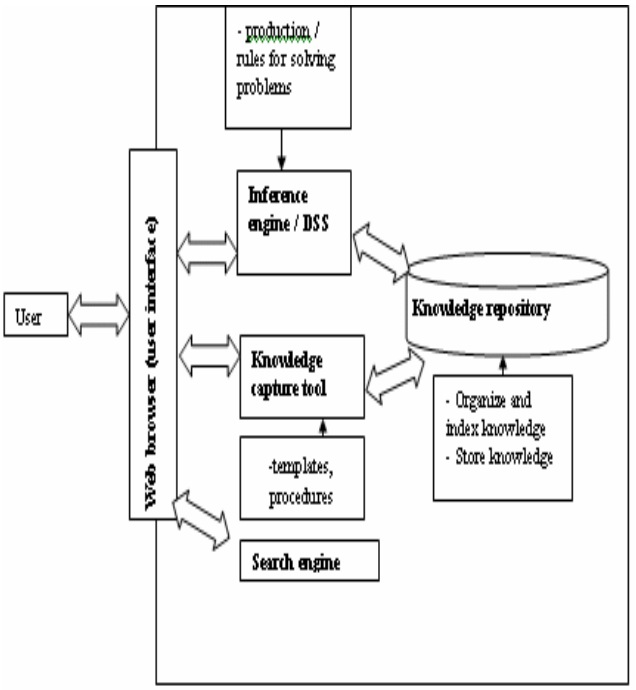

Figure 4: R2AKS System Architecture

5.0 CONCLUSION

The implementation of R2AKS is a modest effort towards establishing knowledge society in the university. The prototype does not only serve as a DSS tools for helping REO in selecting the most suitable winners for each category but also for the capture of valuable insights, intuition, historical experience, judgments and know-how of the REO personnel when they are performing the selection process. This valuable knowledge cannot be simply learned as it can only be gained through years of experience in the field. Having the R2AKS in the organization is not intended to replace human role in decision-making but to facilitate and propose several suitable solutions based on the problems. Hence the decision making process become faster, more accurate and more efficient in terms of cost and time taken to perform the task by the personnel.

Looking from perspective of KM, R2AKS prototype is able to capture the knowledge from the REO personnel which later becomes the rules in the selection process. Additional to that, R2AKS also captured the expertise and knowledge that resides in the researchers and management staff. As a result, a subject matter expert (SME) is established in the university. When these SMEs exist in the university,

indirectly it encouraged the collaboration with the other department internally. From these SMEs, it will be easier to establish the network between the researchers which will result on the establishment of their own Community of Practice (CoP).

As the system runs on the intranet, the created SMEs will become known to the public that is the university's community. When this happens, the knowledge sharing culture and knowledge transfer between the employees are encouraged thus allows the university to leverage the existing knowledge that resides in the employees mind.
It is fairly to say that, implementing R2AKS is a starting point for a better KM initiative. By well organized and structured the knowledge representation through this system, the future enhancement will be better.

6.0 FUTURE WORKS

One of implemented prototype limitation is it runs on the intranet due to security and confidentiality issues. Hence the distribution of knowledge is limits only within the university. For the future enhancement, it is recommended to extend this application to run on the Internet so that more people can access the system. When the system becomes public, it will encourage more potential collaborators to the university. These potential collaborators can find the potential researchers for the potential projects by browsing the system. Secondly, the search function capabilities is not limits to finding the information on the researchers and the projects that they involved, but also includes the categorization according to SMEs, Cops, published works just to name a few. The knowledge capturing tools at the researchers' side should be able to capture the researcher's lesson learned, best practices, tips and their historical experience. The knowledge repository needs to be extended its capability to be able to log a report outlining current projects the researchers involved and the techniques used. By capturing this knowledge, the researchers working on the similar projects may use this knowledge as their reference and guideline. This is critical as it will reduce the redundancy or trying to reinvent the wheels.

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