AN EMPIRICAL STUDY INTO THE LINKAGES BETWEEN ORGANIZATIONAL CULTURE AND KNOWLEDGE MANAGEMENT IN ERP IMPLEMENTATION

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Enterprise Resource Planning (ERP) Systems offer great promise to organizations that are willing to gain competitive advantage by integrating the many elements that comprise business practice. ERP implementation is expensive and poses a challenge for organizations because of its complexity. Knowledge Management (KM) approach had been suggested to ensure its effective implementation in this regard. There are four sets of "knowledge processes" in KM framework: creation, storage/retrieval, transfer, and usage/application. Descriptive studies suggested a knowledge-friendly organizational culture as a major catalyst for these processes. Present research examines empirically the relationship between organizational culture and four sets of "knowledge processes" in the ERP implementation setting. Empirical inputs were obtained through a questionnaire survey. The questionnaire was designed using Web Surveyor Corporation's Web Surveyor software. The survey included responses from ERP Project Managers, Project team members, IT Professionals, CIOs, Users, Top-Management Executives, Vendors, and Consultants associated with companies that had implemented the ERP systems. One hundred and eighty two respondents from thirty-six different organizations participated in the survey. The survey results have shown unequivocally that organizational culture influences all the four sets of knowledge processes in the ERP implementation context. Implications of the study for theory and practices are given as well.

KEYWORDS: Organizational culture, Knowledge creation, Knowledge storage, Knowledge transfer, Knowledge usage, and ERP implementation.

Field of Research: Management

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1. INTRODUCTION

Enterprise Resource Planning (ERP) systems offer great promise to businesses wanting to consolidate and integrate the many elements that comprise business practice. ERP system is a "packaged business software system that enables a company to manage the efficient and effective use of resources by providing a total, integrated solution for the organization's information-processing needs". Many organizations are using them to gain competitive advantage by integrating their functional areas of business. They provide a consolidated holistic view of the enterprise and greater access to real time information. The real challenge of ERP solutions lies in its implementation because it is complex, time consuming, and expensive. Many companies have enjoyed the benefits of such systems; but, many have also had to settle for minimum returns, complete abandonment of the system, or even bankruptcy. After implementing SAP AG's SAP R/3 system, Volkswagen AG experienced trouble delivering spare parts to car dealers. Sobey's Inc. and Hershey Food Corp. experienced similar processing problems resulting in stock shortages due to their SAP R/3 implementations. The ERP journey can be amongst the most complex IT-related transformations that an organization can undertake. Majority of ERP research has focused on pre-implementation and implementation issues. To mitigate the risks in ERP implementation, a Knowledge Management (KM) framework is suggested to be put in place to control the installation launch and fine tuning of the ERP.

Businesses choosing to implement ERP must now consider utilizing KM approach to ensure effective implementation and have to capture and share knowledge found within the organization. KM refers to identifying and leveraging the collective knowledge to help an organization to compete successfully at market place. Organizations are "knowledge systems" and as per one framework, there are four sets of "knowledge processes": (1) creation (2) storage/ retrieval (3) transfer, and (4) usage/application. A knowledge-friendly organizational culture has been identified as a major catalyst to the success of KM initiatives in organizations. In many organizations, a major cultural change may be required to change ERP users' attitudes and behavior so that they willingly and consistently participate in "knowledge processes". Certain cultures alone foster the four sets of "knowledge processes. This research examines the relationship between organizational culture and four sets of "knowledge processes" in the ERP implementation context. Conversely, this paper empirically tests the relationships among organizational culture and creation, storage, transfer, and application of knowledge in the context of ERP implementation.

2. RESEARCH MODEL FOR ORGANIZATIONAL CULTURE AND KM IN ERP IMPLEMENTATION

The research model shown explains the concept that organizational culture not only influences knowledge creation and knowledge storage, but also influences knowledge transfer and knowledge application through intermediary variables of knowledge creation and knowledge storage.
**Organizational Culture:** In the present study, culture is defined as the pattern of shared values of the group that lead people in the group to think and act similarly, and it is a system of perceptions, meanings, values, and beliefs which facilitates individuals and groups to share the common experiences. Major barriers impeding interactions and collaborations between units in a global company are: unwillingness to seek input and learn from others, inability to seek and find expertise, unwillingness to help, and inability to work together and transfer knowledge. Based on content analysis of components that repeatedly have emerged in studies on culture, Detert et al. gave a framework. The same is used as the basis for this study. It includes components such as: (i) orientation to seek inputs and learn from other people, (ii) Motivation to participate in generating new ideas, (iii) Knowledge culture—contribution for creating, storing, and updating information, (iv) Openness for welcoming new ideas, and (v) Reviews to examine the successes as well as failures.

**Knowledge Creation:** Culture is widely characterized as an instrument to be used by management to shape and control some beliefs, understandings, and behaviors of individuals and the organizations to achieve specified ends. If the dominant value among the employees is to use IT for various tasks, then knowledge creation efforts could be facilitated through the use of communication technology. Accordingly, organizational culture could be identified as a major catalyst for the specific behaviors of knowledge creation. Based on the above discussion, this study derives Hypothesis-1.

**Hypothesis-1:** Organizational culture influences knowledge creation in ERP implementation.

Knowledge Storage/Retrieval: Memory (organizational and individual) is required in order to store, organize, and retrieve peoples' knowledge. Organizational memory is the collection of individuals’ memory and it is the means by which knowledge from the past experience, and events influence present organizational activities. Knowledge storage refers to the tacit and explicit knowledge that could be captured and documented. If the organization has a shared value of bringing new knowledge to the organizational memory by hiring, it allows for ERP users to connect and communicate over great distances thereby enabling the possible creation of new knowledge that might not otherwise occur. Based on the above discussion, this study derives Hypothesis-2.

**Hypothesis-2:** Organizational culture influences knowledge storage in ERP implementation.

Knowledge Transfer: Also known as knowledge sharing, it follows a "source and recipient" generic model. It is often interpreted as the transfer of knowledge from a source to a recipient. It prevents reinventing the wheel, creates shared understanding, reduces uncertainty or turns individual learning into organizational learning. It is the "dyadic exchanges of organizational knowledge between a source and a recipient unit in which the identity of the recipient matters." There are four ways of transferring knowledge: informal, formal, impersonal, and personal. Based on this discussion, this study derives Hypothesis-3.
Hypothesis-3: Knowledge creation influences knowledge transfer in ERP implementation.

Knowledge creation is actively constructed from information previously stored and new information drawn from the environment. A major component of knowledge creation process consists of learning from past experiences. This learning or new knowledge creation may take place through social and collaborative processes. Though knowledge is created in abundance, serious flaws had been found in knowledge storage. Procedures and methods to make tacit knowledge explicit were weak; and no expertise database or mechanisms were used to preserve the knowledge of staff or experts leaving the health system. This discussion provides the basis for Hypothesis 4.

Hypothesis-4: Knowledge creation influences knowledge storage in ERP implementation.

Knowledge storage is similar to organizational memory and the accumulation of knowledge as recognized in learning curves. The process of knowledge storage leads to accumulated knowledge ranging from manually written files to digital media. Storing and distributing knowledge electronically lead to low marginal costs. The knowledge transfer process model is based on organizational learning and memory perspectives that include the stages of acquisition, storage, and retrieval. In this model, knowledge acquisition is done from external sources and stored in individual and organizational memory. The knowledge transfer between individuals, groups, or organizations begins as relevant knowledge storage sources have been identified. This discussion provides the basis for Hypothesis-5.

Hypothesis-5: Knowledge storage influences knowledge transfer in ERP implementation.

Organizational culture provides integrated framework that regulates the context for social interaction and goal accomplishment through creation of meaning and it is a major barrier to leveraging knowledge. Specially, it influences the behaviors central to knowledge creation and transfer. Research results supported the idea that the technology is not a driver, but an enabler of knowledge creation and transfer. Knowledge transfer could be promoted in an organization with a favorable culture. Besides culture, a high level of cooperative behavior in social interactions for creating knowledge was emphasized for knowledge transfer. The new knowledge creation is facilitated by psychological safety in an organization and knowledge transfer has primarily focused on the culture of the organization. This discussion provides the basis for Hypothesis-6.

Hypothesis-6: Organizational culture influences knowledge transfer through knowledge creation in ERP implementation.

Several cultural issues must be overcome to create an organizational collaborative advantage. The organization's climate must be accepting new ideas where there is a
motivation to contribute to organizational goals. Individual employees and organizational culture are two repositories of knowledge in knowledge storage. Knowledge that is transferred has limited value and the value increases when it is available with organizational memory for present and future use. Knowledge becomes a valuable corporate asset only when it is stored and transferred. The value of knowledge increases when it is stored, networked, reused and integrated into business processes. Knowledge storage is changed when knowledge transfer occurs and the above discussion provides the basis for Hypotheses -7.

Hypothesis-7: Organizational culture influences knowledge transfer through knowledge storage in ERP implementation.

Knowledge Application: It refers to the integration of the organizations knowledge into their products, processes, and services. ERP solutions offer a competitive advantage for organizations. KM could provide that type of advantage through applying the previously stored knowledge into the ERP systems, business processes, and services. The size of internal and external knowledge gaps influences knowledge-creation efforts and the capability to create knowledge refers to capacity to combine knowledge to develop new knowledge. Only individuals could create knowledge and organizations apply the created knowledge effectively to create an impact of the change in the organization. This discussion provides the basis for Hypothesis-8.

Hypothesis-8: Knowledge creation influences knowledge application during ERP implementation.

Knowledge application is the deployment of knowledge for the benefit of the organization, enabling individual members to use the knowledge they possess in practice and to establish the need for more. The process of knowledge storage does not necessarily lead to enhanced performance of an organization and effective knowledge application does. It has been recognized that organizations have gaps between what they have in terms of organizational memory and what they do by applying the stored knowledge. Knowledge applications are influenced by IT-enabled organizational memory on the behavior and performance of individuals and organizations. Sophisticated storage and retrieval techniques such as query languages, database management systems, and multimedia databases could be effective tools for applying the stored knowledge. This discussion provides the basis for Hypothesis-9.

Hypothesis-9: Knowledge storage influences knowledge application during ERP implementation.

Organizational culture has been identified as either a major catalyst or a major hindrance to knowledge creation and sharing. Successful knowledge management initiatives require organizational cultures that value the creation and use of knowledge. The challenge is to create a favorable culture for applying knowledge through knowledge creation. Explicitly acknowledged cultural values determine the type of knowledge to be applied and stored. Failures in implementing KM systems are often
related to organizational culture. It is important that the new culture promotes attitudes and behaviors that encourage and reward applying and creating knowledge. An individual employee must perceive that withholding the knowledge will not add any value to the organization. This discussion provides the basis for Hypothesis-10.

**Hypothesis-10: Organizational culture influences knowledge application through knowledge creation in ERP implementation**

Organizations that want to implement knowledge management program need to provide a favorable knowledge culture that is capable of motivating their employees to apply the stored knowledge. Knowledge hoarding need not be encouraged in organizations. Employees need to be assured that their use/application of stored knowledge will not be exploited. Trust and integrity are found to be critical values to be practiced in knowledge application. Employees need to be assured that all their ideas will be stored and applied. For knowledge application in a group environment, individual members must understand that the viability of their group depends on their contribution in applying the knowledge from the organizational memory. This discussion provides the basis for Hypothesis-11.

**Hypothesis-11: Organizational culture influences knowledge application through knowledge storage in ERP implementation.**

In general, measurements of KM constructs are an area demanding research. The items that focused on the KM constructs were identified from the existing literature. They are (i) Knowledge creation, (ii) Knowledge storage and retrieval, (iii) Knowledge transfer, and (ii) Knowledge application.

**Knowledge creation:** It is to be measured by the amount of time individuals spend on intellectual activities and the items included are: frequency of (i) keeping a record of the problems and solutions (ii) updating the records (iii) problem solving through discussions and by applying previous lessons learned or best practices.

**Knowledge storage and retrieval:** The measures used are (i) The extent of documenting the problems, solutions, and "lessons learned"; (ii) Number of knowledge structures created to interpret the problems prior to the implementation of ERP system; (iii) Number of repositories created for the problems, solutions, and "lessons learned"; and (iv) frequency of adjusting/ updating and ease of access and searching.

**Knowledge Transfer:** The measures developed are: extent of intentionally and unintentionally transferring knowledge, level of perceived value of the source unit’s knowledge, willingness to share knowledge and to acquire knowledge.

**Knowledge Application:** The measures developed here are: frequency of project generated knowledge that was turned into (i) standardized rules (ii) training materials; documents that can be used by non-specialists; and frequency with which diverse individuals come together to solve a problem.
3. RESEARCH METHODOLOGY

For the purpose of testing the hypotheses statistically, empirical inputs were obtained through a questionnaire survey. The internet respondents were able to gain easy access and interact by incorporating radio buttons, check boxes, and comment fields. The respondents for the survey were randomly chosen. The survey included responses from ERP project managers, project team members, IT professionals, CIOs, users, top management, vendors, and consultants associated with several companies which had implemented the ERP systems. Nine hundred and seventy respondents from North America were contacted through email with simple instructions for completing the questionnaire. Email was used to take advantage of other features that are available through its use such as: speed, linking to website and reminders. E-mail reminders were sent out six days after initial contact which successfully increased the rate of response as initially expected.

Of the 970 potential participants, 182 gave usable responses, giving a response rate of 19%, which was accepted against non-response bias for a blind mailing. Thirty six public and private organizations from various industry sectors participated in this survey. A Chi-square analysis of the industry distribution of the respondents revealed no significant difference from the industry distribution, thus indicating lack of non-response bias. The individual responses were kept confidential in order to encourage openness and disclosure; therefore the names of organizations are not given. To diminish the skewness on data from the same geographical region and to get views from widely scattered user population, the survey was conducted in a random manner.

4. ANALYSIS AND DISCUSSION

Organizational Culture influences Knowledge Creation: The study validated that organizational culture influences knowledge creation. In order to influence the ability to create new knowledge the organizational environment could be changed so that employees are able to freely talk and get feedback from others within the organization. This informal relationship allows for the potential to learn from other employees which propagates new tacit and explicit knowledge being created. Through creating an office environment where people are motivated and generation of new ideas is accepted, an increase in knowledge creation could also be obtained. Postmortem analysis was reported to have been done on average about half of the time during an ERP implementation.

Organizational Culture influences Knowledge Storage: The survey results indicated that values practiced facilitate the process of knowledge storage. Organizations could make use of as-is and to-be analysis as their implementation strategies, which would create documents that could later be stored for future use. However, the details of these documents are solely up to the details required by the ERP implementation project. This research indicates that storing knowledge is an informal process. However, by utilizing a formal KMS, all data could be stored in a central database or data warehouse.
Knowledge Creation influences Knowledge Transfer: The most active type of knowledge transfer during the ERP implementation is between the project team members. This is an informal interaction between individual members, which is fostered by effective team dynamics. Socialization allows for tacit knowledge to be transferred effectively between various different team members. An increase in the amount of knowledge transferred could be realized through implementation team socialization. This research indicates that the informal process of knowledge transfer is occurring mostly within close knit groups through various types of interactions such as meetings, team problem-solving, and one-on-one individual attention.

Organizational Culture influences Knowledge Transfer: Data analysis shows that during the ERP implementation there were frequent scheduled and unscheduled meetings. This shows that there is an environment for knowledge transfer to occur, through informal (unscheduled meetings) and formal (scheduled meetings) processes. Analysis also suggests that there is less frequent discussion of the project around coffee breaks or spur of the moment conversations. From this we could conclude that the knowledge that is transferred within an ERP implementation from one situation to another is tacit and would more likely happen in a meeting type of atmosphere rather than through normal social interaction.

Organizational Culture influences Knowledge Application: The survey results support that organizational culture influences knowledge application. When a self-contained task team is needed to solve a problem through applying context-specific knowledge the team has to be able to think freely and creatively. Organizational culture is an important aspect of ERP implementation. Providing an environment free of criticism and ridicule that increases the ability to think freely in an open environment could have an impact on knowledge application within the ERP implementation.

Organizational Culture's impact on Knowledge Creation and Application: Organizational culture has an informal role in knowledge creation and knowledge application. Organizational culture is influenced by rules and policies set by the organization as well as office layout, and office code of conduct. However not all of organizational culture is formally documented. The survey results show that organizations seldom measure individual’s contribution to knowledge application. A possible increase in knowledge application could be achieved by the organization through introducing incentives, motivations, and performance evaluations that relate to their contribution to knowledge application. From this research, we could conclude that organizational culture’s impact on knowledge application is very significant within ERP implementations. An Organizational culture’s role for ERP implementations would be to create an environment where employees feel motivated to contribute to the KM activities and the culture is accepting KM as a means of enabling employees to be more informed and efficient.

Influence of Knowledge Creation on Knowledge Application: Knowledge creation has a positive impact on knowledge application. Data analysis shows that the socialization process of solving problems through discussion with other users within an
organization is happening just over half of the time during an ERP implementation. In this knowledge creation process, skilled users share their tacit knowledge by providing examples for various processes including how to use the systems and teaching the intricacies of the ERP systems. Both socialization and externalization influences on knowledge creation and knowledge application. A formal KMS could help generate new knowledge during an ERP implementation.

**Influence of Knowledge Creation on Knowledge Storage:** The relationship between knowledge creation and knowledge storage flows from an informal process to a formal process. More creation equals more knowledge that could be stored formally. Data analysis shows that access to the knowledge that has been stored is relatively easy. A formal KMS could greatly increase knowledge storage capabilities.

5. **CONCLUSIONS**

Though the major limitation of this research could be mainly attributed to the responses obtained via internet over which the researchers had less control, the future research could make an attempt to develop a prototype Knowledge Management Expert System (KMES) for ERP implementation. A combination of Case-Based Reasoning (CBR) and Rule-Based Reasoning (RBR) could be used for developing and conducting the prototype to determine the best way to design a Knowledge Management Systems (KMS). The future research questions are: Whether the KMS should be completely automated or whether it could be a separate group within the implementation team whose sole purpose is to create, store, transfer, and apply knowledge during the implementation process. Another design would be to combine both methods to create a more efficient system than a group of experts/consultants doing by themselves.

It is evident from the analysis of the internet-based questionnaire that no formal KMS for ERP implementations is currently being used. By providing additional knowledge creation using automated reasoning, more efficient knowledge transfer through set of formal rules and procedures, and automated application, a formal KMS not only benefits the ERP implementation with more efficient and better decision making capabilities, it also benefits the organization as a whole by adding to its memory which can be used in future endeavors. Another important variable in knowledge processes would be user involvement in ERP implementation. Organizational environment can be setup in the optimal way but users must have a reason or incentive to create, transfer, and apply their knowledge in a more collective way. Without motivation, only the most committed users will share their knowledge while others will share only some of the time, if at all. Specific measures are to be taken to ensure employees are contributing to the knowledge base. Users’ contribution for knowledge processes would be an effective method of consistently generating, transferring, and using new knowledge.
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