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General Systems Theory: A Guiding Framework for IS Research

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Abstract

General systems theory (GST) holds the potential to address some of the issues that information systems (IS) field faces today. This paper addresses the question whether the concepts, principles and approaches prevalent in GST can be gainfully employed for studying and conducting research in IS. Using the concepts embedded in GST, we analyze the problem of “fragmented adhocracy” in IS research. We describe how the various disparate and apparently incongruent viewpoints and findings that have emerged from IS research can be organized, reconciles and leveraged using systems concepts. We also show the utility of the systems approach in studying and analyzing IS problems, specifically the IS value problem. In conclusion, we suggest that systems concepts, and therefore GST, can be applied at two levels in IS field – firstly, for helping understand and organize the body of knowledge in IS and secondly, as a guide for conducting IS research.

Keywords: systems theory, information systems, IS value

Introduction

General systems theory (GST) provides the basis to study trans-disciplinary abstract phenomenon that can be considered as independent of its substance, type, or spatial or temporal scale of existence (Heylighen and Joslyn, 1992). There are many possible contributions that systems theory promises for the IS field. For instance, one possible advantage can be thought in terms of the sheer breadth of systems theory that promises to hold realistic promise of providing an integrative framework while retaining the richness and diversity of the field. Another value of broad formulation is that it enables comparative analysis across various levels (individual, organizational and societal, for instance) at different points in time and also at different times within the same level. Perhaps as important as systems theory's promise for helping unify information systems is its promise of linking it to other fields of inquiry. At the very least, it provides the legitimacy of effort aimed at spanning disciplinary boundaries through its focus on trans-disciplinary phenomenon. From a methodological standpoint, systems theory (the field) and systems thinking (the worldview and approach shared by those who subscribe to systems theory) can help IS researchers frame and address complex and messy problems.

Our objective in this paper is to show how the concepts and principles from GST (henceforth referred to as systems theory) can be used to understand the issue of "fragmented adhocracy" in IS field and how system concepts can guide the research efforts in the field. To do that, we first introduce the difference between traditional thinking (usually known as reductionist approach to research) and system thinking to research. We then discuss relevance of systems theory for information systems. We use a case study approach to understand the relevance of systems theory to IS research by taking up the specific problem of IS value creation. We conclude the paper by highlighting the significance of systems concepts for IS research.

Our contribution lies in showing that the richness of systems theory needs to be leveraged at the appropriate levels of abstraction. We identify two such broad levels in this paper. One is the level at which we consider the entire IS discipline. The second is at a lower level of abstraction in the form of an IS research problem. Based on our discussions, we show how systems theory can be used to develop an improved understanding and appreciation of the research problems in the IS field.

Background

While the ideas of systems theory go back many decades, Bertalanffy (1934, 1968) formally introduced GST as a modeling device that accommodates the interrelationships and overlap between separate disciplines. Therefore, systems theory can be considered the trans-disciplinary study of the abstract organization of phenomena, independent of their substance, type, or spatial or temporal scale of existence. GST investigates both the principles common to all complex

entities, and the (usually mathematical) models that can be used to describe them (Heylighen and Joslyn, 1992). The very fact that IS is considered to be an amalgam of multiple disciplines (or is considered to have many referent disciplines), makes it, in many ways, an ideal subject to employ systems theory to derive its first principles.

When it comes to definitions, IS, as an area of inquiry, is closely linked with the management discipline. Given that ISs are almost always embedded within organizations, we borrow some generic terms (relevant to management and organizations) from Ackoff (1971) and relate them to IS.

A system is a set of inter-related elements. The interrelated elements in the case of IS are computers (including all the associated hardware), organizational processes, and users. Business processes can be considered an abstraction of the organization system. A process is a sequence of behavior that constitutes a system and has a goal-producing function. The environment of a system is a set of elements and their relevant properties, whose elements are not part of the system but a change in any of which can produce a change in the state of the system. The organizational systems typically provide the environment for the IS. From a behavioral standpoint, there is a difference in ISs and organizations they are embedded in. ISs tend to be purposive systems and organizations tend to be purposeful systems. A purposive system is a multi-goal seeking system the different goals of which have a common property. Production of that common property is the system's purpose. A purposeful system is one that can produce the same outcome in different ways in the same (internal or external) state and can produce different outcomes in the same and different states. Thus a purposeful system (like a human being or an organization managed by humans) is one that can change its goals under constant conditions. In the context of an IS the observer (who can be a user, manager, researcher, customer) too is a system. Hence, the boundary of the system varies from observer to observer.

Once we have chosen to view the IS as a subsystem or an element of a larger system – in this case the organization – certain IS-related issues and behaviors can be re-conceptualized in ways that are distinct from past approaches to analyzing information systems. To better understand the role of information systems and also to appreciate how GST can be useful to study ISs, we again borrow Ackoff's definition for an organization: "An organization is a purposeful system that contains at least two purposeful elements that have a common purpose relative to which the system has a functional division of labor; its functionally distinct subsets can respond to each other's behavior through observation or communication; and at least one subset has a system-control function (p. 670)."

Based on this definition, an IS can be easily conceptualized as a control system. However, an IS can also be conceptualized as the sub-system or system element that helps accord common purpose to the purposeful systems that constitute the larger system. This definition is more valuable and representative of the contemporary roles of ISs.

Before we move on to discussing the implications of applying systems theory to information systems, we would like to reinforce the centrality of four systems concepts, when attempting to define any system (including an IS): emergence, hierarchy, communication and control.

Emergence: Emergence is the process of deriving some new and coherent structures, patterns and properties in a complex system. Phenomena that display emergence take place due to interactions between the elements of a system over time.

Hierarchy: A collection of levels ordered by their inherent complexity (or extent of detail). This can best be understood in terms of systems and their sub-systems. Effects propagate through a hierarchy through adjacent levels

Communication: We consider communication to be the process through which information is transferred between systems and / or elements.

Control: An element or a system controls another element or system (or itself) if its behavior is either necessary or sufficient for subsequent behavior of the other element or system (or itself), and the subsequent behavior is necessary for or sufficient for the attainment of one or more of its goals (Ackoff, 1971).

Literature review

Systems theory is often juxtaposed against, what might be broadly referred to as reductionism, an approach that forms the basis of majority of IS research. Reductionism can be understood as an approach to understand complex things or phenomena by breaking them into their constituent parts and then understanding those simpler and manageable parts. From a methodological angle, reductionism results in “analysis” as opposed to “synthesis.” However, it is much too simple to argue that IS researchers place themselves firmly in one camp or the other. Most often, individuals choose their approach to investigate phenomena based on past training and available resources (time and expertise). To that end, we provide Table 1 that shows the two ends of multiple continua – each continuum characterizing an aspect of an investigator’s thinking approach.

Table 1. Differentiating systems view from traditional view (CUSSN, 2005)

Characteristic	Traditional thinking	Systems thinking
Overall view	Reductionist, focus is on parts	Holistic, focus is on the whole
Key processes	Analysis	Synthesis
Type of analysis	Deduction	Induction
Focus of investigation	Attributes of objects	Interdependence of objects
State during investigation	Static	Dynamic
Basic assumption	Cause and effect	Multiple, probabilistic causality
Problem resolution	A static solution	An adaptive system or modeling
Operation of parts	Optimal	Sub-optimal

It should be apparent that when information systems are designed and developed, the traditional reductionist approach is likely to be more effective than the other approach. However, when the developed systems are embedded into an organization (a social system), their expected effectiveness is usually found to be much less than anticipated (sub-optimal), making reductionist approach less useful. The effectiveness of implemented systems depends on the nature of use and the competence of users (interdependence of objects) since what works in one organization may not work in another (the breakdown of deductive logic), cause and effect are not clearly apparent and effective solutions are those that emerge as opposed to the ones that are imposed (adaptiveness of the larger system). So, from the standpoint of abstraction, systems theory does appear relevant in addressing the problematic traits of information systems once implemented.

Despite the long history of systems approach in IS research, starting with Churchman (1968), there appear to be only two dominating theoretical approaches in the discipline – the variance theoretic approach and the process-theoretic approach (Burton-Jones et al., 2004). Systems theory has been intimately connected to the IS field since its early years through the work of Checkland (1999) [soft systems methodology applied to systems development, implementation and management of change], Mitroff et al. (1972 and 1974) [who based their work on that of Churchman into a theoretically dialectical approach toward information systems] and Ackoff (1967) [where he explored many managerial assumptions regarding information systems using systems theory]. However, (Burton-Jones et al., 2004) rightly point out that instances of the applications of systems theory in North American research are rare – and can be traced to the reluctance of researchers to acknowledge feedbacks, non-linearities and the dynamics that underlie IS phenomena.

One of the problems associated with applying systems theory to IS is that there are different versions of the systems approach. For instance, Porra (1999) identifies three such approaches: mechanistic, organic and colonial. Churchman (1968) himself provided a classification of systems and (imputed approaches). This classification has formed the basis for relating Churchman's inquiring systems and information types (Olson, 2001). This problem also appears in terms of the different flavors of how systems theory is applied. For instance, while Abdel-Hamid (1988) applies system dynamics modeling in the context of software projects, Porra et al. (2005) apply very general descriptive metaphors to an organizational cases study.

In order to avoid a piecemeal approach to applying systems theory to IS, we avoid the temptation of choosing a certain aspect or facet of systems theory that may be theoretically convenient or methodologically relevant. On the other hand, we hope to contribute by describing broad levels at which the systems approach can add value. To that end, we believe that there are two main levels at which systems theory can potentially be used in the field of IS. The first level pertains to the use of systems theory to understand and organize the body of knowledge in the IS field. This level is characterized by the work of Nolan and Wetherbe (1980). The other level has to do with actually applying some of the systems theory concepts to

understand specific IS problems. This type of research is characterized by the work of Abdel-Hamid (1988), Bajgoric (2006), Wennberg et al. (2006) and Rose (2002).

In the following two sections describe and discuss the applications of systems theory at the two levels. We show (a) how complex adaptive systems be used to study the IS field and (b) the relevance of systems theory to the actual conduct of IS research. In both the sections, we first provide the background and follow it up with a discussion.

Using systems theory to understand the IS field

Background

A chronic problem that every IS researcher confront, sooner or later, is that of the legitimacy of the IS field itself. We first summarize the debate associated with the field of IS and then argue how systems theory can provide a meaningful basis to frame the debate – and even resolve many issues.

The IS field has been described as a fragmented adhocracy by Hirschheim et al. (1996) because of the multiple research traditions, multiplicity of perspectives, heterogeneity of research contexts and the fast changing nature of the apparently central artifact of interest – the technology itself. A useful entry into the questions surrounding IS as a discipline is the debate sparked by Benbasat and Zmud (2003) in their article in which they argued for a more disciplinary nature for the IS field. They made this call because they believed that the central identity of the IS field has become more ambiguous as researchers tend to conduct research on phenomena too distant from IT-based systems.

In response, Galliers (2003) argued against such a call. Galliers' response was based on the following arguments. His first argument against a central core for the IS discipline was that there is no clear cut definition for information systems. Secondly, Galliers questioned the dominant role of the “organization” as the primary construct of interest in IS research. Thirdly, the necessity of treating IS as a discipline was itself questioned. Lastly, Galliers questioned the narrow consideration of IS as a discipline that largely ignores the inter- and trans-national nature of IS as a field of study. While such conflicting viewpoints exist in any academic discipline, they are far more prevalent in a “new” and emerging field like IS. These dynamics connote the complexity of the IS field and it is not surprising that IS as a field of inquiry been studied as a chaotic system (McBride, 2005).

DeSanctis (2003) has proposed that the IS community of practice is robust and vibrant, and that it has succeeded in growing, attracting newcomers, and setting up forums of collaboration, interaction, and exchange. She views IS researchers as a community of practice that shapes phenomena of interest in an ongoing process of inquiry and in a social process of interactions through journals, conferences, and special workshops. Members of the community and newcomers will develop interests in new phenomena, theories, and methodologies and the community must find effective structures for absorption of

novel inquiry. Such novelty, induced by change, has been characteristic of the field of IS. El Sawy (2003) describes this changing nature of IT and its evolving sophistication by employing three temporal perspectives: connection, immersion, and fusion. This shows that the IS field has changed in response to external (typically, technological) changes – which makes the field an adaptive system. The definition of an adaptive system is one that can change itself in response to changes in its environment in such a way that its performance improves through a continuing interaction with its surroundings.

Given that the IS field is complex and given further that it has been adaptive, it can be considered as a complex adaptive system (CAS). A complex adaptive system is defined as a system of individual agents, who have the freedom to act in ways that are not always totally predictable, and whose actions are interconnected such that one agent's action changes the context for other agents (Waldrop, 1992). Employing systems concepts that are applicable to CAS, we can study the properties of CAS as applicable to the IS field. Complex adaptive systems have many properties and the most important ones include emergence, dynamism, sub-optimality, requisite variety, connectivity, and self-organizing.

Discussion

We now discuss how these properties are relevant (as derived from system theory) to the IS field.

Emergence: It is relatively easy to argue that the field of IS has displayed emergence. The nature of interactions in the IS community that have led to emergence can be thought of as the discursive interactions between scholars. According to Goldstein (in Zimmerman et al., 1998) emergence is “the arising of new, unexpected structures, patterns, properties, or processes in a self-organizing system.... Emergent phenomena seem to have a life of their own with their own rules, laws and possibilities (p. 265).” The behavior or the outcomes in the field of IS are induced not by a single entity but rather by the simultaneous and parallel actions of agents within the system itself. Thus, the field of IS continues to undergo “a process..., whereby new emergent structures, patterns, and properties arise without being externally imposed on the system (Goldstein in Zimmerman et al., 1998).” At the very least, this insight should make every IS researcher reach a heightened state of awareness of their roles and responsibilities and their ability to individually, and collectively, make a difference to the field.

Environmental dynamism: The environment of CASs is made up of multiple CASs, which influence each other. One common way of changes in systems is to alter the boundaries of the system. This is quite common in IS. The boundaries are incessantly changing; we may like to believe that they are expanding. However, the changing boundaries also imply that boundaries change to exclude some entities – like “older” problems and technologies. The shifting of boundaries also takes place by virtue of the fact that IS researchers make forays into other disciplines – which manifests itself as research collaborations and memberships on the editorial boards of journals. The implication of this is that as boundaries change, the content bounded by the boundary also changes. So we should expect the field of IS to change.

Sub-optimality: A CAS does not have to be perfect in order to thrive within its environment. This notion of sub-optimality may address the problem of “anxiety discourse” (King and Lyytinen, 2004) that afflicts the IS field. Loosely translated, this view holds either that, “we are not as good as the other” or that “the others do not consider us good enough.” Among the many problems with this view is that what is good enough in other fields may not be applicable in IS. However, a normative view forces an absolute notion of what is good enough. When that gets reified, then paradoxically the solution becomes the problem. In other words, trying to find an intellectual core in an inherently dynamic discipline leads to increasingly divisive, but necessary, debates. Interestingly, a CAS, once it has reached the state of being good enough will trade off increased efficiency every time in favor of greater effectiveness. The implication for this is that the IS field is going to improve and grow.

Requisite variety: The greater the variety within the system the stronger it is. This is because the variety within a system must be at least as great as the environmental variety against which it is attempting to regulate itself (Ashby, 1960). This is relevant for IS given the “perceived disrespect toward the IS field by other fields within management schools (Lytinnen and King, 2004, p. 223).” In fact ambiguity and paradox need to abound in CASs which use contradictions to create new possibilities to co-evolve with their environment. The variety of disciplines (referent or otherwise) that are relevant for IS, the methodological variety, the regional flavors and the variety of technologies that fall under the rubric of IS – all add up to create a phenomenally rich variety in IS field. For the IS field, political democracy is an appropriate exemplar of the strength of variety in that its value comes from its acceptance and even insistence on there being a variety of political standpoints.

Connectivity: The different ways in which agents (or entities) in a system interact with each other and relate to one another determine the survival of the system. This is because these connections generate the behavior of the system and determine how feedbacks are communicated. In IS field, these connections can be formal or informal. Interactions at conferences or memberships in doctoral committees can be considered less formal compared to peer reviews of research manuscripts. The variety, degree, sophistication and strength of the relationships influence any system’s ability to adapt. There can be too much connectivity, as well as too little. For instance, as the connectivity increases, we would expect to see that the degree of constraints one agent in the IS field creates on others will be significantly more than when the connectivity is less.

Self-organizing: Von Foerster (1960) persuasively argued that only organisms and their environments taken together organize themselves. Ashby (1960) redefined a self-organizing system to be not an organism that changes its structure as a function of its experience and environment but rather the system consisting of the organism and environment taken together. The concept of self organization is pertinent for the IS field because of its praxis-based *raison d’être*. The field exists because of the existence of IT artifacts. Such artifacts and their application form the environment for the field. For the field to survive and *develop* (not just *grow*) in this hyper-dynamic environment, the IS field and the environment need to influence each other; in doing so, the field not just self-organizes, but has also displayed the property of autopoiesis (i.e recreating itself).

This aspect is brought out well by the notion of “salience” by Lyytinen and King (2004) who argue that the origins of IS can be traced to the very salience of the subject matter and not its theory per se. They go on to show how despite the dot com bust (a technological downturn) the demand for IS/IT related jobs will increase. In essence, IS, as a field needs to continually make internal and external adjustments to display emergent properties so as to re-create itself.

In summary, properties of emergence, dynamism, sub-optimality, requisite variety, connectivity, and self-organizing can be used to understand the developments within the IS field and analyze some of the paradoxes that exist in the field. These concepts provide a useful framework to shape the debate within the IS field as to what constitutes the field and how it is progressing. We now demonstrate the utility of systems theory and concepts in the context of a specific research issue in IS – that of IS value.

Systems theory to frame IS research

Background

The problem of IS value has always been central to IS researchers. Figure 1 shows how this problem has been conceptualized by various researchers and how different researchers have attempted to focus on a specific aspect of the problem.

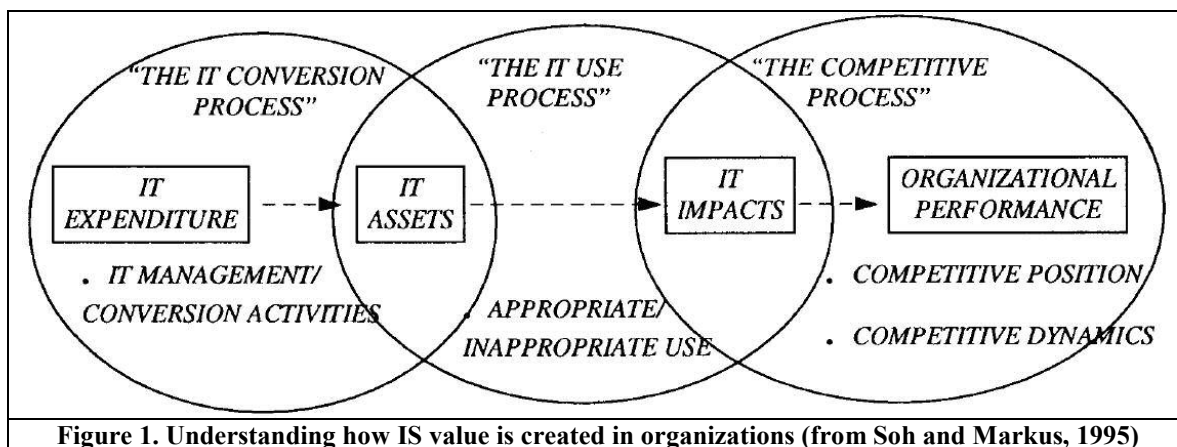


Figure 1. Understanding how IS value is created in organizations (from Soh and Markus, 1995)

The question addressed in Figure 1 has to do with how IT expenditures result in or are “converted into” IS value (IT assets or IT impacts or organizational performance). This question also represents the problem where the IT artifact and the context that such an artifact is immersed into can not be easily delineated (El Sawy, 2003). Such intertwining of concepts has resulted in difficulties with the very concept of IS value itself. A scrutiny of research on IS value reveals how this difficulty has manifested itself as the problem of the elusive dependent variable (DeLone and McLean, 1992). After describing some of

the contrasting perceptions and conceptualizations of IS value, we discuss how systems concepts are applicable in conceptualizing the problem and in designing research.

We describe three continua that have been employed in the context of IS value: the qualitative-quantitative, efficiency-effectiveness and the endogenous-exogenous value determination continuum.

Qualitative - quantitative continuum: One of the enduring debates surrounding IS value has to do with whether such value can be assessed quantitatively (typically in dollar terms) or qualitatively (user satisfaction or improvement in quality of work life). Chan (2000) pointed out that such a conceptualization has created a schism in IS value research in that researchers tend to favor one or the other view of IS value depending on the research method they employ. Lee (2001) argues that both views are important and employing both views is preferable in terms of completeness. However, the bias still remains either at looking for quantitative measures of IS effectiveness or at quantifying IS effectiveness measures, be they qualitative or quantitative (Heo and Han, 2003).

Efficiency – effectiveness continuum: Another common theme for assessing IS value has been “efficiency” versus “effectiveness”. The “efficiency” aspect of IS value can be understood in terms of getting things done cheaper (cost efficiency) or faster (productivity) or both while “effectiveness” aspect reflects the extent to which IS and related organizational processes produce the desired organizational objectives. In essence, efficiency oriented IS value measures include measures such as cost reduction or productivity improvements while effectiveness oriented measures include those used to assess product or service enhancements or customer satisfaction.

Endogenously determined – exogenously determined: IS value can be viewed as either endogenously determined or exogenously determined. IS value determined by forces and processes that are primarily inside the organizations can be considered endogenous. When IS value is determined by forces and influences outside the organizational boundary, such measures of IS value can be considered exogenously determined. Melville et al. (2004), who employ competitive advantage and operational efficiency as distinct measures of IS value, provide an example of endogenous and exogenous continuum for assessing IS value. The competitive advantage represents exogenous end of the spectrum while operational efficiency represents the endogenous end of the spectrum. The continuum based on external and internal focus identified by Melville et al. (2004) has been identified earlier by Hitt and Brynjolfsson (1996) who used three dimensions -- gross marginal product, market value, consumer surplus -- to conceptualize IS value.

Discussion

Considering that multiple proxies for IS value exist in current literature with financial performance measures being the most frequently used as proxy for IS value, it is reasonable for us to assume that much of the research has adopted a black box approach to IS value by linking IT investment and organizational performance. This point is substantiated by the fact that

we are still not sure how and where IS adds value in an organization leading us to take cognizance of three salient aspects related to IS value. These are:

- (a) Investments in IS and the desired outcome(s) are separated in time. For instance, investment in IS precedes IT asset creation (in Figure 1) which subsequently leads to IT impacts. Therefore, before the desired outcome, organizational performance, is achieved, two intermediate outcomes, IT asset creation and IT impacts have to be achieved. From this standpoint, final or ultimate IS value is contingent on two intermediate outcomes.
- (b) There are multiple variables, some endogenous, some exogenous and some intermediate in the context of IS value. There is an interplay between the environment inside an organization and that outside in determining the nature and quantum of IS value.
- (c) IS value is created over time and it is a dynamic process. There are multiple causes. However, relationships between antecedents and consequents are not simple. For instance, IT assets are necessary but not sufficient for IT impacts; similarly, IT impacts do not necessarily result in enhancing an organization's competitive position.

These three aspects related to IS value make systems theory and its principles relevant to its study. For instance, El Sawy (2003) suggests the immersion and fusion views about IS in an organization where context, systemic relationships and mutual interdependence need to be addressed. In addition, "the laws of the whole are embedded in the implicate domain, rather than the explicate domain (El Sawy, 2003, p. 14)." In terms of Table 1, the emphasis on focusing on the whole, the need for synthesis, a complex interdependence of objects and multiple sources or probabilistic causality are clearly consistent with systems thinking. These aspects of systems thinking are particularly relevant for the study of IS value because IS investments and IS value are temporally separated that bring in the effect of multiple factors and requires an understanding of complex interdependence of such factors.

The implication is that there is a need to study IS value over time. In doing so we should incorporate a variety of qualitative as well as quantitative dimensions of IS value (Langley, 1999). Moreover, we need to go well beyond the surface descriptions to penetrate the logic behind observed temporal progressions (Van der Ven, 1992). The relationship between IS value and its environment clearly calls for researchers to explore dynamic relations between sets of variables and recognize feedback structures (Monge, 1990), identify dynamic and static causal structures (Markus and Robey, 1988). Lastly there is a need to understand a process as a way to accomplish a goal or as a transformation of inputs (IT investments) into to outputs (organizational performance) in order to identify the links between processes and outcomes (Crowston, 2000; Soh and Markus, 1995). Unless IS value researchers focus their attention to these systemic issues, they are unlikely to find answers to the questions related to origin and the process of IS value creation in an organization.

Implications and Conclusions

The study of information systems in organizations requires recognizing and understanding the complex web of inter-dependent internal and external factors that have the potential to influence IS in multiple ways. In essence, we call for more varied approaches to research so that we can do justice to the intricate web of causal influences that exist in organizations. While abstraction is the basis for any model including research models, simplification should not be resorted to under the pretext of scientism (Klein and Lyytinen, 1984). Increasingly, we are beginning to observe research efforts in IS field that incorporate mixing levels of analysis or involve control issues between two disparate information systems. For instance, if IS value is conceptualized in terms of better decision making by managers in an organization, it requires understanding what constitutes effective decision making at two levels, one at the level of individual manager, and other at the collective or group level for strategic decisions. In this type of research, individual level phenomenon (effectiveness of individual decision making) and group or organizational level phenomenon (effectiveness of collective decision making) interact with each other to influence IS value, the ultimate phenomenon of interest to an IS researcher. Such types of research require recognizing and taking into account the dynamics, complexity, and ambiguity that exist within an organization by adopting research methods and theories that are developed around them.

We believe that systems theory and its principles provide a comprehensive, open and inclusive framework to study such complexities and dynamic behaviors related to the IS in organizations. In this paper, we have attempted to demonstrate how systems thinking can help us in organizing IS field by attributing meaning to our collective research efforts in context of the realities and uncertainties that confronts the IS field today. While we do recognize that systems theory may not be the ultimate panacea to the problems that exist in IS field today, it can provide us with the basis to help organize the IS field. This is because the field of IS has been, is, and will be in a flux and its boundaries will continue to change and expand, at least for some more time. Systems theory with its generic principles of hierarchy and emergence can help us understand the linkages between different subfields of IS and provide a basis to develop a hierarchy of knowledge that could be helpful in providing a sense-making framework for articulating an epistemology of IS.

From the standpoint of the practice of IS research, systems approach can prove to be very valuable. By employing the systems approach, IS researchers can ensure that they retain the richness of a concept, preserve the inter-linkages associated with concepts that exist at different levels of analysis, recognize and respond to the importance of time as an important variable – and by doing all this ensure that the process theoretic approach can be employed meaningfully to complement the variance theoretic approaches that are so dominant in IS research.

In conclusion, as researchers, we are acutely aware of the limitations places by prevailing collegial expectations concerning standards of scholarship and modes of inquiry. However, that should not restrict us from using inquiry methods

and approaches that are more challenging and intriguing. The field of information systems, has been, and needs to remain vibrant, open and intellectually brave.

References

- Ackoff, R. L. (1967). "Management misinformation system," *Management Science*, (14 :4), pp. B147-B156
- Ackoff, R. L., (1971). "Towards a system of systems concepts," *Management Science*, (17:11), pp. 661-671.
- Ashby, W. R. *Design for a brain: The origin of adaptive behavior* (Second edition). London: Chapman and Hall., 1960
- Bajgoric, N. "Information systems for e-business continuance: a systems approach," *Kybernetes*, (35:5), pp. 632-652, 2006.
- Benbasat, I. and Zmud, R. "The Identity Crisis within the IS discipline: Defining and Communicating the Disciplines's core properties," *MIS Quarterly*, (27:2), pp. 183-194, 2003.
- Bertalanffy, L. von, (1934). *Untersuchungen über die Gesetzmäßigkeit des Wachstums. I. Allgemeine Grundlagen der Theorie; mathematische und physiologische Gesetzmäßigkeiten des Wachstums bei Wassertieren.* *Arch. Entwicklungsmech.*, 131, pp. 613-652.
- Bertalanffy, L. von, *General systems theory: Foundations, development, applications.* New York: George Braziller, 1968.
- Burton-Jones, A.; McLean, E. R.; Monod, E. (2004). *In pursuit of MIS theories: Process, variance and systems,* Working Paper, Department of Computer Information Systems, Georgia State University.
- Chan, Y. E. "IT value: the great divide between qualitative and quantitative and individual and organizational measures," *Journal of Management Information Systems*, (16:4), pp. 225-261, 2000.
- Churchman, C. W. (1968). *The systems approach*, Dell Publishing Company: New York.
- Crowston, K. "Process as theory in information systems research," In *IFIP WG 8.2 International Conference: The Social and Organizational Perspective on Research and Practice in Information Technology*, Aalborg, Denmark, 2000.
- CUSSN (2005) "Concept paper: Systems theory," http://www2.uta.edu/cussn/courses/5306/coursepack/theory_systems.pdf, Last accessed on February 10, 2005.
- DeLone, W. H. and McLean, E. R. "Information Systems Success: The Quest for the Dependent Variable," *Information Systems Research*, (3:1), pp. 60-95, 1992.
- DeSanctis, G. "The social life of information systems research: A response to Benbasat and Zmud's call for returning to the IT artifact," *Journal of the Association for Information Systems*, (4:7), pp. 360-376, 2003.
- El Sawy, O. A. "The 3 Faces of IS Identity: Connection, Immersion, and Infusion," *Communications of the AIS*, 12, pp. 588-598, 2003.
- Galliers, R. "Change as Crisis or Growth? Toward a Trans-disciplinary View of Information Systems as a Field of Study: A Response to Benbasat and Zmud's Call for Returning to the IT Artifact," *Journal of the Association for Information Systems*, (5:6), pp. 220-246, 2003.
- Heo, J. and Han, I. G. "Performance Measure of Information Systems (IS) in Evolving Computing Environments: An Empirical Investigation," *Information Management*, (40:4), pp. 243-256, 2003.
- Heylighen, F. and Joslyn, C. *Cambridge Dictionary of Philosophy*, Cambridge University Press, 1992, Accessed from <http://pespmc1.vub.ac.be/SYSTHEOR.html> on March 1, 2007.
- Hirschheim, R., Klein, H. K. and Lyytinen, K. "Exploring the intellectual foundations of information systems, *Accounting , Management and Information Technologies*, (6:1/2), pp. 1-64, 1996.

- Hitt, L. and Brynjolfsson, E. "Productivity, Profit and Consumer Welfare: Three Different Measures of Information Technology's Value," *MIS Quarterly*, (2:20), pp.121-142, 1996.
- King, J. and Lyytinen, K. "Grasp and reach," *MIS Quarterly*, (28:4), pp. 539-551, 2004.
- Klein, H. K. and Lyytinen K. "The Poverty of Scientism in Information Systems," in *Research methods in Information Systems Proceedings of the IFIP WG Colloquium*, September, pp. 131-162, 1984.
- Langley, A. "Strategies for theorizing from process data," *Academy of Management Review*, (24:4), pp. 691-710, 1999.
- Lee, C. S. "Modeling the business value of information technology," *Information and Management*, (39:3), pp. 191-210, 2001.
- Lyytinen, K. and King, J. "Nothing at the Center?: Academic legitimacy in the information systems field," *Journal of the Association of Information Systems*, (5:6), pp. 22-246, 2004.
- Marcus, M. L. and Robey, D. "Information technology and organization change: causal structure in theory and research," *Management Science*, (34:5), pp. 583-598, 1988.
- McBride, N. "Chaos theory as a model for interpreting information systems in organizations," *Information Systems Journal*, (15:3), pp. 233-254, 2005.
- Melville, N.; Kraemer, K.; and Gurbaxani, V. "Information Technology and Organizational Performance: An Integrative Model of IT Business Value," *MIS Quarterly*, (28:2), pp. 283-222, 2004.
- Mitroff, I. I.; Rathswohl, E. and Williams, J. (1972). *Dialectical Inquiring Systems: A New Methodology for Information Science*, November-December, *Journal of the American Society for Information Science*, pp. 365-378.
- Mitroff, I. I.; Nelson, J. and Mason, R. O. (1974). On management myth-information systems, *Management Science*, 21(4), pp. 371-382.
- Monge, P. R. "Theoretical and Analytical Issues in Studying Organizational Processes," *Organization Science*, (1:4), pp. 406-430, 1990.
- Nolan, R. L. and Wetherbe, J. C. "Toward a comprehensive framework for MIS research," *MIS Quarterly*, (4:2), pp. 1-19, 1980.
- Olson, D. L. (2001). Rationality in information systems support to decision making, *Information Systems Frontiers*, (3:2), pp. 239-248.
- Porra, J. (1999). Colonial systems, *Information Systems Research*, (10:1), pp. 38-69.
- Porra, J.; Hirschheim, R.; and Parks, M. S. (2005). The history of Texaco's corporate information technology function: A General Systems Theoretical Interpretation, *MIS Quarterly*, (29:4), pp. 721-746.
- Rose, J. "Interaction, transformation and information systems development - an extended application of Soft Systems Methodology," *Information Technology & People*, (15:3), pp. 242-268, 2002.
- Soh C., Markus M.L. "How IT creates business value: a process theory synthesis," *Proceedings of the 16th International Conference of Information Systems*, Amsterdam, The Netherlands, pp. 29-41, 1995.
- Waldrop, M. W. *Complexity: The Emerging Science at the Edge of Order and Chaos*, New York; Simon and Schuster, 1992.
- Wennberg, L.; Brandt, P. and Révay, P. "Information security - an application of a systems approach," *Kybernetes*, (35:6), pp. 786-796, 2006.

Van de Ven, A. H. "Suggestions for Studying Strategy Process: A Research Note," *Strategic Management Journal*, (13: Special Summer Issue), pp. 169-188, 1992.

von Foerster, H. "On self-organizing systems and their environments," In: *Self-Organizing Systems*. M.C. Yovits and S. Cameron. Pergamon Press, pp. 31-50, 1960.

Zimmerman, B., Lindberg, C., and Plsek, P., Edgeware. VHA, Irving, TX, 1998.