Dynamic Information Systems in Higher Education

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INTRODUCTION

The management of creative knowledge work presents great challenges in higher education, where individuals and information systems play a significant role in attaining the strategic objectives of a higher education institution (HEI). It is argued in this article that an analysis of the information systems (IS) of an organization using the concept of information environments (IE) activates the organization's awareness of the development needs of intellectual capital and ISs. A classification of information environments is introduced, developed, and successfully applied to the core processes of an HEI.

The purpose of this article is to show that the ISs can be classified according to the IEs and the core processes of an organization. An analysis of information environments helps the educational management to develop the institution's information systems in an innovative way. In particular, dynamic ISs are analyzed for the purpose of managing the intellectual capital in HEIs. A case study on the E-Learning Unit at the Turku University of Applied Sciences (TUAS) is presented. The findings of the study are useful for educational administrators, project managers, software developers, and usability specialists.

The article is organized as follows: First, the IE approach, useful for analyzing an organization's ISs, is introduced. Next, the concept of IEs is used to analyze the ISs used in the core internal processes of a HEI, which is the main focus of the article. Thereafter, a short case study of a dynamic IS is presented, including future trends. Finally, the results of the study are summarized and discussed in the concluding section.

BACKGROUND

Information Environments

The IE approach can be used to provide the basic structure for the management of an organization's intellectual capital and ISs. The approach is developed by Ståhle and discussed in several studies (e.g., Ståhle & Grönroos, 2000; Ståhle, Ståhle, & Pöyhönen, 2003). Ståhle and Hong (2002) describe an organization as a knowledge-creating system that arises as a result of interaction. They define the organization as a network where the possibilities of individuals to influence activities are determined by the management structures and management system. The way in which these networks are organized generates different IEs, with different characters, limits, and possibilities. For the most part, the kinds of IEs that organizations may generate are defined by the structures of management systems and technology.

The main thesis of the approach is that there are three kind of IEs formed in organizations as a result of the management's action:

- mechanical,
- organic, and
- dynamic.

Each of these environments specializes in handling information in different ways. They have various limits, consequences, and advantages that affect internal processes.

Organizations need *mechanical*, thoroughly controlled IEs for such tasks as accounting and logistics. These permanent support systems form the mechanical

IE of an organization. A mechanical IE can increase the efficiency of internal processes which it is reasonable to mechanise. The automation of routine tasks enables the management to release the human contribution to more important functions. The aim of a mechanical IE is to reach a state of permanent efficiency. The mechanical level of an organization is based on explicit knowledge strictly defined and documented, flowing in one direction, that is, top-down. The relations in a mechanical IE are hierarchically determined.

The second IE in an organization is *organic*. If an organization intends to change and develop, there must be an organic IE. The organic IE emphasises dialogue and communication. The organic level is based on a dialogue between the actors. The actors develop their personal know-how and also that of the organization by sharing their experience-based tacit knowledge (Kim, Chaudhury, & Rao, 2002; Nonaka & Takeuchi, 1995; Takeuchi & Nonaka, 2004). Thus, the core of the organic IE includes social interaction and the actors' ways of handling information. An organic IE requires a different management model compared to an organization run by the mechanical model. In this case, the steering includes power sharing, development of feedback systems, and fostering of two-way communication across all organizational levels.

The third IE for an organization is *dynamic*. The purpose of a dynamic IE is a continuous production of innovations. The abundant and rapid flow of information in the dynamic IE is the source where new innovations emerge by self-organization. The nature of the information in dynamic IEs is potential: it is constructed of weak signals from the environment. This interpretation demands a sound ability to use external information and the intuition of the members of the organization. An essential feature of dynamic IEs is that power and authority are not used by any predetermined actor, but the innovation process is led by the actor best suited for the task. A dynamic IE is a surface for reaching outside organizational limits. Networking with other organizations requires a dynamic IE that provides a two-way access to shared information.

MAIN FOCUS OF THE ARTICLE

ISs and Internal Processes of an HEI

Table 1 presents the three-dimensional IEs of the Turku University of Applied Sciences (TUAS). The IEs are constructed by analyzing and localizing the main ISs of the TUAS. Each system is classified using four or-

Table 1. The three-dimensional IEs of the TUAS

Core processes	Mechanical	Organic	Dynamic
Education	• Student and study register (Winha) • Electronic library catalogues • National HEI database (AM-KOTA)	• Course implementation plan (Totsu) • Discussion areas in virtual learning environment (Discendum OPTIMA)	• Courses in virtual learning environment (Discendum OPTIMA) • GoodMood NetCasting • Finnish virtual university portal • Services of virtual libraries
R&D	• TUAS Publication register (Publikaattori) • Staff qualification and education register (HR) • National HEI database (AM-KOTA)	• Project management systems (Projektori and Proppi) • Library ISs	• Project management systems (Projektori and Proppi) • Local WLAN Net (SparkNet) • E-communities of practices in virtual learning environment (Discendum OPTIMA)
Regional development	• National HEI database (AM-KOTA)	• Management IS (4T) • Customer relations management system (CRM)	• Local WLAN Net (SparkNet) • Local e-networks • Open systems of regional partners
Management	• Payment system (Rondo) • Accounting system (Hansa) • Payroll system (Fortime) • Decision-making system (JoutseNet) • National HEI database (AM-KOTA)	• Management IS (4T) • E-mail and bulletin board area (Lotus Notes) • Staff workload planning system (Tilipussi)	• Local WLAN Net (SparkNet) • IntraNet (NeTku) • IT Help Desk • Open systems of higher education partners • National statistics and student feedback system (OPALA)

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