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Murray E. Jennex Ph.D
University of Phoenix-San Diego

Lorne Olfman Ph.D
laremont Graduate University

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The Impact of Organizational Memory Information Systems on Organizational Learning

Murray E. Jennex, Ph.D., University of Phoenix-San Diego

Lorne Olfman, Ph.D., Claremont Graduate University

ABSTRACT

This paper reports on a case study of the organizational memory information system (OMIS) of an engineering group at a nuclear power plant. It found that the OMIS was effective based on the criteria of the competing values model (Quinn and Rohrbaugh, 1983). The engineering group was also considered to be effective based on the criteria used to evaluate effectiveness by the group managers. One of the criteria used to assess group effectiveness was the ability to use organizational memory and it was found that an improved OMIS resulted in improved organizational and individual effectiveness. The study also found that measurements of OMIS effectiveness could of been improved by refining the competing values model measurement of "integration" and by creating a measure for evaluating the reliance on individual's memories.

I. Introduction

To what extent can an organizational memory information system (OMIS) contribute to organizational effectiveness? Huber (1991) maintains that organizational memory is one of four basic constructs and processes associated with organizational learning. If organizational learning depends on organizational memory, and if organizational memory can be shown to contribute to organizational effectiveness, then it is likely that an effective organizational memory can enhance organizational learning. This paper reports on a case study of how an engineering group at a nuclear power plant implements its OMIS, and how this OMIS contributes to organizational effectiveness.

II. Significant Prior Research

OM is defined by Stein and Zwass (1995, p.89) as "the means by which knowledge from the past is brought to bear on present activities, thus resulting in higher or lower levels of organizational effectiveness." Walsh and Ungson (1991) define OM in its most basic sense as stored information from an organization's history that can be brought to bear on present decisions.

OM has two principle goals: to integrate information across organizational boundaries and to control current activities and thus avoid past mistakes. Basic functions of OM are perception, acquisition, abstraction, recording, storage, retrieval, interpretation, and transmission of organizational knowledge (Stein and Zwass 1995). Walsh and Ungson (1991) propose that organizational memory consists of five retention facilities: individuals, culture, transformations, structures, and ecology.

Stein and Zwass (1995) extend Walsh and Ungson's (1991) definition by proposing that there is an information systems component that serves to augment the interactions between knowledge seekers and human experts. They define an Organizational Memory Information System, OMIS, as a system that functions to provide a means by which knowledge from the past is brought to bear on present activities, thus resulting in increased levels of effectiveness for the organization. In this study, four subsystems are defined for the OMIS:

1. Document based OMISs are based on paper documents.
2. Computer based OMISs are based on databases and application programs.
3. Self memory based OMISs are based on a person's memory. They consist of whatever system one chooses to utilize to keep that memory.

4. Others' self memory based OMISs are based on co-workers' memories. These systems are the self memory systems of co-workers.

These are overlapping systems with each subsystem containing elements from the others. This will be especially true for IT components of organizational memory due to process automation and reengineering replacing many documents and processes with IT substitutes.

Stein and Zwass (1995) propose that organizational effectiveness can be described using the competing values model proposed by Quinn and Rohrbaugh (1983). An implicit assumption of this model is that organizational effectiveness is related to OM. This model uses four of Campbell's organizational effectiveness criteria that have been found to be consistent with Parsons' effectiveness functions for systems of action. Memory has been found to be directly relevant to the four functional clusters of effectiveness:

The integrative function is the IT capability for providing local and instantaneous access to OM information. Integration in toto involves sharing across both space and time.

The adaptive function includes boundary spanning activities to recognize, capture, organize, and distribute knowledge about the environment to the appropriate organizational actors.

The goal attainment function is essentially one of using past performance information to establish and manage performance goals.

The pattern maintenance function is for maintaining the human and organizational culture memory.

III. Methodology

The case study approach was used to gather detailed information on the subject organization. It utilized interviews, surveys, and document research as the means for data collection. Multiple theoretical approaches for measuring effectiveness and analyzing data as well as multiple sources of data, were used to converge to a conclusion as a means of reducing validity threats.

The subject organization was selected because it was an organization known to use OM. Activities performed by this organization that require OM include equipment problem resolution, trend identification and analysis, equipment and system status assessments, and root cause identification. It is the purpose of this organization to compile the historical basis for the plant systems and equipment and to use that basis keep the plant running at optimal effectiveness. Members of this organization are almost exclusively degreed engineers with several years of experience.

Interviews with 5 managers, 5 supervisors, and 11 engineers were used to gather data on the integrative function of Quinn and Rohrbaugh's (1983) competing values model of organizational effectiveness and on how the organization measures productivity. Document search and direct observation were used to evaluate the adaptive, goal attainment, and pattern maintenance functions and on how the organization measures productivity.

IV. Findings

The Competing Values Model

The interviews indicated a nearly unanimous consensus that the changes to the OMIS that incorporated more computer-based aspects had made the organization more effective. Nearly all agreed that most past decision information could be retrieved within a couple of hours with the majority of it being retrievable

within minutes. Yet, nearly all agree that the OMIS could be further improved. The following comments indicate the range of responses to the effectiveness of the OMIS:

"It helps to keep from re-inventing the wheel. Every decision we make is not a new decision. Our systems help us to do this."

"We have much more capability now than we did. We can do so much more than we could ten years ago. There is almost too much data."

"The information is there but the tools are slow, systems crash, and information and tools are unreliable." From the standpoint of organizational learning, it was evident that the OMIS generates positive impacts. Using information from past decisions to make future decisions and to prevent repeating mistakes or ineffective corrective actions is an important step. Also, there is potential for further improvement through the development of more reliable and integrated systems.

It was found that the effectiveness of the OMIS hinges to a large degree on how well the composite system integrates the components. The subject OMIS did not integrate its component systems well as indicated by negative responses on composite system integration by one third of the interviewees. Four major computer systems along with several minor systems, each with its own interface and database, comprised the computer-based OMIS. It is expected that a composite system that has components with common interfaces that access the same databases will be more effective than those composite systems that do not. This needs to be accounted for in the Competing Values Model, it is recommended that the integration function be expanded to consider system integration in addition to temporal and physical integration as the subject system was found to be well integrated using the current criteria for evaluating integration.

There is also a need for a function that evaluates the availability of self-based OMIS data to others. During this study the organization underwent a voluntary retirement program and several members of the organization were lost. During the interviews it was found that several managers and supervisors had their doubts about the effectiveness of their OMIS after they lost people. Prior to the program all of them were confident the OMIS was effective. Afterwards, when significant chunks of personal memory was lost, there were doubts. It is expected that an OMIS that maximizes database usage to store memory and which reduces reliance on personal memory storage, will be more effective than those that do not. A competing values function that evaluates the amount of or reliance on personal memory storage would increase the reliability of the competing values model by evaluating an additional factor that affects OMIS effectiveness.

Finally, none of these functions actually evaluates the quality of the decisions and evaluations made using the OMIS. In an implemented OMIS the real measure of effectiveness will include the quality of the decisions and evaluations made. It is recommended that a function be added for measuring decision and evaluation quality.

Productivity

Several factors were identified that were used by managers and supervisors to determine the productivity of their workers. These included:

1. Quantitative factors such as the priority, number and timeliness of completed assignments;
2. Qualitative factors such as the thoroughness and accuracy of solutions;
3. Client satisfaction factors such as the responsiveness and quality of decisions;

4. Competency factors such as the complexity of work that can be assigned, amount of work that has to be repeated, and the skill the individual has in using the available tools.

Several of these factors are clearly influenced by the effectiveness of the OMIS and its utilization. It was actually observed that the ability to use the OMIS was considered a basic skill needed by every engineer. It was evident that memory happens, and that it is a factor in producing organizational learning. The findings lend credence to proposing that organizational memory can positively impact productivity.

Organizational effectiveness was also looked at in this study. Effectiveness ratings determined by external agencies were taken as measurements of organizational effectiveness. These ratings showed an improving trend that was in part attributed to improved decision making, trending, and problem resolution as a result of better computer-based OMIS components. Performance factors selected to indicate overall plant effectiveness were also used to evaluate organizational effectiveness. These factors demonstrated an improving trend of increased capacity factors and reduced reactor trips and forced shutdowns that was also attributed in part to improved computer-based OMIS components.

V. Conclusions

A case study of an engineering group at a nuclear power plant was used to determine to what extent organizational memory information systems are used, and how they are used to improve productivity. The Competing Values Model was used to evaluate the effectiveness of the OMIS. It showed that managers and supervisors strongly believed that the shifting of the OMIS from paper-based and self-based OMIS components to computer-based OMIS components has led to improvements in productivity as defined by the four aspects of the model: integration, adaption, goal attainment, and pattern maintenance. It was also believed that the technical aspects of the OMIS can continue to be improved so that further benefits can be gained. From the standpoint of measurement, it appears that the integration function should include system integration and a measure of the importance of self-based memory, especially that part which is in an individual's head.

Overall, it was found that organizational memory is a necessary component of this organization. The increased use of this memory, especially via information technology tools (computer-based memory), was reported to have improved organizational learning as manifested by evaluations from outside organizations. This was also observed when the Competing Values Model was applied. This lends credence to continued use of the Competing Values Model, with the suggested improvements, as a measurement tool for organizational memory and organizational learning.

References available upon request from the authors.