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2000

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Recommended Citation

Alter, Steven, "A General, Yet Useful Theory of Information Systems" (2000). *AMCIS 2000 Proceedings*. 22.
<http://aisel.aisnet.org/amcis2000/22>

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A General, Yet Useful Theory of Information Systems

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Abstract

This tutorial presents and extends ideas presented in an article with the same title published recently in the *Communications of AIS*. (Alter, 1999). The basic idea is that the concept of “work system” provides an effective framework for studying almost any kind of information system. The meaning and significance of an information system is not in the information system itself, but rather, in the work system(s) it supports. The tutorial explains the elements of a work system and shows how the work system concept can be used as a common denominator for systems in operation and for projects. It shows how this concept can be used to understand topics including alternative roles of information systems, plumbing vs. content in information systems, success factors and other generalizations about systems, and various aspects of IS research.

Background and need for a theory of information systems

Almost every ICIS and AIS meeting seems to have at least one panel discussion or debate about whether information systems is actually a field of study and if so, what might be its core. The theory of information systems discussed in this tutorial attempts to define a set of core concepts. It tries to provide a basis for deep analysis of any information system, and therefore tries to go beyond slogans, 2x2 frameworks, classification schemes and catch phrases such as “keep it simple, stupid,” “the system is greater than the sum of its parts,” “convert data into information,” “to the user the interface is the system,” “garbage in, garbage out” and “don’t pave the cow paths.” The theory of information systems relies on a distinction between an information system and the “work system(s)” it serves. The basic concepts include work system, the elements of a work system, a work system’s environment, information system, content versus plumbing, viewing a project as a work system, and viewing an information system project as part of a work system project.

Elements of a work system

A work system is a system in which human participants and/or machines perform a business process

using information, technology, and other resources to produce products and/or services for internal or external customers. Organizations typically contain multiple work systems and operate through them. Understanding a work system requires at least cursory understanding of six elements: the business process, participants, information, technology, products, and customers.

Fit between elements of a work system and between a work system and its environment

The smooth and painless operation of a work system depends on the mutual balance and alignment between the various elements of the system plus adequate support from the external environment. Understanding a work system usually requires an understanding of its environment, including the external infrastructure that it relies upon in order to operate and the managerial, organizational, regulatory, and competitive context that affect its operation.

The “work system” as a common denominator for systems in operation and for projects

An information system is a work system whose internal functions are limited to processing information by performing six types of operations: capturing, transmitting, storing, retrieving, manipulating, and displaying information. A project is a time-limited work system designed to produce a particular product and then go out of existence.

Alternative roles of information systems in work systems

An information system exists to produce information and/or to support or automate the work performed by other work systems. Information systems may serve other work systems through a variety of roles. In relation to a single work system, an information system may provide information for decision making, may structure or control the work, or may automate some of the work. In relation to a group of related work systems, an information system may support information sharing, may coordinate the work, and may integrate the work. The integration

between an information system and a work system can take on many different forms. The information system may serve as an external source of information; it may be an interactive tool; it may be an integral component of the work system; the information system and work system may overlap so much that they are virtually indistinguishable. The information system may also serve as shared infrastructure used in many diverse work systems.

Content and plumbing in information systems

An information system can be viewed as consisting of content and plumbing. Its content is the information it provides and the way that information affects the business process within the work system(s) it supports. Its plumbing is the details that concern information technology rather than the way information affects other work systems. In principle, plumbing should be hidden from work system participants to the extent possible. The relative balance of content and plumbing in an information system project affect the project's degree of difficulty and should affect its organizational structure. For projects of any particular size, those in which both content and plumbing change significantly have more conceptual and managerial complexity than projects in which the changes are mostly about content or mostly about plumbing.

Generalizations, truisms, and success factors related to work systems, information systems, and projects

The success of a work system depends on the relative strength of internal and external forces supporting the system versus internal and external forces and obstacles opposing the system. Generalizations, truisms, and success factors related to work systems also apply to information systems and to projects (because these are work systems). Additional generalizations may apply to information systems in general, to specific types of information systems, to projects in general, and to different types of projects.

Using this theory to analyze information systems from a business viewpoint

This theory can be used as the basis of a systems analysis method for business professionals. This method starts by using the elements of a work system to define the system that is being studied and to define the problems or opportunities that are being explored. Examination of each element of the work system and related possibilities for improvement provides a useful

way to see opportunities and to recognize that any particular change such as a technology fix or a business process change may not address many of the important issues.

Using this theory to understand information system research

The distinction between work systems and information systems is potentially useful in interpreting many different types of information system research. For example, does a particular research study about DSS present its results in terms of the work system that is being supported, in terms of the information system, or in terms of the technology within the information system? Looking across the information system field, which generalizations (such need for management support, need for user involvement, system quality as a determinant of usage, etc.) are really about work systems in general, about information systems in general, or about particular types of information systems?

References

Alter, S. (1999) "A General, Yet Useful Theory of Information Systems," *Communications of AIS*, Vol. 1, Article 13, March 1999. <http://cais.isworld.org/articles/1-13/>