

An Analysis of the Conceptual Underpinnings of IS Research: The Quest for A New Ontology**

Juhn, Sung-Hyun*

경영정보학 연구의 인식론적 분석

전 성 현

This essay traverses the ontological space of IS research and identifies various misconceptions, biases, and conceptual peculiarities that inhabit the research. Three aspects of the IS ontology are examined: the conceptualization of the IT construct, demarcation of phenomena for investigation, and conceptual binding of the IT construct to other constructs. Various ontological issues are discussed including the transparency of the IT construct, the objectification of IT, and the causal primacy assigned to IT. The ontological purviews are further explored and their inadequacies are traced in the structural explication of IS phenomena. At the end, some epistemological implications of the IS ontology are discussed and a two-tier theory structure is proposed for IS research.

* 국민대학교 정보관리학부 교수

** 이 논문은 1997년도 한국학술진흥재단의 학술연구조성비(특별연구과제: "한국경영학의 학문적 위상에 대한 사회론적 및 인식론적 분석")에 의하여 수행된 연구의 일부분임.

I. Introduction

This essay examines the ontology of information systems (IS) research and discusses its epistemological implications. Ontology and Epistemology are two aspects of human inquiry. The former is an inquiry into the nature of the world: it asks what are the phenomena of interest, what sort of concepts and objects constitute the phenomena, and how the concepts and objects are bound to one another. The latter, on the other hand, is an inquiry into the nature of knowledge: it is concerned with what constitutes a proper explanation of the world and what method of inquiry may lead to such an explanation [Craib, 1992]. The ontology and epistemology are interrelated. The nature of the world that exist, or that we conceive of to exist, affects how we go about understanding and explaining it [Bhaskar, 1980]. Thus if we start with an inadequate ontology, our ensuing epistemology suffers, resulting in a failed explanation.

We intend to show in this essay that IS research presently subscribes to some inadequate ontological stances and that this affects the process and outcome of IS research. We examine three aspects of the IS research ontology: First of all, we examine the concept of information technology (IT) as a research construct.¹⁾ IT, while being a quintessential construct in IS research, has been pointed out

to be lacking a clear, consistent definition [Markus and Robey, 1988; Bakopoulos, 1985]. We discuss some conceptual quandaries in the conceptualization of the construct. In particular, we examine a rather peculiar quality of IT, which we term the *transparency* of IT, in that IT becomes transparent to and indistinguishable from the context it is situated in. We argue that the transparent quality of IT seriously undermine the validity of IT as a research construct, and affect IS research.

Secondly, we examine the demarcation of IS research phenomena. The IS research community has rarely been conscientious nor specific about why and how it selects a particular phenomenon for research. On the other hand, our experience with the history of IS research suggests that the research has been driven by *technical* concerns and punctuated by *technological* events. Each time a new form of IT appears on the market, the IS research community has been known to eagerly jump on and produce copious writings about the technology, only until the next new form of IT takes its place. We first distinguish different conceptual modes for demarcating research questions and phenomena. We then discuss some cognitive predilections that direct the demarcation. In particular, we note a peculiar practice in phenomena demarcation in IS research, which we term the *objectification* of IT, wherein IT is seen not as a research construct to explain a phenomenon with but itself becomes a phenomenon to be explained.

Thirdly, we examine how IS research binds

1) The term IT is used in this essay in a broad sense, encompassing both specific applications of IT, i.e., information systems, and the technology itself.

research constructs together. We identify various predilection of IS research which influence the binding. In IS research, IT is to be bound in various ways to other research construct, such as a person, a group, an organization, etc., to explain a phenomenon. The construct binding in IS research, much as in phenomena demarcation, has been guided by technical and causal predilections. The technical predilection indicates that the research is conducted primarily to prove the technical supremacy of the technology: demonstrating what the technology can and will do for people, organization and society is an overriding concern, if not a preoccupation, for the research. The causal bias of the research, on the other hand, renders some causal potency to IT: IT is conceived not as a passive object that is merely acted upon and used, but as an actor, a causal agent, that actively responds to, interacts with, and exerts influence upon people, organization and society. Both the technical and causal biases, taken together, project an obvious trace of fateful technological determinism to IS research, no matter how well we disguise it. We discuss several metaphoric modes in which the constructs are bound. We also discuss how we may interpret causality among the constructs.

We culminate our discussion on the three ontological purviews of IS research - the conceptualization of IT, phenomena demarcation, and construct binding with a critical review of the structurational argument for IT. The structurational argument has recently emerged as a dominant theory structure for explicating IT, organization, and agency relationships

[Orlikowski, 1992; Orlikowski and Robey, 1991; Orlikowski and Baroudi, 1991]. We show how the structurational argument subscribes to various ontological inadequacies and how they may cause some logical pitfalls of the argument.

Lastly, based upon our excursion into the ontology of IS research, we discuss the epistemological consequences of the IS ontology and propose a new theory structure for IS research. It is argued that an appropriate theory structure for IS research should not only incorporate different conceptions of IT, but specify how IT may transpire from one form to another. Based upon the discussion, we present a two-tier theory structure for IS research.

II . The Conceptualization of IT

The first aspect of the IS ontology we examine is the conceptualization of the IT construct. We ask if IT makes a viable research construct: is IT, as most IS research posits, a conceptually distinct, empirically observable research construct, something to explain a phenomenon with? We suggest otherwise. We argue that several conceptual predicaments interfere with the conceptualization of IT in IS research. The predicaments are closely intertwined to undermine the viability of IT as a research construct.

2.1 Generalizability, Semantic Discontinuity, and Semantic Deprivation

We identify three conceptual predicaments which interfere with the conceptualization of

the IT construct - non - generalizability, semantic discontinuity and semantic deprivation. The predicaments arise in abstraction and generalization of IT from an instance level to an aggregate level conception. The conceptualization of IT as a research construct deals with two levels of conception - an instance level and an aggregate level, and abstraction and generalization from the one level to the other. An instance level conception of IT refers to IT as what is manifest in each particular instantiation of the technology: it takes a particular form, performs particular functions, and is situated in a particular context. An aggregate level conception of IT, on the other hand, refers to IT in its entirety as an abstract entity: it is not an object which physically exists and is observable, as in the instance level, but an abstraction and generalization of the instantiations. The conceptualization of a research construct should entertain both levels of conception. The transition from the one level to the other, the operationalization (from aggregate to instance) and the generalization (from instance to aggregate) in fact represents the core process of research.

The first predicament in the conceptualization of IT is the non-generalizability of the IT construct. The peculiarity of the technology at an instance level is too diverse and disparate to warrant a single, uniform characterization and generalization of the technology at an aggregate level. The non-generalizability of IT stems from the versatility of the technology. IT, as we all experience it, is a versatile technology that can be put to use in a wide

variety of ways. As such, it is not a homogeneous entity, and not easily generalizable to represent a research construct [Weill, 1992].

The conceptualization of IT also encounters a *semantic discontinuity* problem. IS research presently subscribes to multiple, idiosyncratic conceptions of IT, governed by different semantics, and that they suffer some serious semantic discontinuity among them. Some conceptions, for instance, adopt a highly mechanical view of IT, focusing upon technical, functional aspects of IT (e.g., Bakopoulos, 1985). Others, on the other hand, adopt a more social, behavioral view of IT, focusing upon its organizational and structural ramifications (e.g., Orlikowski, 1992). Such different conceptions are semantically discontinuous. And a conceptual transition between the conceptions or an integration of them is extremely difficult.

The non-generalizability and semantic discontinuity problems, however, are only surface issues. A more serious problem in the conceptualization of IT is *semantic deprivation* that occurs as we generalize from an instance to an aggregate level conception of IT. The semantic deprivation is caused because the conceptions at the two levels are governed by strikingly different semantics, and we incur some serious semantic loss as we generalize from an instance level to an aggregate level. To see this, contrast the semantics that govern the conception of IT. At an instance level, the conception is governed by *situational* semantics. IT is conceived in terms of what is manifest in a particular instantiation of the technology,

situated in a particular context. The conception of IT thus takes on the rich situational semantics of the context, such as the social, cultural, political, and personal peculiarities surrounding the technology. Orlikowski and Baroudi[1991] argues that the conception of IT cannot and should not be dissociated from such rich situational semantics of the context:

"The design and use of information technology in organizations...is intrinsically embedded in social contexts, marked by time, locale, politics, and culture. Neglecting these influences may reveal an incomplete picture of information system phenomena." (p.12)

An aggregate level conception of IT, on the other hand, is governed by *technical* semantics. Those sets of technical features that are universal to the instantiations are abstracted upon and generalized to arrive at an aggregate level conception of IT. Since IT is a versatile technology with a wide variety of technical and functional variations in its instantiations, the abstraction and generalization is necessarily selective, focusing only upon most generic and common characteristics of the technology. The result is a highly abstract and general conception of IT, such as an information processing device, composed of certain computer hardware and software, and with certain functionality to perform particular information processing tasks' [Davis and Olsen, 1985]. While such a technical conception is most intuitive and therefore prevails widely in IS research, the problem is that it tends to be highly generic, barren and sterile. It is 'so abstract as to have limited discriminatory or information value' [Orlikowski, 1992, p. 399]. The conception of IT at the two levels, being governed by different semantics, shares few

common semantic denominators. The rich situational semantics of an instantiation of IT is not adequately reflected in the technical semantic of an aggregate level conception of IT. Some serious semantic discontinuity results. Furthermore, we incur substantial semantic loss as we move from an instance level to an aggregate level conception of IT, for while contextual peculiarities of the technology are rich in semantics, the functional generality of it is not. The peculiarity of the technology at an instance level, as indicated above, is too diverse and disparate to warrant a single, uniform characterization of it at an aggregate level. However, by focusing only upon the technical, functional aspect of IT, we incur serious semantic loss. The technology, devoid of all the social, cultural, political, personal innuendoes of the context, indeed represents nothing but a bare computing machine.

2.2 Transparency of IT and its Impact on IS Research

We argue that the three conceptual predicaments of IT conception discussed above - non-generalizability, semantic discontinuity, and semantic deprivation - stem from a rather peculiar quality of IT, the *transparency* of IT. The transparency of IT refers to the fact that IT, being an abstract, cognitive, and virtual technology, easily immerses into, dissolves in, and quickly becomes transparent to the context it is situated in. It is no longer distinguishable from the context it is situated in. And as a consequence, one cannot look into the technology but only through it, and

what is seen is not the technology but the context. It is such transparent quality of IT that causes the problems of non-generalizability, semantic discontinuity, and semantic deprivation. It is indeed an IS version of the problem of embeddedness[Granovetter, 1985].

The transparent quality of IT causes some interesting twists in the conception of IT. The first is an expansion of the IT concept to signify not just technology, but something else and something more. For instance, IT is often conceived in association with various exogenous processes surrounding the technology, such as information processing, communication, decision making, problem solving, strategy making, etc. Thus research on DSS's is coincided with research on decision-making processes; research on SIS's is associated with strategy making, competitive posture, and competitive advantage. An expansion of the IT concept is not just limited to the exogenous processes surrounding the technology. A further expansion is to associate IT with the phenomena that the technology entails. For instance, reengineering, learning, and organizational transformation - those organizational phenomena that the technology is argued to entail, frequently populate the IS literature. Another interesting twist in the conception of IT is the notion of IT as an enabling mechanism. Here, IT is conceived in terms of what it can accomplish, of the changes it helps to bring about. The notion of IT as an enabling mechanism has been voiced with enthusiasm in the literature [Scott Morton, 1991; Venkatraman, 1991]. The technology is considered to enable fundamental changes in the way work is done, such as

integrating business functions, causing shifts in the competitive climate, and so forth.

The expanded conception of IT in terms of exogenous processes and phenomena and as an enabling mechanism involves several issues. First of all, the seemingly logical extension from IT to the exogenous processes is not necessarily justified. For instance, Swanson[1987] indicates that the correlation between information systems use and information use in organizations is unexpectedly low. Secondly, as IT is expanded to include the exogenous processes and phenomena, it seriously alters the nature of the IT concept. IT as, say, a decision making process, is no longer an independent research construct, i.e., a concept to explain a phenomenon with. Rather, it itself becomes a phenomenon to be explained. This leads to what we call the objectification of IT, to be discussed in the later section. Thirdly, the notion of IT as an enabling mechanism mystifies the IT concept and misrepresents the organizational change process. By focusing not upon the content of the concept but upon its effects, it conveys little about the nature of the technology itself, except, of course, granting a certain aura of omnipotence to the technology. It also misrepresents the change process. While organizational change is an effect produced by multiple causes including human ingenuity and structural versatility[Kanter, Stein and Jick, 1992], the notion of IT as an enabling mechanism presents the change process to be largely technology-driven, dictated only by the technical prowess of the organization. It thus promotes a highly simplistic, skewed, and

strong technological imperative view of the change process, with a connotation that IT initiates, mandates, and unfolds organizational change with its own will and logic. Markus and Benjamin[1997] aptly cautions against such a view.

The transparency of IT carries important implications for IS research. First of all, it seriously threatens the validity of the construct. It makes IT to be conceived not in terms of its own characteristics but in terms of the characteristics of the context it is situated in. As a consequence, IT is no longer a construct with substantive content and boundary of its own, to be discernible from the context. Secondly, the transparency of IT alters and expands the domain of IS research. As IT becomes transparent to the context, IS research becomes more of context research. The phenomena of interest are expanded from technological ones to more remote organizational ones. Also maintaining logical continuity from those technology phenomena to organizational phenomena becomes a greater challenge. Thirdly, the transparency of IT calls for a more process type research[Markus & Robey, 1988; Sabherwal & Robey, 1993, 1995; Newman & Robey, 1992]. Traditional IS research has been concerned with a dyad or triad relations between IT and non-IT constructs. However, as IT loses its viability as an independent research construct due to its transparency, explicating the process where IT becomes transparent to the context, is at least as important as explicating its relation to other constructs. This will be further discussed in a new theory structure proposed

for IS research in the later section.

III. The Demarcation of Research Phenomena

The second aspect we examine of the ontology of IS research is phenomena demarcation - where and how IS research draws research boundaries and selects research phenomena. For any research, phenomena demarcation critically determines the form, content, and relevance of the research. It reflects the ontological mindscape of the researchers, illustrating how the researchers make choices, both consciously and unconsciously, regarding what conceptual realms to look into, the level of analysis to adopt, and the research method and approaches to employ, among others. What is of interest here, therefore, is not the research issues and phenomena per se, but to identify the underlying ontology, those tacit assumptions, presuppositions, and biases that direct toward particular research issues and phenomena. In the following, we identify several peculiarities IS research displays in phenomena demarcation, and some caveats for them.

3.1 Causal Predisposition of Phenomena Demarcation

We identify two different modes of phenomena demarcation, guided by different conceptual predispositions. The one is problem driven demarcation and the other cause driven demarcation. Phenomena demarcation is rarely conducted in a conceptual vacuum. Rather,

researchers bring with them particular predispositions, which invariably affect the demarcation process, and produce significantly different research phenomena and research questions(cf.: Morgan, 1986). In *problem* driven demarcation, a phenomenon is selected for study for it poses problems to people and yet is neither understandable nor explainable. What the research looks for, therefore, is a plausible explanation, some unknown causes, for why the phenomenon occurs. In *cause* driven demarcation, on the other hand, a phenomenon is selected for study because it is suspected to exhibit some effects of a known cause, which in our case, is IT. Thus while a problem driven research looks for an unknown cause of a known problem, a cause driven research looks for an unknown effect of a known cause.

We argue that most extant IS research is *cause* driven. The effect of a known cause, i.e. IT, is sought in a domain that is pertinent to the technology, such as decision making, communication, etc. Consider, for instance, an IS research work concerning the impact of a Group Support System(GSS). A common scenario for the cause driven IS research goes as follows. First, a researcher starts from the cause, GSS, to prove its effect on group decision process; She selects upon some particular characteristics of the technology, say, anonymity, and forms a proposition concerning the effects of the characteristics, such as anonymity may induce more voluntary expression of ideas; Then she selects a phenomenon for observation, say the number of ideas volunteered in the group process, to

prove or reject the proposition(cf. Sambamurthy & Scott Poole, 1992). The above scenario for cause driven research is contrasting to that of problem driven research, which we observe more frequently in Organizational Research. The scenario for problem driven research goes as follows. First, a researcher starts from a problem, say, that the group decision process lacks lively exchange and expression of ideas; people in the process seem too reserved and hesitant to volunteer ideas. Second, she forms a proposition concerning the cause of this problem, say, that there is a certain social pressure at work, such as a pressure for conformity, suppressing the expression of ideas. Third, she sets up and contrasts two social settings, the one with and the other without a social pressure, to see if there is indeed any difference in the way people express ideas. The anonymity of GSS is brought in only as a means for setting a particular social context, the one without a social pressure, for the research. The two modes of phenomenon demarcation may seem little distinguishable at a surface level. Regardless of being cause driven or problem driven, they may select identical research phenomena and produce identical research results. However, at a deeper level, they follow completely different cognitive processes, as illustrated above.

The cause driven nature of IS research is amply demonstrated in the fact that the history of IS research has been largely punctuated by technical events. Each time IT as a cause changes its form from, say, DSS to SIS to GSS, more research has followed to

demonstrate its effects. The cause driven nature of IS research is also demonstrated in the never-ending quest in the IS research community for the dependent variables of IS research [DeLone and McLean, 1992; Seddon, 1997], looking for the effect(success) of a known cause(information systems) along several domains.

3.2 The Objectification of IT and its Impact on IS Research

The cause driven nature of phenomena demarcation in IS research discussed above presents several problems to IS research. First of all, there is a *goal displacement* problem. A cause driven research displaces what is to be explained, from an explanation of a phenomenon to an explanation of the cause. The primary interest of cause driven IS research, therefore, lies more in an embellishment of our understanding of the cause - what IT can and will do, and less in an enhanced understanding of the phenomenon - why it occurs and how. And the research results end up illuminating more about the cause than about the phenomena.

Secondly, there is a problem of *relevance*. A cause driven research often selects a phenomenon that is either too trivial or too far removed from the real problems of people to have any relevance. This is because the phenomenon is selected not for being important and relevant to people, as in a problem driven research, but for being adjacent to and surrounding IT, i.e., for displaying some effects of a known cause. Thus unless the importance

of the cause itself is established convincingly, cause driven research is not assured of its relevance. The proven effect of IT, in and of itself, does not necessarily carry any bearing upon the problems of people. What contributes to the problem of relevance is the inaccordance between the nature of the problems and solutions. While the solutions that IT provides are largely of a cognitive and rational nature, the problems that people face in organization are often as emotive and irrational. IT thus is a wrong solution to problems. The ontological stance taken is another contributing factor. Most cause driven IS research takes up an engineering standpoint, putting forth a bunch of 'can-dos' for the technology, but with little regards to 'what need to be done' for the problem. The result is valuable research resources wasted on trivial, irrelevant problems. The table vs. graph research is an illuminating example.

The cause driven nature of IS research and the concomitant problems of goal displacement and relevance culminate in what we term the *objectification* of IT. As indicated above, what is of interest in cause driven research is not an explanation of the phenomena but an embellishment of our understanding of the cause - IT. This cause orientation naturally leads to the objectification of the cause, i.e., the cause itself becomes a primary object of inquiry and observation. This is what we observe to be happening in IS research. IT now represents an independent research object, which entails numerous phenomena for investigation. Such an objectification of IT is closely associated with the expanded conception

of IT discussed in the previous sections, where IT signifies various exogenous processes and phenomena..

IV. The Binding of Research Constructs

The third aspect of the ontology of IS research we examine is the binding of research constructs. IT, as a research construct, is to be bound in various ways to other constructs, such as agent, structure, and organization. We suggest that such construct binding, like the phenomena demarcation discussed above, is to be affected by some underlying ontology - those tacit assumptions, presuppositions, and biases concerning the nature of the world. In the following, we discuss the ontology of construct binding. First of all, we discuss the nature of the relationship between the constructs, in particular, that between IT and Organization. We suggest that researchers draw upon particular imageries when conceiving the relationship. We identify three imageries: the imageries of change, fit, and movement. We then discuss some conceptual predisposition of the imageries, namely the causal primacy assigned to IT, and its implications for IS research.

4.1 The Three Imageries for Construct Binding

We suggest that IS research draws upon some particular imagery in envisaging the relation between constructs, in particular, between IT and Organization. We identify

three imageries which prevail in IS research. The imageries basically depict and characterize how researchers conceive the nature of the relation between IT and Organization. The imageries are like metaphors, i.e., perceiving and understanding one object in terms of another object. The imageries, however, are not necessarily employed consciously nor recognized explicitly by researchers. As such, they may be more like what Alvesson[1993] calls a second-order metaphor, those deep structures underlying a metaphor. The first is an imagery of *change*: the nature of the relation between IT and organization is conceived to be that of change, i.e., IT prompting a series of changes in the organization. The changes are conceived to be of a chemical nature, in that they are deterministic, irreversible, and propagating. The second is an imagery of *fit*: the nature of the relation is conceived to be that of fit and adjustment, a more bilateral one, with IT and organization interacting, influencing, and accommodating each other. The third is an imagery of *movement*: the nature of the relation is conceived to be one of movement wherein IT generates a complex assortment of moves around and upon itself when introduced into the organization.

In the following, we discuss the imageries in some detail. For a figurative depiction of the imageries, we name the change, fit, and movement imageries as Catalyst, Lego, and Football imageries, respectively. We do not intend the imageries to be either exhaustive nor representative for IS research. IS research may entertain a wide variety of other imageries

in its work(e.g., Kendall & Kendall, 1993; Hirschheim & Newman, 1991; Morgan, 1986). Our discussion is only for an illustrative purpose, for demonstrating the presence, role, and influence of the imageries in construct binding.

The Catalyst Imagery

This is an imagery where the nature of relationship between IT and organization is imagined to be that of *change*: an introduction of IT in one part of the organization brings about changes in other parts of the organization, which propagate throughout the organization.

An interesting element of the imagery is that the change relation between IT and organization is considered to be of a chemical nature, hence the name Catalyst. IT is imagined to be like a catalyst, which, when injected into an organization, instigates a chain of reactions from the organization. The organization, on the other hand, is conceived like a chemically unstable test tube, being acutely responsive to and easily disturbed by an IT stimulus, even a small dosage of it.

The imagery arises with some particular presupposition. First of all, the imagery perceives organizations to be *informationally sensitized*: Of all the strings that thread the organization, the information string is imagined to be the tightest, a tiny oscillation of which, i.e., a change in information processing mode as induced by IT, is to generate an organization-wide vibration. The imagery thus

anticipates immediate, explicit responses to IT. IT is granted some chemical potency that is strong enough to perturb any organization, no matter how stable or rigid it may currently be, and to extract ostensible responses from it. The responses are also expected to be far-reaching and often unpredictable, not confined just to the IT domain but transpiring to more remote realms of the organization.

Another presupposition of the catalyst imagery, which is perhaps more fundamental, and hence more disturbing, is its *causality* presumption: the catalyst imagery projects the causality between IT and organizational phenomena to be given, rather than to be proven. Here, IT is assigned the status of a legitimate, important, active cause directly responsible for specific organizational phenomena.

An interesting outcome of the causality presumption is that it produces a correlation type of research. Correlation, rather ironically, displaces causality as a primary research motive. This is because what the research is concerned with is not *whether* but *what* IT causes. Hence the stronger the causality presumption of a research study, the less it is concerned to prove the causality and the more it focuses upon finding high *correlation*. Causality itself is more a *prima facie* fact - one that requires no proof. And whatever it is that exhibits a high correlation with IT, no matter how idiosyncratic and remote it may appear to be, a causal relation is ascribed between them.

The catalyst imagery and its associated

causality presumption is most visible in IT Investment research(cf. kauffman and Weill, 1989). The research hypothesizes that high IT investment will lead to high firm performance. Underlying the research, we argue, is a catalyst imagery, wherein an investment in IT is imagined to cause a chain of reactions in the organization, which should ultimately manifest in firm performance. Despite the unmistakably obvious trace of causal presumption of the research, few researchers acknowledge its deficiencies for failing to address the causality itself.²⁾

The Lego Imagery

This is an imagery where the nature of the relation between IT and organizations is imagined to be one of *fitting* and *adjustment*, rather than that of 'change' as in the Catalyst imagery discussed above. Like two matching Lego pieces, the imagery projects a snug, tight fit between IT and the organization. Figuratively speaking, IT is a complex *Lego* piece, which is to be fitted with a complex Lego block - an organization. The fitting relation between IT and organization, however, is of a more bilateral nature, not like a one directional, stimulus-response type as imagined in the Catalyst imagery above. The strategic alignment research, which advocates some mutual, dynamic, interactive fitting and adjustment

between IT and business, is an example of work subscribing to this fitting imagery(cf. Henderson & Venkatraman, 1993).

The Lego imagery connotes that the fitting requires some reassemblage and reconfiguration of the organization. This is because both IT and organizations, like Lego pieces, come in preset form and figures and are not easily moldable to be fitted to each other. Unfortunately, the reassemblage and reconfiguration is to be done more on the part of the organization, than on the part of IT. The imagery thus projects that organizations go through some major decomposition and restructuring phases in the face of IT.

The Football Imagery

This is an imagery where the nature of the relation between IT and organization is imagined to be that of movement: IT generates a complex assortment of moves upon and around it as it is introduced into the organization. Figuratively speaking, it is like a *football* in a (american) football game, around and with which players display diverse moves: the offense throws, catches, and runs with the ball; the defense chases, blocks and tackles in response. The moves that IT generates, however, are not as deterministic as the chain of reactions in the Catalyst imagery. Nor is the relationship between IT and the organization to be as static as in the Lego model. The moves that IT generates, on the contrary, more voluntaristic and spontaneous, more dynamic and emergent [Markus and Robey, 1988].

2) The researchers, of course, rarely forget to warn in their conclusion that no causality relation is assumed nor intended between IT investment and firm performance. However, Weill[1992] indicates, it amounts to little more than an academic cliché.

Like the other imageries, the imagery carries several conceptual presuppositions. First of all, the imagery assigns a center position to IT. IT is made the reason for all the moves that appear in the organizational playground. It is what generates actions in the organization. Secondly, the imagery projects a different conception of the IT-organization relation. While a common conception of the relation is in terms of actions through and by IT, the imagery conceives it in terms of actions around and upon it. In a sense, IT becomes an object of its own effect. Thirdly, as IT being likened to a football, the imagery makes the technology itself of a less concern. The form or shape of the ball makes little difference as to how the game is to be played. Rather the focus of IS research is laid more upon the movement, both patterned and spontaneous, which erupts and recede around the technology. In other words, IS research becomes not so much on what IT will do for an organization, as on what the organization will do with the technology. A good example of research with the imagery is work on IT usage behavior. How people perceive, respond to, and use the technology has always been of primary interest to IS researchers [Dickson, Senn & Chervany, 1977; Davis, 1989].

4.2 The Causal Primacy of IT and the Interpretation of Causality

The three imageries discussed above, although neither comprehensive nor exhaustive, are suggested to be representative of prevailing imageries in IS construct binding. They altogether display a peculiar quality in construct binding

- the *causal primacy* of IT: IT is assigned a center stage in the organizational arena, and is regarded to be a predominate causal agency which possesses more potency for generating responses than any other constructs in organizational phenomena.

The causal primacy nature of IT, however, has some variations. The Catalyst imagery discussed above projects the causality to be a 'necessary' kind, i.e., the regularity in phenomena we observe in association with IT, as is a series of chemical reactions, is interpreted to be a necessary consequence of IT, and no other factors are required for it to actualize. The Football imagery, on the other hand, projects the causality to be a 'contingent' type, i.e., the occurrence of the regularity is contingent upon an intervention of some external agency; The internal logic of IT, while providing a context for action, does not invoke any regularity of action in and by itself, but its effects may actualize only through the will and conscious choice of an external agent who interacts with, appropriate, and put into practice the logic of the technology.³⁾

3) The necessary and contingent conceptions of causality address a different aspect of construct binding than that of the deterministic and emergent perspectives of organizational change [Markus and Robey, 1988]. The former conceptions address the conditions for the IT effect to realize whereas the latter conceptions address the mode of realization. The necessary and contingent conceptions thus explicitly recognize that the realization of the effect of IT is only contingent upon the intervention of some external human agency. The deterministic and emergent perspectives,

The causal primacy of IT, of course, reflects the disciplinary bias of the IS research community. It alludes that proving the supremacy of the technology, i.e., what it can and will do for the organization, is an overriding concern, a preoccupation, a faith, for the community. It also promotes a particular conception of IT: IT is not a passive object that is merely acted upon and used, but an actor, a causal agent, that actively responds to, interacts with, and exerts influence upon people, organization and society. IT is endowed with a certain aura of omnipotence to it: All in all, it projects an obvious trace of fateful technological determinism to IS research, no matter how well the IS research community disguises it.

V. IT, Structure, and Agency: The Ontology of the Structuration Theory

So far we have discussed at length the ontological stances of IS research and the various peculiarities and biases associated with them. We have examined three aspects of IS ontology - the conceptualization of IT, phenomena demarcation, and construct binding. As for the conceptualization of the IT construct, we noted that IT conception suffers several conceptual predicaments, such as non-generalizability, semantic discontinuity, and

semantic deprivation in generalization, and that the predicaments stem from the transparent quality of the IT construct. As for the phenomena demarcation, we noted that phenomena demarcation for IS research is largely cause-driven, and that it leads to the objectification of the IT construct. As for the binding of constructs, we noted that IS research presently subscribes to particular imageries for construct binding, and that they share a causal predisposition to the role of IT.

We argue that the ontological inadequacies of IS research discussed in previous sections are ubiquitous and prevail in IS research. To demonstrate this, we critically review the structural explication of IS phenomena. Structural explication is a prevailing theory structure in IS research for explicating IS phenomena, in particular the IT, organization, and agency relationships[Orlikowski, 1992; Orlikowski and Robey, 1991; Orlikowski and Baroudi, 1991; DeSanctis & Scott Poole, 1994]. It draws upon the Structuration Theory in Sociology[Giddens, 1976, 1979, 1984], and argues for the *duality* nature of IT, that IT is both a product of human action as well as a medium of human action[Orlikowski, 1992]. IT is a product of human action in that it represents something physically and socially constructed by actors in a given social context; IT is a medium of human action in that, once developed and deployed, it tends to become reified and institutionalized, thereby constraining human action. The explication provides theoretical legitimacy and respectability for IS research, in particular the macro, social aspect of it, by drawing upon a premiere

on the contrary, take the realization of the IT effect for granted, and are concerned with *how* the IT effect comes into existence, i.e., the effect occurring in a predetermined way (deterministic) versus in a more spontaneous way (emergent).

theory structure in a reference discipline. The explication, however, is also subject to various ontological inadequacies of IS research discussed in the sections above. In the following, we discuss the ontological inadequacies of the structurational explication in terms of the three purviews of ontology - the conceptualization of IT, phenomena demarcation, and construct binding, and discuss how they may impair the logic of explication.

5.1 The Conceptualization of IT

In the structurational explication, IT is conceived as having a dual nature in its interaction with organization and agency [Orlikowski, 1992; Orlikowski & Robey, 1991]. On the one hand, it is a (socially constructed) product of human action: people design, develop, appropriate, and modify the technology. On the other hand, it is a medium of human action, which facilitates and constrains human action through the provision of organizational interpretive schemes, facilities, and norms.

The duality conception of IT, in its present form, espouses multiple, extremely diverse conceptions of IT. At least 5 different conceptions cohabit the duality conception of IT; First of all, IT represents the physical and conceptual devices used for action. Secondly, it represents the action rules, interpretive schemes, and behavioral norms embedded in the technology. Thirdly, it represents the social practices that enact those rules, schemes and norms. Fourthly, IT, being a socially constructed artifact that 'comes into existence only through creative human action

and is sustained by human action through the on-going maintenance and adaptation of technology'[Orlikowski, 1992, p. 409], represents those sets of human actions that design, use, and adapt the technology. Lastly, IT represents institutional properties of the organization, which result from the recurrent use and practice of the technology and the action rules, interpretive schemes, and norms that the technology embodies.

The duality conception of IT, while comprehensive and rich in its conceptualization, subscribes to several ontological inadequacies discussed in the previous section. Most notably, the conception entails serious *semantic discontinuity* between different conceptions of IT. IT as, say, a physical device, is qualitatively different from IT as a social practice or an institutional property. A metamorphic change occurs in the nature of the conception. This also renders IT to be a highly time and space dependent concept because there is time-space discontinuity between different conceptions of IT[Orlikowski, 1992] and IT changes its meaning depending upon when and where we choose to look at the technology. The duality conception also suffers the *transparency* dilemma discussed above. As IT changes from a physical device to a social practice to an institutional property, it is increasingly dissolved into and blends with the context it is situated in, being no longer separable nor distinguishable from the context. Such transparency has been indicated before to undermine the validity of IT as a research construct: it renders IT to be less a research construct than a research phenomenon. IT is

conceived not in or by itself but only in relation to other constructs, the structure and agency, which together constitute a social phenomenon for inquiry. In other words, IT is just part of the phenomena, that something to be explained, but not something to explain a phenomenon with.

5.2 Phenomena Demarcation

The structurational explication also is problematic in phenomena demarcation. In particular, it *displaces* what it is to be explained. While the primary research concern of the structuration theory in Sociology, wherein the structurational explication of IS research is couched, was why we observe recurrent social practices, the research motive underlying the structurational explication of IS research is the characterization of the IT construct. The focus is more upon specification of the duality nature of IT, that it is both the medium and the result of human action, and less upon explication of how recurrent social practices are generated, as in the structuration theory. As a consequence, the structurational explication embellishes our understanding of the nature of IT but not of the nature of social action. This represents an illuminating case of research goal displacement in that explication of IT now takes primacy over explication of human action. This also represents an interesting twist of the structuration theory from a theory of action, which it was originally intended, to a theory of structure.

The displacement of goals leads to the

objectification of IT discussed above in that IT itself becomes an object of inquiry. This means a dramatic shift in the conception of IT occurs: IT is no longer a research construct, that which to explain a phenomenon with, but a research phenomenon, that which is itself to be explained. There also occurs a dramatic shift in the nature of IS research: IS research becomes more of organizational research, looking at various organizational processes and phenomena that IT entails in the organization. The domain of research is expanded from those processes and phenomena that are immediately adjacent to and surrounding the technology to those more remote, exogenous, and contextual ones. Examples of the former are phenomena surrounding the introduction, design, development, and use of IT. Examples of the latter are such exogenous processes and phenomena as decision-making, learning, communication, reengineering, and organizational transformation, among others.

5.3 Construct Binding

The structurational explication borrows its logic of construct binding from that of the Structuration Theory in Sociology[Giddens, 1976, 1979, 1984]. Traditionally, social theory has been sharply divided between who takes primacy in explaining social action, the structure (society) or the agency. The functionalist and structuralist tradition has emphasized the predominance of the social whole, the structure, over its constituent parts, the human actors. It argued that social action is determined by objective, institutionalized rules and resources, which exist independent

of and external to the human agent. Hermeneutics and other interpretive sociology, on the other hand, have emphasized the subjectivity of human actors, arguing that social action is driven by the subjective will and intention of the human agent.⁴⁾⁵⁾ The Structuration Theory has bridged the two sides by proposing that human action not only is shaped by structure but also continually reshapes the structure itself. In short, structure is both the medium of human action and the result of human action. The structuralist explication of IS research, which vindicate that IT is both the medium and the result of human action, is therefore a direct extension of the Structuration Theory, with an identical argument structure as that of the Structuration Theory.

The explication of IS phenomena in the Structuration Theory framework, however, is not as straightforward as it appears to be at first glance. It presents some thorny issues in the positioning of IT in the Structuration

Theory framework. In fact, we argue that the ontological inadequacy of the structuralist explication is most acute in this regard. The Structuration Theory framework involves two constructs, structure and agency, and a process of interaction, the structuration process, by which (recurrent) social actions are generated. A proper positioning of the IT construct in the framework should, therefore, address a) how the IT construct is to be conceptually related to the two constructs, and b) how the IT construct may participate in, alter, or mediate the structuration process. In particular, it should address whether IT is a new, third variable, apart from structure or agency, which plays a distinct role in the shaping of social action. The discussion in the literature, however, leaves the questions largely unanswered. While IT was introduced as a distinct, independent construct, which participates directly in the shaping of human action [Orlikowski, 1992; pp. 409-412], its role and function in the shaping of human action is little specified. Other than being couched in the argument structure of the Structuration Theory framework, and argued to be, just as structure is, both the medium and the result of human action, IT is assigned few distinct roles in the shaping of human action. The explication of recurrent social actions seems little affected nor enhanced by the introduction of the IT construct. Ask, for instance; If both structure and IT are both the medium and the result of human action, what is there of IT that stands out, over and above structure, to be the medium and the result of human action?; If IT is indeed a medium and result of human action, is it not already part of and

-
- 4) The structure-agency dichotomy also represents ideal/static vs. empirical/dynamic conception of social action. The structure side is in an ideal plane, being concerned with the existence of an abstract, logical set of action rules and resources. It also represents a static state of affairs, a pattern of relationships that are formalized, reified, and with a lasting effect on humans. The agency side, on the other hand, involves more of an empirical, dynamic conception of action, signifying the actual enactment of the structural rules by the human agent, taking place at a particular time and at a particular place.
- 5) See Craib[1984, 1992] for a good review and summary of the development of social theories.

embraced in the structure concept, as Giddens proposes it? It is not obvious how the structurational explication of IS research addresses the questions. Instead, many of the statements made in the IS literature with respect to the role of IT in the structuration process[Orlikowski, 1992] seem to be an exact duplicate in semantics, if not in syntax, of the Giddens' description of the role of structure in the process, except that the word 'structure' is substituted by the word 'technology'.⁶⁾

The problem of distinguishing between IT and structure can be escaped if we have a different reading of the structurational argument: Instead of treating IT as a separate, independent construct with distinct roles and characteristics, it can be conceived as part of structure. It is one of the many elements that together constitute and produce what we call structure. If we take this venue, however, it then significantly change the nature of IS research. For one, it poses completely different research question for IS research. The research question is no longer how IT interacts with the agency, as the structurational explication concerns itself with: the argument that IT is both the medium and the result of human action adds little additional insight to the theory of social action because it is structure that is the medium and the result of human action and IT is only part of the structure.

6) Note, on the other hand, how the discussion of technology is conspicuously missing in Giddens' work: the technology is rarely mentioned as something, apart from the structure concept, having a direct influence on the shaping of human action.

The question rather should be how IT is transformed to and ends up being part of, being manifest in the structure. The structurational explication, however, only deals with an already structured version of the IT concept and how it interacts with the agency, thereby completely overlooking the more fundamental aspect of the IT-organization relations.

VI. The New Ontology and the Epistemological Implications

We conclude this essay with a note on some epistemological implications of the present IS research ontology and propositions for a new ontology for the research. The present IS research ontology significantly affects the epistemology of IS research. It specifies a particular type of knowledge to be produced and induces a particular research method to be adopted for arriving at such knowledge. In the following, we first discuss the epistemological consequences of the present IS research ontology. Next, based upon the discussion, we propose a new ontology for IS research. We revisit the three purviews of IS ontology - the conceptualization of IT, phenomena demarcation, and construct binding, and propose a reframing of IS research. As for the conceptualization of IT, we propose a dual conception of IT. As for phenomena demarcation, we propose a two-tier theory structure for IS research. And as for construct binding, we propose to focus upon a dual nature of the IT, structure, agency relationship.

We at the end make some suggestions on what research method to employ for different phases of IS research.

6.1 The Epistemological Consequences of IS Ontology

The present IS ontology discussed in previous sections carry several epistemological consequences. The first and primary epistemological consequence is the difficulty in empirical definition of IT. The difficulty results from the loss of the validity of IT as a research construct. As indicated before, IT affects people and society not directly but through the social practice of people. A conceptual difficulty arises, however, for by the time the technology is immersed into the social practice of people, it tends to lose its conceptual identity: it no longer possesses a concrete, physical presence nor boundaries, but becomes transparent to and indiscernible from the social practice of people. This loss of identity for the IT construct seriously threatens the conduct of IS research, for IT no longer constitutes a viable research construct and without a research construct, it is no longer a legitimate field of inquiry. However, there is surprisingly little discussion on how to empirically identify and observe the IT construct, especially IT as immersed into a social practice.⁷⁾ Consequently, most IS research holds onto and confines itself in a concrete, physical conception of IT, with all the

ensuing problems discussed before.

Secondly, the present IS ontology induces a rather hasty conclusion be drawn on the causality relationship between IT and organizational phenomena. As indicated before, IS research regards the relationship between IT and organizational phenomena to be of a causal nature. Furthermore, the causality is presumed to be a *prima facie* fact - one of given, rather than one to be proven. Most extant IS research, therefore, makes a premature causal linkage to be established between IT and organizational phenomena. It presumes IT to have an immediate effect after its introduction to an organization. Any change that is observed in the organization is causally attributed to the introduction of IT, regardless of the plausibility of the attribution. The underlying ontology again is that IT is a potent enough stimulus to have an immediate, direct effect on the general social order of the organization.

Thirdly, the present IS ontology induces a particular research method. As most extant IS research is cause driven as discussed above, the analytical thrust of the research is more focused and directed, largely involving logical deduction, derivation, enumeration, and forward chaining from a cause to an effect. For a given cause, its effects are logically deduced, based upon a set of attributes it possesses, and projected onto the real world phenomena. Hypothesis testing is a common form of analysis. The analytic thrust of a cause driven research is very much in tune with the positivist tradition of IS research. Orlikowski

7) An important and notable exception is the operationalization of DeSanctis et als faithfulness of appropriation by Chin et al. [1997].

and Baroudi[1991], for instance, has identified that, of the 155 information systems research studies conducted in 1980's, over 90% of them are what they call positivistic research which looks for unilateral, causal relations that can be generalized across situations.

6.2 A Dual Conception of IT

We suggest, first of all, that the loss of identity for the IT construct discussed above calls for a dual conception of IT. As discussed in the previous section, the primary problem in the conceptualization of IT is that of transparency, that IT becomes indistinguishable from the context it is situated in. IS research, therefore, needs to deal with two different conceptions of IT. The one conception is IT as a *designed artifact*: it is what is designed and deployed, most likely with computer hardware and software. It assumes concrete and physical existence, with tangible content and boundaries, such that human agents physically interact with it in performing tasks. The other conception is a *structured* version of the designed artifact, which may be termed IT as a *social practice*: it is a particular mode and manner of conduct, a manifestation of the artifact as it gets dissolved into, subsumed and embedded in the social practice of people.

The dual conception of IT calls for a fundamentally different research questions to be posed for IS research. As indicated in the previous section, the research question is no longer how IT as an independent research construct interacts with people and organization,

as the structural explication concerns itself with. The question rather should be how IT transpires from a designed artifact to a social practice. This in fact refers to none other than a process of structuration for IT. The structural explication, however, rather ironically, completely bypasses this fundamental question. By stressing the duality nature of IT, that it is both a medium and a result of human action, it only deals with an already structured version of IT, which is little distinguishable from the structure.

6.3 The Two-Tier Theory Structure

The dual conception of IT discussed above calls for a particular theory structure for IS research. As IS research deals with two different conceptions of IT, the one as a designed artifact and the other as a social practice, it needs to assume a two-tier theory structure. The first tier of the theory structure is to explicate the metamorphosis of IT from the one to the other, i.e., from a designed artifact to a codified social practice. We may conceptualize the extent to which IT settles in as a social practice of people as the *maturity* of IT. The second tier of the theory structure is to address the relation of the IT-induced social practice to the general social order of the organization, such as organizational structure or culture. The first-tier and second-tier aspects of the theory structure are interrelated, with the latter being contingent upon the former. The maturity of IT in the first-tier aspect of the theory structure is an important intervener for the second tier aspect of the theory, for IT at different stage of

maturity is likely to have differing effect on the general social order of organization.⁸⁾

The two-tieredness of the IS theory structure helps address the problem of establishing a premature causal link between IT and organizational phenomena. As indicated in the previous section, an important epistemological consequence of the IS ontology is that it induces IS research to draw a premature causal association between IT and organization phenomena. An introduction of IT into an organization is considered to have an immediate effect on the organization, and is held causally responsible for various organizational phenomena. Such a premature causal association occurs because it fails to recognize the two-tieredness of the IT-organization relationship. IT as a designed artifact is directly associated with the general social order of the organization, such as organizational structure and culture, without regard to how it is first dissolved into the social practice of people. The first-tier aspect of the theory structure is altogether ignored.

The first-tier aspect of the IS theory structure should provide an explanation on how IT is to be transformed from a designed artifact to a social practice. The transformation involves a change of a metamorphic nature in

the character of IT. Some qualitative difference, a time-space discontinuity in Orlikwoskis terms[1992], exists between the two forms of IT. While IT as a designed artifact is technical, physical, and concrete, with discernible content and boundaries, IT as a social practice is social, conceptual, and abstract. In fact, IT as a social practice is little distinguishable from the structure of the organization it is situated in. At present exactly when and how this metamorphic change in the nature of the technology occurs is not explained properly, except perhaps that the change is emergent, not necessarily happens as intended nor as planned[Markus and Robey, 1988].

DeSanctis and Scott Poole[1994] proposes an adaptive structuration theory for explicating the transformation of IT from a designed artifact to a social structure. They employ two constructs. The one is the *structural potential* of technology. It refers to the extent to which a technology embodies a particular set of action rules, and thereby enforces a particular behavior pattern. It is thus a structure-in-technology concept. A technology with high structural potential means the technology permits only a few select social practices, with particular action rules embedded in the technology itself. A technology with low structural potential, on the other hand, means the technology does not specify any particular behavior patterns but is open to multiple interpretations and actions. The other is the *faithfulness of appropriation*. It refers to the extent to which a person or group *appropriates* the action rules of the technology. The high and low degrees of appropriation means the

8) This notion of IT maturity is contrasting to the traditional notion of IT maturity, where maturity is perceived only in terms of the physical aspect of IT - IT as a designed artifact - with measures such as the proliferation of the IT hardware and software, the tenure of IT, the amount of budget allocation for IT, etc.

users faithfully internalize and carry out the action rules of the technology or largely ignore them, respectively. DeSanctis et al. argues that it is only through the interaction of the structural potential of IT on the one hand and the faithful appropriation by the users on the other hand that IT is transformed from a designed artifact to a social structure.

The adaptive structuration theory by DeSanctis et al., is perhaps one of the first attempts at providing an operational account of the transformation process. Measures have been developed subsequently to further operationalize the theory[Chin, Gopal, & Salisbury, 1997]. The theory, however, invites some criticism. First of all, the theory conveys a strong trace of technological determinism. It treats structure as static and embedded in technology, thus largely obviating the role of agency in a dynamic creation of structure.⁹⁾ Secondly, the theory overlooks the destabilizing effect of technology. Technology, according to the theory, only stabilizes structure. It embodies a particular set of action rules and enforces a particular behavior pattern. Technology, however, has another effect on structure, which is equally important. This is the destabilizing effect of technology. As technology advances, it becomes more versatile, flexible and open-ended, removing constraints and providing more choices for action. Internet is a good example of such a versatile, open-ended technology. Such technology has an

effect of destabilizing structure, not stabilizing it as the adaptive structuration theory proposes.

The above discussion on the stabilizing and destabilizing effects of technology on structure, in fact, suggests the *duality* nature of the IT, structure, agency relationships; on the one hand, IT stabilizes the structure; by enforcing a particular behavior pattern, it reinforces and reproduces the existing structure. Perhaps it was this aspect that Orlikowski[1992] referred to when she stated that IT is both the medium and result of human action. IT, on the other hand, has a destabilizing effect on structure, as the technology removes constraints traditionally imposed upon people and expands the horizon of alternative actions, thereby greatly disturbing and diminishing the reproducibility of the organizations current practices. The recent surge of restructuring in the major corporations, largely inspired by the reengineering drives initiated by the IS community, attests to this destabilizing aspect of IT.

6.4 Research Methods

A final comment to be made for IS research is about research methods. The two-tier theory structure above suggests that IS research is conducted in two phases, and that different research methods be employed for different phases. The first phase, the transformation of IT from a designed artifact to a social practice, requires a longitudinal, interpretive observation, more of a process type research that Markus and Robey[1988] and others[Sabherwal & Robey, 1993, 1995;

9) I appreciate a comment by an anonymous reviewer for this remark.

Newman & Robey, 1992] propose. A case study or qualitative research may be more appropriate for this phase[Lee, 1989; Walsham, 1995]. The traditional quantitative research that looks for a causal association between IT and social phenomena can be harmful and dangerous. The second phase, the relation of an IT-induced social practice to the general social order, on the other hand, is more tolerant to cross-sectional research and statistical analysis. Both quantitative and qualitative research methods may be employed in this phase[Lee, 1991].

The discussion so far on the nature of IS research also illustrates the need for an interdisciplinary approach to IS research. The ontological purview above suggests that IT manifests itself on multiple, largely discontinuous conceptual realms, such as the macro institutional structure realm or the micro individual behavior realm. And conducting IS research, as Behlmg[1978] has indicated, is essentially an attempt at establishing logical bridges among the realms, searching for a plausible explanation on how IT transpires from one realm to another. The bridging along each of the realms raises different issues and requires different theory structures and foundations for addressing them. For instance, the bridging between the micro and macro levels of analysis involves the issue of aggregation - the micro to macro transition [Munch & Smelser, 1987; Coleman, 1986, 1990]. The bridging between the structure and the practice realms, on the other hand, involves the theory of structuration[Orlikowski, 1992; Giddens, 1976, 1979], the socio-cognitive

evolution theory[Garud & Rappa, 1994], virtual organization theory[Lucas & Baroudi, 1994], the incomplete contract theory[Brynjolfsson, 1994], and the role theory[Barley, 1990], among others. The multitude of theories involved in IS research, therefore, indicates that the theory structure of IS research may never be a uniform theory structure. As Huber[1990] has indicated, diverse set of theories may need to be assembled from multiple fields of social theory.

6.5 Concluding Remarks

In this essay, we have traversed the ontology of IS research and identified various conceptual peculiarities that inhabit the research. Three aspects of the IS research ontology were discussed: the conceptualization of the IT construct, the demarcation of phenomena for investigation, and the binding of the IT construct to other constructs. As for the conceptualization of IT, we identified several common conceptions of IT, and argued that the concept of IT suffers, among others, a transparency problem, i.e., IT loses its identity as it is embedded in and become transparent to its context. As for the demarcation of phenomena for investigation, we distinguished a cause-driven versus a problem-driven research and argued that the IS research is largely cause-driven, resulting in the objectification of the IT concept. We also discussed several conceptual biases and predispositions in the phenomena demarcation. As for the binding of the IT construct to others, we identified several imageries adopted in IS research, and argued that each

assigns an unwarranted causal primacy to the IT construct. We then discussed the structuration framework and identified several problems in its ontology. At the end, we discussed the epistemological consequences of the present IS ontology and suggested a new ontology, including a dual conception of IT and a two-tier theory structure for IS research.

The essay has raised many issues but rests

few. Indeed, as the readers may have unfailingly noticed by now, the essay reflects as much the authors own misconceptions, biases, and conceptual predisposition as those of the general IS research community. Nevertheless, we hope that the essay, by bringing to light the hitherto neglected aspect of the ontology of IS research, is a step forward toward the next plane of our inquiry, the epistemology of IS research.

〈REFERENCES〉

- [1] Alexander, J.C., B. Giesen, R. Munch, and N.J. Smelser, *The Micro-Macro Linkage*, Berkeley, CA: University of California Press, 1987.
- [2] Alvesson, M., "The Play of Metaphors," in J. Hassard and M. Parker, ed., *Postmodernism and Organizations*, Sage Publications, London, 1993.
- [3] Bakopoulos, J.A. Yannis, "Toward a More Precise Concept of Information Technology," *Proceedings, Sixth International Conference on Information Systems*, Indianapolis, 1985, pp. 17-24
- [4] Barley, S., "The Alignment of Technology and Structure through Roles and Networks," *Administrative Science Quarterly*, Vol. 35, 1990, pp. 61-103.
- [5] Behling, O., "Some Problems in the Philosophy of Science of Organization," *Academy of Management Review*, 1978, Vol. 3, pp. 193-201.
- [6] Bhaskar, R., "Scientific Explanation and Human Emancipation," *Radical Philosophy*, No. 26, 1980, pp. 16-28.
- [7] Brynjolfsson, E., "Information Assets, Technology, and Organization," *Management Science*, Vol. 40, No. 12, December 1994.
- [8] Brynjolfsson, E., T.W. Malone, V. Gurbaxani, & A. Kambil, "Does Information Technology Lead to Smaller Firms?" *Management Science*, Vol. 40, No. 12, December 1994.
- [9] Carter, N.M., "Computerization as a Predominant Technology: Its Influence on the Structure of Newspaper Organization," *Academy of Management Journal*, Vol. 27, No. 2, June 1984, pp. 247-270.
- [10] Chin, W.W., A. Gopal, and W.D. Salisbury, "Advancing the Theory of Adaptive Structuration: The Development of a Scale to Measure Faithfulness of Appropriation," *Information Systems Research*, Vol. 8, No. 4, Dec 1997.
- [11] Coleman, J.S., "Social Theory, Social Research, and a Theory of Action," *Amer. J. Sociology*, Vol. 91, 1986, pp. 1309-1335.

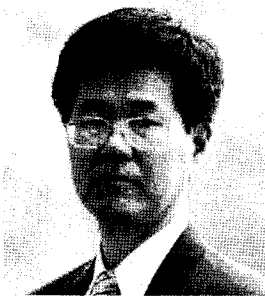
- [12] _____, *Foundations of Social Theory*, Harvard University Press, Cambridge, 1990.
- [13] Craib, I., *Modern Social Theory*, Harvester Press, 1984.
- [14] _____, *Modern Social Theory*, Harvester Press, 2nd Ed., 1992.
- [15] Davis, F., "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly*, Vol. 13, No. 3, 1989.
- [16] Davis, G.B., and M. Olson, *Management Information Systems: Conceptual Foundations*, McGraw-Hill Book Company, New York, 1985.
- [17] Dawson, P., & I. McLaughlin, "Computer Technology and the Redefinition of Supervision," *Journal of Management Studies*, Vol. 23, No. 1, January 1986, pp. 116-132.
- [18] DeLone, W.H., & E.R. McLean, "Information Systems Success: The Quest for the Dependent Variable," *Information Systems Research*, Vol. 3, No. 1, March, 1991, pp. 60-95.
- [19] DeSanctis, G., & M. Scott Poole, "Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory," *Organization Science*, Vol. 5, No. 2, May 1994, pp. 121-147
- [20] Dickson, G.W., J.A. Senn, and N.L. Chervany, "Research in Management Information Systems: The Minnesota Experiment," *Management Science*, Vol. 23, No. 9, May 1977, pp. 913-923.
- [21] Foster, L.W., & D.M. Flynn, "Management Information Technology: Its effects on Organizational Form and Function," *MIS Quarterly*, Vol. 8, 1984, pp. 229-236.
- [22] Garud, R., and M.A. Rappa, "A Socio-cognitive Model of Technology Evolution: The Case of Cochlear Implants," *Organization Science*, Vol. 5, No. 3, 1994.
- [23] Giddens, A., *New Rules of Sociological Method*, New York: Basic Books, 1976.
- [24] _____, *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis*, Berkeley, CA: University of California Press, 1979.
- [25] _____, *The Constitution of Society: Outline of the Theory of Structure*, Berkeley, CA: University of California Press, 1984.
- [26] Granovetter, M., "Economic Action and Social Structure: The Problem Of Embeddedness," *American Journal of Sociology*, Vol. 90, 1985, pp. 481-510.
- [27] Griffith, T.L., & G.B. Northcraft, "Distinguishing Between the Forest and the Trees: Media, Features, and Methodology in Electronic Communication Research," *Organization Science*, Vol. 5, No. 2, May 1994.
- [28] Henderson, J.C., and N. Venkatraman, "Strategic Alignment: Leveraging Information Technology for Transforming Organization," *IBM Systems Journal*, Vol. 32, No. 1, 1993, pp. 4-16
- [29] Hirschheim, R., & M. Newman, "Symbolism and Information Systems Development: Myth, Metaphor and Magic," *Information Systems Research*, Vol. 2, No. 1, 1991.
- [30] Huber, G.P., "A Theory of the Effects of Advanced Information Technologies on Organizational Design, Intelligence,

- and Decision Making," *Academy of Management Review*, Vol. 15, No. 1, 1990, pp. 47-71.
- [31] Jelinek, M., "Technology, Organization and Contingency Theory," *Academy of Management Review*, Vol. 2, No. 1, 1977, pp. 35-43.
- [32] Kanter, R.M., B.A. Stein, and T.D. Jick, *The Challenge of Organizational Change*, The Free Press, New York, 1992.
- [33] Kauffman, R.J., and P. Weill, "An Evaluative Framework for Research on the Performance Effects of Information Technology Investment," *Proceedings, Tenth International Conference on Information Systems*, Boston, December 1989.
- [34] Kendall, J.E., and E.K. Kendall, "Metaphors and Methodologies: Living Beyond the Systems Machine," *MIS Quarterly*, Vol. 17, No. 2, June 1993, pp. 149-171.
- [35] Lee, A.S., "A Scientific Methodology for MIS Case Studies," *MIS Quarterly*, Vol. 13, No. 1, 1989, pp. 33-50.
- [36] _____, "Integrating Positivist and Interpretive Approaches to Organizational Research," *Organization Science*, Vol. 2, No. 4, 1991, pp. 342-365.
- [37] Lucas, H.C., & J. Baroudi, "The Role of Information Technology in Organization Design," *Journal of Management Information Systems*, Vol. 10, No. 4, Spring 1994, pp. 9-23.
- [38] Markus, M.L., & R. I. Benjamin, "The Magic Bullet Theory in IT-Enabled Transformation," *Sloan Management Review*, Winter, 1997.
- [39] _____ & D. Robey, "Information Technology and Organization Change: Causal Structure in Theory and Research," *Management Science*, Vol. 34, No. 5, May, 1988.
- [40] Mintzberg, H., *The Structuring of Organizations*, Prentice Hall, Englewood Cliffs, NJ, 1979.
- [41] Morgan, G., *Images of Organization*, Sage Publications, Beverly Hills, CA, 1986.
- [42] Newman, M., & D. Robey, "A Social Process Model of User-Analyst Relationships," *MIS Quarterly*, Vol. 16, No. 2, June 1992, pp. 249-266.
- [43] Olson, M., & H.C. Lucas, "The Impact of Office Automation on the Organization: Some Implications for Research and Practice," *Communications of the ACM*, Vol. 25, 1982, pp. 838-847.
- [44] Orlikowski, W.J., "The Duality of Technology: Rethinking the Concept of Technology in Organizations," *Organization Science*, Vol. 3, No. 3, August 1992.
- [45] _____, & D. Robey, "Information Technology and the Structuring of Organizations," *Information Systems Research*, Vol. 2, No. 2, 1991.
- [46] _____, & J.J. Baroudi, "Studying Information Technology in Organizations: Research Approaches and Assumption," *Information Systems Research*, Vol. 2, No. 1, 1991.
- [47] Pfeffer, J., *Power in Organization*, Pitman Publishing, Marsfield, MA, 1981.
- [48] _____, *Organizations and Organization Theory*, Pitman Publishing, Marsfield, MA, 1982.
- [49] _____, and H. Leblebici, "Information Technology and Organizational Structure," *Pacific Sociological Review*, Vol. 20, No. 2,

- pp. 241-261.
- [50] Sabherwal, R., and D. Robey, "An Empirical Taxonomy of Implementation Processes Based on Sequences of Events in Information Systems Development," *Organization Science*, Vol. 4, No. 4, 1993, pp. 548-576
- [51] Sambamurthy, V., & M. Scott Poole, "The Effects of Variations in Capabilities of GDSS Designs on Management of Cognitive Conflict in Groups," *Information Systems Research*, Vol. 3, No. 3, September 1992, pp. 224-251.
- [52] Scott Morton, M.S., (ed), *The Corporation of the 1990s*, Oxford University Press, New York, 1991.
- [53] Seddon, P.B, "A Respecification and Extension of the DeLone and McLean Model of IS Success," *Information Systems Research*, Vol. 8, No. 3, September 1997, pp. 240-253
- [54] Stinchcombe, A.L., *Constructing Social Theories*, The University of Chicago Press, Chicago, 1968.
- [55] Swanson, E.B., "Information Systems in Organization Theory: A Review," in Boland, R.J., and R.A. Hirschheim, ed., *Critical Issues in Information Systems Research*, John Wiley & Sons, New York, 1987.
- [56] Venkatraman, N., "IT-Induced Business Reconfiguration," in M.S. Scott Morton, ed., *The Corporation of the 1990s*, Oxford University Press, New York, 1991.
- [57] Walsham, G., "The Emergence of Interpretivism in IS Research," *Information Systems Research*, Vol. 6, No. 4, December 1995.
- [58] Weill, P., "The Relationship Between Investment in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector," *Information Systems Research*, Vol. 3, No. 4, 1992, pp. 307-333.

◆ 이 논문은 1998년 9월 15일 접수하여 1998년 9월 25일 게재확정되었습니다.

◆ 저자소개 ◆



전 성 현 (Juhn, Sung-Hyun)

저자는 서울대학교에서 수학하였으며 미국 미네소타 대학에서 경영정보학으로 박사학위를 취득하였고 현재 국민대학교 정보관리학부 교수로 재직하고 있다. 주요 연구분야로는 정보기술과 조직, 정보전략, 프로세스 혁신 등이 있다.