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Successful Utilization of Technology for Knowledge Management: A Review of Relevant Issues

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Abstract

While various organizations have invested in knowledge management (KM), it is not yet an established part of day-to-day business. Technology plays a major role in KM, aiding in the creation, transfer, sharing and storage of knowledge, making it an integral part of KM processes. This has necessitated the need for studies into technology's involvement in KM and how it can contribute effectively to the KM objectives of the implementing organization. However, there is a lack of depth in the fundamental issues and concepts affecting technological implementations for KM. Most of the underlying issues are left to the implementing organization to figure out, as there is a weak foundation upon which KM is built. The theoretical framework for technological use in KM is not solidly developed, resulting in an unstructured approach towards technological use and implementations in KM. This is as a result of the inter-disciplinary nature of KM, which has led to academics concentrating more on certain disciplines contributing to KM, such as management and social aspects of KM, while disciplines such as information technology (IT) have not received adequate attention and review. There is therefore need to analyze the issues that are of significance to the use of technology in KM. This paper provides a review of issues which are important to the successful utilization of technology for KM, offers solutions which will help create a theoretical framework for technological implementations for KM and identifies research areas in KM which can be instrumental in KM's use of technology at large.

Keywords: knowledge management, technology, utilization, models, architectures.

Introduction

KM is an inter-disciplinary field with cross-disciplinary applications [1], encompassing fields such as psychology, philosophy, management, sociology and economics. For KM to be useful, it should be shaped around a real world issue, and its objectives should be purposeful, concrete, action-oriented [2] and measurable, in line with organizational goals. IT investments which the organization would have made towards KM and their implementations should therefore be in line with these objectives. Not only is this relationship between technology and goals, in terms of investing in technologies that will achieve the objectives important, it also guides in choosing technologies that will not become obsolete or unable to deliver their tasks before the expiry of the timeframe set for meeting the organization's KM objectives. More so, it has to be understood what knowledge an organization is to manage and towards what goal [3]. [1] Bemoans the lack of sound theories and conceptualizations in KM which has led to a deficiency in the accumulation of knowledge about KM. This paper seeks to outline the areas which contribute to the successful utilization of technology for KM, and to point out the areas which still have to be researched and looked into by both academics and professionals.

Definitions of Knowledge and Km

There are many and varied definitions of knowledge and knowledge management. These definitions define knowledge from various perspectives, ranging from the psychological to the technological views, as necessitated by the inter-disciplinary nature of KM. [1]gives a comprehensive review of definitions of knowledge and knowledge management. This mash of definitions has been created by the desire of academics to fit knowledge management into their respective disciplines with an ease for interpretation as well as implementation. The problem this has created is that knowledge becomes a subjective thing that is interpreted in any way by anyone who professes to be an expert in the area of knowledge management. As a result, technological implementations for KM become haphazard and unstructured due to the absence of a common consensus on what knowledge is. Ultimately, IT experts have no firm basis on which to justify their

technology investments because stakeholders will produce varying definitions of knowledge and KM. There is need for deep analysis of philosophical issues, including but not limited to definitions of knowledge, if KM is to move forward as a discipline of research as well as to be of value to implementing organizations [1], and to bring about focused IT investments for KM.

KM Focus Areas

It is possible to categorize all issues to do with KM under three focus areas; Techno-centric, Organizational, and Ecological [4]. The techno-centric approach involves studying technological implementations for KM, the effects of technology on KM, as well as its relationship with the other focus areas. The organizational approach deals with how the organization may be structured to facilitate knowledge sharing. The ecological approach deals with the environment for knowledge sharing, and the interactions of people for knowledge interchange. These focus areas make it clear that technology is not KM and vice-versa, and outline the evident need for coordination between these areas for a well-engineered KM initiative.

From the techno-centric view of KM, IT may be considered from 3 dimensions: IT knowledge, IT operations and I.T infrastructure [5]. IT knowledge is the expertise in the IT domain that the company employees possess to be able to implement and maintain the KMS and other technologies. IT knowledge is important as it determines the type and depth of the KMS implemented in the organization. It may be important, as deemed necessary by management, to outsource experts to implement and maintain KMSs, to assure their alignment with overall organizational objectives. IT operations are the functions the IT personnel and department engage in, in supporting the organizational processes and stakeholders. The IT infrastructure is the components required for service delivery to relevant stakeholders in the organization. IT knowledge and IT infrastructure should function together in supporting IT operations, as IT operations are a subset of organizational goals, whereas IT knowledge and IT infrastructure are areas which are determined by the operations set for IT to support. This means, for a successful KM initiative, IT operations have to be determined first and then IT knowledge and IT infrastructure can be ascertained interchangeably afterwards.

Role of IT in KM

The more accepted understanding about knowledge is that it can only reside in one's mind [6]. It is also the result of human experience and reflection based on a set of beliefs that are at the same time individual and collective. In this light, the role of technology for KM is limited to the creation of an environment for knowledge creation and transfer that supports a humanistic perspective of work [7]. It is argued that IT should be viewed more in its role to aid in ad hoc, spontaneous but intensive intra and inter-organizational collaborations [8] and less in its ability to support storage of explicit information [9] and its primary objective is to lead users to the information they need. In today's working environments, KM is increasingly dependent on the support of a solid IT infrastructure, due to geographical dispersion among workmates or collaborating organizations [7] hence the need to create a boundary-less ecological system for knowledge sharing. IT should not inhibit the transfer of knowledge between people and should not lead to recycling of knowledge, which hinders new thinking as well as the making of optimal decisions with the most relevant knowledge. From this, it can be ascertained that technology for KM plays the role of connector (of people) more than collector (of information) and also plays a supporting role to the strategies and policies of an organization [10].

Technologies used for KM

Various technologies are used in coming with KMSs. They can be classified under three levels of knowledge management technologies(adapted from Sprague, 1970)[11];

- Level 1 are the knowledge management tools,
- Level 2 are the subsystems that make up a KMS, and
- Level 3 are the KMSs themselves.

These technologies include intranets, groupware and workflow systems, document management systems, brainstorming applications, information retrieval engines, push technologies and agents, help desk applications, data warehousing and data mining tools, electronic bulletin boards, expert systems, CD-ROMs, video conferencing, online information sources [12], among others. These technologies can be broadly classified into two categories:

- Integrative Applications, which deal with the flow of explicit knowledge in and out of repositories and,
- Interactive Applications, which allow for the interaction of humans with tacit knowledge [13].

The interactive applications support the integrative applications in KM activities [13] as these technologies work together either by sharing tacit or

explicit knowledge between themselves or by converting one form of knowledge into another. However, the conversion between these forms of knowledge without distorting the semantics of it is not well understood [13], resulting in a knowledge gap concerning how these categories of technologies can be interleaved to support one another effectively and efficiently.

Another issue is the amount of technology required for a KM initiative and the extent to which technology is used for KM. It can be argued that transfer of knowledge among individuals requires less technology than its creation and storage, because the former involves mainly communication among humans, which can be done with communication technologies only. Knowledge creation, storage and extraction on the other hand, require other technologies, in addition to communication technology. Hence, in essence, tacit knowledge requires less technology for its management than explicit knowledge. It is important for an organization to understand the nature of the knowledge it works with and which it wants to share, so as to introduce a KMS that is in line with the nature of the knowledge as well, and not just the organizational goals and strategies. However, there is a knowledge gap in the area of ascertaining the types of knowledge an organization wants to manage as there lack quantitative approaches which can ascertain the qualitative means used in determining the nature of knowledge an organization wants to manage.

Determination of a KMS' Effectiveness

Since knowledge and information as commodities have very short life spans [5] and have a knock-on effect on the technologies involved with them, it is therefore imperative that these technologies be managed continuously by measuring and evaluating their relevance to each other and to the KM initiative as a whole. The evaluation can be done by observing interaction complexity of the applications, the repository life cycle in relation with the knowledge life spans, and the repository as well as application structures to allow for the KMS to remain relevant in this fast moving and knowledge guzzling world[13] and also to keep the technologies used in line with organizational goals.

Unlike information systems (IMS), which have results (like Return on Investment, ROI) associated with quantitative and intangible results[7], it is a different case for KMS. KMSs depend on the willingness of individuals to share their knowledge, whereas IMS can function well even without a human element[7]. This affects the determination of success or failure of a technological implementation for KM due to a lack of quantitative and/or tangible evaluation methods and criteria for KMS. Even after coming up with an organizational business strategy, the KMS introduced into the organization has no direct way of being evaluated for its worth in line with the strategy, as measurement is still a problematic issue in KM. This is due to the difficulties in defining knowledge itself and hence the difficulty in coming up with a benchmark for measuring the success of a KM initiative [14].

There have been repeated failures of KMSs and this can be attributed to the lack of a formal analysis technique to check if the KMS will function as desired before introducing it into the organization[15]. There is also need for such a measure to compare different KMSs and KM initiatives at large. The investment in IT resources used for KM and their lifespan should be, in the worst case, linearly proportional to the combination of the timeframe of the objectives set for the KMS and the expected ROI of achieving those objectives, and exponentially related, in the best case. This provides a measure by which the KM technological investment can be assessed for its value to the organization. Lack of a relationship between the amount of investment in IT for KM and the organization's targets for KM leads to failed KMSs which hit hard on the organization's finances, resulting in losses incurred as a result of the inappropriate IT infrastructure that would have been invested in [3].

IT- KM Architecture Alignment

It should be noted that, besides being in line with organizational goals for KM, IT should also be aligned with other factors, especially those that make up the overall KM architecture in addition to IT itself, namely: knowledge components, knowledge management processes and organizational aspects [16]. This entails that for KM initiatives to be successful, technology should co-exist with these components of the architecture, to allow for interaction and interchange among these areas of knowledge generation, use and accumulation, and the organizational processes. This alignment also facilitates a systematic approach to KM that takes into consideration the continual overlapping among organization strategies, values, human capital and IT infrastructure that has to be developed[7].IT therefore should support knowledge creation and sharing among humans, which explains its role of being an enabler among the KM overall architecture components.

Technology is also being aligned to support process-based KM activities [8]. Improper setting up of the IT infrastructure for KM may lead to info-

famine and /or info-glut[17], both of which hamper the productivity and efficiency sought for in managing the intellectual capital that supports the organizational processes. Tools for knowledge management should handle the richness of the content and the context of the information, and not just the information itself [11]. This constitutes the difference between knowledge management tools and information management tools.

Models and Architectures for KMS

Various models for KM exist. Most of these models concentrate on the who listic approach to KM, taking into cognizance most of the factors considered for successful KM initiatives. They however emphasize more the role of leadership and management in KM and the social aspects of human interaction with little emphasis on the role and nature of technology in KM. These include models such as Boisot's Knowledge Category Model, Nonaka's Knowledge Management Model, Hedlund and Nonaka's Knowledge Management Model, Skandia Intellectual Capital Model of Knowledge Management and Demerest's Knowledge Management Model, Frid's Knowledge Management Model, among others[18].

As far as technology for KM is concerned, two generic models can be used; the Technology-Push Model (TPM) and the Strategy-Pull Model (SPM) [3]. The SPM is superior since it takes advantage of the "plug and play" technologies available today, while at the same time using the strategy of the organization as the determining factor for IT investments for KM [3]. On the other hand, TPM has led to a high failure rate in IT investments as technology is acquired before ascertaining its validity as far as the organization's strategy is concerned, and the failure rate can also be attributed to the rapid change in the business environment which renders other technologies obsolete in a relatively short space of time [3]. TPM demonstrates a gap between technology inputs, knowledge processes and business performance[3].

There lacks research on technology-centric generic models and architectureswhich can be used for reference purposes during implementation and there is also need to study how to use the various technologies in relation to each other for KM. As a result of this lack of research and study, KMS become systems of software assembled in an ad-hoc manner. Integration of these technologies is also an issue of concern, as this affects the maintainability, performance, extensibility as well as modifiability of these systems. There is therefore a need to come up with technology-integration strategies for KM [19], which ultimately should emanate from software architecture research in line with KM, as different platforms for viewing data and incoherent architectures are some of the inhibitors to knowledge transfer [12]and management.

Developing these models will help reduce the rate of IT failures and help in structuring the infrastructure for managing specific types of knowledge pertaining to an organization. More so, these reference models will introduce apoint by which an IT investment for KM can be evaluated for its effectiveness and to help in determining whether the IT infrastructure being introduced will serve the goal it is intended for. Therefore, there is need for research in academia and industry for these types of models and to define architecture frameworks for IT infrastructure uniformly among software architects from a KM perspective [19]. This demonstrates a lack of standards and/or policies which can be used in KM for abstractly or generally representing knowledge for interchange between experts as well as KMSs, which would increase portability, integration and reusability of the systems.

The evolution of KM has taken advantage of the evolution of the world-wide web. Ubiquitous computing is now playing a great role in technology today, with information processing being embedded in everyday activities. The bring your own device (BYOD) culture in organizations these days is allowing for ubiquitous computing to play a meaningful role in KM as individuals determine the means by which they will share data with colleagues in line with their personal devices and telecommuting has also become important in ascertaining the nature of KMS and KM initiatives at large. The evolution of KMS needs to be managed to avoid KMS failures and evolution of such systems is an area of research which is important for KMS' success [20]. With the advent of the semantic web, there is a great opportunity for KM to take center stage, as the semantic web makes it possible for the world-wide web to be a participant in knowledge management through its structure of information retrieval from various sources.

Conclusion

In this paper, it was highlighted that KM is inter-disciplinary and technology, while playing a pivotal role in KM, should be in line with organizational goals. There lacks sound theories and conceptualizations in KM, which affects the understanding and depth of the field. There are many and varied definitions of knowledge and KM, and this make it difficult to reach a consensus on what knowledge and KM are. The techno-centric focus area outlines the framework required for an IT investment for KM. Technology plays the role of a

connector more than a collector in KM and there are various technologies used in managing knowledge. There is need to come up with quantifiable and reliable techniques for measuring the effectiveness of KMS, and these systems also have to be aligned to other aspects of the overall KM architecture. There is a lack of generic models and architectures for KMSs, which can be used as reference points in technological implementations for KM.

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