Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2003 Proceedings

Americas Conference on Information Systems (AMCIS)

December 2003

Where Should a New IS Researcher Start?

Nik Hassan
University of Minnesota, Duluth

WHERE SHOULD A NEW IS RESEARCHER START?

Nik R. Hassan
University of Minnesota, Duluth
nhassan@d.umn.edu

Abstract

This paper uses the principles of disciplinarity to answer questions posed by many authors on the legitimacy of the IS discipline. Using these answers, the paper uncovers which areas a new IS researcher should focus on and provides a teleological basis for advancement of the IS discipline. The paper also draws from Heidegger's and Jonas's philosophy of technology to arrive at an operational ideology for IS – the imperative of responsibility. This philosophy offers many benefits that will free the IS discipline to find its unifying paradigm.

Keywords: Information systems research, information systems foundation, information systems theory, epistemology, information systems discipline, philosophy of technology, paradigms

Introduction

After spending several years as an Information Systems (IS) practitioner, I have decided to join the ranks of IS researchers, not realizing how much the field has changed in those years I was distanced from academia. As a new researcher, the accumulation of research amidst its diversity has been both impressive and overwhelming. I was tempted to quickly start focusing on a small IS area that I thought would be interesting and fertile when I came across several interesting writings that distracted my attention. These articles asked questions that I felt were not satisfactorily addressed by any other writings. Because these questions cast doubt on the legitimacy of the field, I felt I could not continue with my research until I had answered them, at least to my own satisfaction. I felt that having answers to these questions would reassure me that I will be spending what little time and resources I have, in an area that will contribute the most to the development of the IS field.

There appears to be an inconsistency between what is happening in the world of practice and what is developing in the academic field of IS. My years of experience showed that real, complex, and multi-faceted "IS-related" issues do exist in practice. These IS-related issues are seldom trivial and their impacts often extend well beyond the boundaries of the organization the issues originated from. Not surprisingly, I found that those trained in management, organization science, psychology, or computer science, were not well-equipped to address these issues. However, despite the accelerating growth of IS programs in universities, there is a paucity of IS experts that are capable of recognizing an "IS problem" when they see one, and be able to suggest solutions from their textbooks and references, and repertoire of tools.

This inconsistency I observed give credence to the claim that the IS discipline may be struggling with an identity crisis (Stowell et al. 1997). In addition to this claim, others have also written on related problems the field appears to be experiencing (Adam et al. 2000; Banville et al. 1989; Ciborra 1998; Ciborra 2000; Khazanchi et al. 2000; Lowry et al. 2000; Markus 1999; O'Donovan et al. 2002). As a new researcher in the field, I will be addressing each of these questions. The authors that have asked these questions deserve credit for doing so because as these questions are answered, new IS researchers will understand better where their chosen areas of research lie within the large and sometimes confusing field of IS and how their matching skills contribute to the development of that area. These questions are also useful for researchers from other fields who want to understand what our field is about.

Objective of this Paper

The main objective of this paper is to suggest appropriate areas of research that will add to the progress of IS based on answers to questions asked by articles on the nature of IS. I will not discuss the epistemological structure of IS. The epistemological structures which are critical to lay the bases for inquiry are discussed in much detail in Weber (1987), Nissen et al. (1991), Hirschheim (1985), Galliers (1992), Lee et al. (1997) and Goles and Hirschheim (2000). Instead I will approach the nature of the IS field from the "disciplinarity" of the field – the possibility that the field is a discipline --- and uncover the focus required at this stage of the field's development. Once the disciplinarity of the field is clarified, I will propose an approach from the philosophy of technology that I feel is most suited for the advancement of the field. This approach can focus the efforts of new IS researchers on topics that merit their time and energy and produce the most benefit to the beneficiaries of IS and ultimately, to the intellectual development of the field. This effort is also necessary to ensure that people who are outside the discipline that wish to contribute to the IS discipline understand the entities that make up the universe of the discipline and will contribute meaningfully to its richness. If for example, a researcher from the relatively young discipline of finance wish to collaborate with a researcher from IS, how should the finance researcher view IS before embarking on building a new fountainhead of knowledge for both fields? Finally, the result of this effort will be to limit the wide spectrum that is "information system" to a list of research areas that is less unwieldy for a new researcher.

Other multi-disciplinary fields such as molecular biology and solid state physics in the natural sciences, and finance, accounting and strategic management in the social sciences have managed to make the transition from being new to becoming a discipline in their own right. This successful transition may be due to their coherent epistemological structure, but more likely can be attributed to the seminary work and continuing progress of their researchers. For example, Keller (1990) explains the influence of physics on biology in the creation of the new discipline of molecular biology, and how the approaches and instruments used by physicists were able to breathe new life into the traditional discipline of biology, making molecular biology more prominent than its parent disciplines. Similarly, Klein (1993) describes the intellectual and institutional development of the new discipline of solid state physics (an amalgamation of physics with chemistry, crystallography and metallurgy, which later led to the microprocessor revolution) from a broad sub-field of physics. Solid state physics evolved from its inception in the 1940's, to a loose federation of research groups in the 1950's and finally to becoming the most important subfield of physics in the 1960's. In the social sciences, before Porter's seminary book, Competitive Strategy, there was little consensus about the objective of strategic management practice as a discipline (Barney 2002). Porter focused the field's efforts on understanding how organizational strategies can generate a rate of return in excess of an organization's cost of capital – the field's dependent variable. Porter also provided the proper theoretical framework for analyzing strategic management problems, the appropriate unit of analysis, and finally the appropriate role of broader social issues in the field of strategic management. He was not only able to use the theories of the field's referent discipline – economic theories, but was able to articulate the theoretical tools that would be most useful to measure and understand the dependent variable. As Barney (2002) notes, "Porter helped set the stage for a revolution in the field of strategic management that continues to this day" (p. 54).

Accounting, another social science discipline, also underwent a similar transformation as the result of their researchers' progress. Hoskin et al. (1993) argue how accounting has become a "disciplinary force", distinct and becoming part of the existence of its own referent disciplines of economics and psychology. They suggest that accounting has a certain priority over both economics and psychology because "it is part of the condition of their very existence" (p. 26). The empirical evidence of this transformation began in the mid-nineteenth century, when the accounting system of "administrative coordination" (managers reporting to other managers based on accounting) was able to engineer "greater productivity, lower costs and higher profits than coordination by market mechanisms" (p. 27). Evidence of the opposite is clear from recent corporate collapses brought upon by poor (or questionable) accounting practices. From these two examples, it appears that both the disciplines of strategic management and accounting have developed a sense of responsibility to their primary beneficiaries, the firm's equity holders. I will explain why as a discipline, IS needs the same sense of responsibility.

It is my objective to show that the IS field is capable of such transformations given an appropriate sense of mission and a focus on appropriate areas. It is also my objective to show that the multi-disciplinary nature of the field is not the reason for its purported lack of progress. I will show that the nature of IS qualifies itself as an academic discipline, only that it needs to find an appropriate direction to demonstrate progress. To continue, I need to first answer the question of whether or not our field is an academic discipline.

Is Information Systems an Academic Discipline?

The question many authors have put forward is whether or not IS qualifies as an academic discipline. Often, authors equate this question with the related question of whether or not IS qualifies as a science, which confuses the issue. Many liberal arts academic fields (e.g., visual and performing arts and art history) that are not sciences are clearly legitimate disciplines and may even qualify as a science to some. An area of interest that qualifies as a science has the legitimacy to some day, become an academic discipline. However, an academic discipline in the arts may not qualify as a *scientific* discipline. Although I am assuming in this paper that IS researchers would like to see their field qualify as a science, I am deferring that discussion because it begs the long-drawn argument on whether social sciences are sciences at all, which is outside the scope of this paper. The first objective of this paper is to answer the question on whether or not IS qualifies as an *academic discipline*.

Three articles that address this issue in great detail are Banville and Landry (1989), Adam and Fitzgerald (2000), and Khazanchi and Munkvold (2000). Using the sociological practices of IS, Banville and Landry (1989) purports that IS qualifies as an academic discipline because IS exists in both undergraduate and graduate programs in universities, and because there are specialized publication outlets as well as prestigious conferences for the field. Khazanchi and Munkvold (2000) argue somewhat apologetically ("it seems to fulfill this requirement for "science", p. 33) that because IS *is* a science, it qualifies as a discipline. Their arguments for the scientific basis of IS are (1) it has a distinct subject matter, (2) it can be described and classified, (although "the scope of IS is indisputably broad and somewhat ambiguous", p. 34), (3) it contains underlying general uniformities, and (4) because the field uses scientific methods.

First, I feel that these justifications may be sufficient only for the IS researcher, or for their need of confidence in their own field ("There is something to be said about the importance of increasing the self-esteem of the members of the IS community, *ibid*, p. 38). However, these justifications may not be sufficient for a researcher outside of the IS field. Second, these answers do not address questions put forward by other authors about the long-term survival of IS. Will IS be transformed into the study of information technology and return to the school of computer science (Markus 1999)? Has IS gone into a natural drift (Ciborra 2000), or has IS taken a turn to the worse (Ciborra 2002)? Will IS suffer the same fate as Operations Research (Corbett et al. 1993; Fildes et al. 1997; Lucas 1999) or Human Resource Development (Kuchinke 2001), to be perceived as merely an "area of interest" and finally to be subsumed under other major fields of study, either because of lack of 'progress" or because they could not find beneficiaries who will continue to fund and provide resources to the field?

To answer these questions, I turn to the experts of disciplinarity, the experts that study disciplines and their progress. The first question to answer is why IS needs to become a discipline? The history of the social sciences is replete with examples of how various areas of interests struggle to establish themselves as distinct disciplines. For example Aristotle's *Politics* and Hobbes's "social physics" evolved to become a struggle to extricate the new field of political science from the more established field of history. Political science was finally established as a cogent discipline by Burgess at Columbia University in 1880, and Adams at Johns Hopkins in 1882 (Manicas 1987). Once established, the discipline then needs to differentiate itself from other disciplines. Messer-Davidow et al. (1993) explain the importance of differentiating each discipline from its neighbor and the "possibility conditions of discipline" – what makes an area of area interest become a discipline. Messer-Davidow et al., (1993) argue that it is important to engage in the practice of differentiating our field so that we can recognize who we are and what we do (and of course for others to recognize us), so that we can recognize what does and what does not qualify as disciplinary knowledge, hence incorporate certain types of knowledge and exclude others. It is important so that our journal editors can sort submissions into central and marginal categories, how new sub-disciplines of IS may be created and nurtured, how trivial controversies are defused and creative unorthodoxies nurtured and developed into mainstream knowledge. The success of this activity will result in the IS discipline receiving its due recognition in the form of power, funding and other resources.

The establishment of any discipline does not mean that the discipline should not change or progress after its initial advance. For example, the discipline of organization science went through a major revolution as a result of the work by Campbell on "selectionist evolutionary explanations of emergent order and differential survival", evolutionary epistemology; multimethod triangulation perspectives and, experiments and quasi-experiments (McKelvey 2001; McKelvey et al. 1999). However, after that initial advance, Pfeffer (1993) put to question the discipline's level of paradigm development and progress.

Criteria for Disciplines and Areas for New Researchers in IS

In this section, I will discuss the criteria that make a field of interest an academic discipline. Based on each criterion, areas of research that will contribute most to the maturity of the IS field is proposed. Messer-Davidow et al. (1993) suggest the following criteria for assessing the disciplinarity of a field:

1. Genealogy – presence of theory from reference disciplines

2. Boundary work – building of clear boundaries that demarcates disciplines from each other and from other ways of knowing

3. Methods of construction – ways in which disciplines and fields are constituted and are brought into contact with each other

4. Socializing practices – how individuals socialize into group experts thereby supporting the authority of the knowledge they produce and establishing the hierarchy of membership in that expert group

5. Counter- and post-disciplinary projects

I will not discuss the fifth criteria, counter- and post-disciplinary projects because of the relative youth of the IS field compared to established fields such as management and finance.

Genealogy

Another group of questions that are asked concerns the origins of information systems. What are the referent disciplines of IS? The study of genealogy of disciplines answers this question (Messer-Davidow et al. 1993). The criterion of genealogy hinges on whether IS has incorporated critical or core theories from its referent disciplines. These theories may be acquired adventitiously (casually acquired, accidentally) or could be historically contingent (not determinable by any certain rule, dependent upon what is undetermined or unknown). If these theories are applied in the new field, that new field fulfills this criterion for being an academic discipline because of the application and extension of the theory from its parent discipline.

Using Culnan's (1986) list of articles as a reference to locate any use of core theories, a survey of the listed articles suggest a very fragmented use of "theory" by IS researchers. For example, computer science is quoted as a major referent discipline (Culnan 1987; Culnan et al. 1986; Ives et al. 1980); however very little computing or algorithmic theories are applied in IS research. Principles of software engineering and database modeling may play a major role in IS education, but we don't see those engineering theories or relational algebra theories in Culnan's list of exemplary IS articles. As Lee (1999) suggests, IS begins where computer science ends. These two fields are complimentary but distinct. Consequently, I feel that new researchers should not focus their efforts in areas such as artificial intelligence, human computer interface, expert systems, natural language processing and certain areas of software engineering because they are engineering sciences and are clearly realms of computer science. Until and unless the theories of those fields play a major role in our inquiry, IS will gain little from their research.

On the other hand, systems theory, psychological theories and management theories are being actively incorporated into IS concepts and applications. Simon's psychological theories (e.g. human decision making) played a major role in developing the field of machine intelligence for computer science. At the same time his psychological theories of bounded rationality and information processing played a major role in IS and Decision Support Systems (Sprague 1980). This lack of use in computing theories is consistent with Culnan's (1986) observation drawing from Ives et al. (1984) that the systems development stream of research in IS is "poorly grounded and methodologically flawed" (Culnan 1986 p. 169). Although the field of IS fulfills this criterion of genealogy, what happens to the development of IS and how these incorporated theories will shape the direction of the IS field will depend on IS researchers. I feel that the diversity of the IS field can become a problem if IS researchers fail to use the "proven" theories of the referent discipline appropriately. Using this criterion, more research should be performed to demonstrate which of the so-called referent disciplines actually qualify as a "real" IS referent discipline.

We can map this criterion with the updated ISRL classifications and suggest areas that can add significantly to the maturity of the field. This preliminary list can also serve as a basis for further research in IS genealogy. The mapping suggests that new researchers should focus on (1) areas of research that have not successfully demonstrated any extensive use of core theories from referent disciplines, and (2) areas of research that have used these theories extensively but have not progressed sufficiently. Examples of the former are systems and software development (software engineering theories), IS and industry (economic theory), IS planning (management and political science theories), IS security (legal theory), IS and political environment (political science theories), IS staffing (psychological theories) and educational information systems (theories of learning and education). Examples of the latter are matching IS with organizational dynamics, characteristics and functions, IS and task characteristics, IS and organization change and design, societal impacts of IS, and IS evaluation.

Boundaries

Delineating boundaries or boundary work refers to the task of developing arguments to justify particular divisions of knowledge and the strategies to use in constructing and maintaining them (Gieryn 1983). Amariglio et al. (1993) argue that "a discipline arises in the course of struggles to limit discourses involved in the production of formal knowledge" (p. 150). As Klein (1993) explains, there may be in reality, no boundaries at all in disciplines, and if there are, all boundaries are permeable. Boundary work should not be understood as erecting barriers so that other fields cannot enrich our field or, so that new fields cannot be born from the mutual discourse that takes place among different disciplines. Boundaries are set for the purpose of the production of knowledge. For example, is educational technology or the use of technology in education the exclusive realm of the discipline of education? If IS has a claim to that activity, which part of education technology falls within the boundaries of IS so that researchers from the education discipline can refer to researchers in the IS discipline that are experts of that area. Is distance learning (inter-organizational information systems) one of the concerns of IS, or is the management of the educational process the specific area that IS should be involved in as opposed to the area of teaching and learning? In a sad case of the failure of a large IT-driven, government schools project in South East Asia (Ramasamy et al. 2002), the factors contributing to the failure could be attributed to (1) the combined inability on one side, of the representatives from the technical community of computer science and education to address the underlying economic, business, organizational, management and political issues abound in such a gargantuan project, and (2) on the other side, the inability of the government administrators and corporate managers to understand the implications and limitations of the information technology they were so enamored with. Who, besides the IS researcher, is better equipped to fill the gap between this two communities?

If we can claim that such a boundary exist or can be created, I feel that this boundary-work has not been extensively developed in the case of IS. The most argued boundary of all is the distinction between science and non-science (Messer-Davidow et al. 1993). The determination of this boundary is not the objective of this paper. Fuller (1993; 1997), drawing from Francis Bacon, argue that instead of trying to define the boundaries by using "divine" criteria for science, which he claims is an effort "doomed to failure" (p. 127), the common boundary of all academic disciplines should be how they produce knowledge in maintaining social order. With this criterion, the onus for boundary work does not fall on the indiscriminately changing technological environment, or "natural" epistemological structures, but rather on the shoulders of the researchers themselves. Fuller (1993), Klein (1993) and Whitley (1984) all agree that disciplinarity is a social activity and that power plays a major role in determining the legitimacy of certain disciplines. Drawing from these three authors, I propose that IS researchers erect boundaries by (1) developing the field to a state when a discourse in IS cannot be engaged without considerable prior technical training, (2) building normative models to which reality should be made to conform rather than becoming the object of technological change, and (3) developing an agreement on the generally progressive direction of the development of the field such that it will challenge what disagreements may remain among its practitioners.

Much of what is proposed is consistent with Kuhn's (1996) concept of progress in a field. As Kuhn (1996) notes, "It may, for example, be significant that economists argue less about whether their field is a science than do practitioners of other fields of social science. Is that because economists know what science is? Or is it rather economics about which they agree?" (p. 161). This is the notion of progress that Kuhn is espousing, and it is significant to IS researchers because it answers the question of why IS researchers feel that their discipline is not moving ahead in the way other disciplines are. Instead of arguing about the perfect definition of IS, we should be working on the changes to techniques and methods (or ideology as the case is with this paper) that would enable our field to progress. Progress is the "universal concomitant of scientific revolutions" (Kuhn 1996, p. 166). An academic discipline is a science because it makes progress and this should be the focus of IS researchers, developing the scales that will accurately measure IS constructs and variables. As Kuhn observes, the reason why IS appear not to be making progress is because there are competing schools within it that are questioning the foundations of the field. The members of the community should be pleased, because the progress from addressing competing schools will eventually add to the collective achievement of the group. This brings us to the next criterion for disciplinarity -- how a discipline is constructed.

Construction of the Discipline

Despite the voluminous arguments between the followers of Kuhn, and their opponents, and the subsequent abuse of the term "paradigm", there are many instructive lessons from that overall discussion for the construction of the IS field. These discussions answer many questions put forward by several IS authors. For example, the answer to the question, "should we be looking for a paradigm?" depends on what one defines as paradigm. Kuhn never suggested that members of a discipline spend their time developing a paradigm as such, but rather to develop laws, theories, applications and instrumentation, all of which constitutes a paradigm that will provide a model for coherent traditions of scientific research. Deciding on positivism or intrepretivism is not deciding on a paradigm in the Kuhnian sense, instead that endeavor is merely the beginning of a long process of construction that will eventually lead to a paradigm. These two philosophical approaches will define the variables and instruments that will be used to build theory, and assuming most IS researchers can agree on those discoveries, will result in a productive paradigm. So our preoccupation, as Kuhn stresses, should be in developing theory through the process of invention, innovation and creativity. In formulating his own theory of scientific revolutions, he started by trying to answer the question of "who invented the wheel" and concluded that major shifts in paradigms are seldom an isolated event but instead is the result of the work of a series of talents.

Banville and Landry (1989) ask the question, "If one is to build a paradigm, then the scientific community to which it will apply has to be identified. But, then, who are the members of MIS? (p. 49)", and the follows up with, "it seems dubious that we could end up with a paradigm that could include the different approaches currently found in the MIS field" (p. 49), and finally the assertion, "Those claiming a paradigm for MIS seem to think that it could be created by a group of persons through simple force of will and adherence to a strict set of rules (p. 50)." They conclude by asserting that Kuhn's model is too restrictive in its application to bring a valuable contribution to the MIS field, and that the advent of a paradigm does not necessarily guarantee progress in a field. Hopefully, the preceding paragraph has answered some of these concerns. Kuhn, in explaining the four characteristics of the scientific community, answers Banville and Landry's (1989) first question by identifying those people that will be members of a scientific community as follows, (1) those concerned about the behavior of nature (in our case, the behavior of social systems), (2) those that are working on specific detailed problems as opposed to general ones, (3) those that have solutions that satisfy not only themselves, but others, and (4) the group that shares these solutions should be drawn from a well-defined community of the researcher's professional compeers (i.e. that the IS community collectively chooses). This description contains a systemic implication that whomsoever the IS scientific community chooses, they will safeguard the progress of the field based on their mutual agreement.

The answers to the second question of whether or not it is possible to find a unifying paradigm that is capable of including all the different approaches currently found in IS lies with the Kuhn's explanation of how scientific research progresses. Kuhn asserts that scientific research can proceed without a common paradigm – only that it won't progress very far, just like how strategic management floundered before Porter's Competitive Strategy. A paradigm need not include all the different approaches of referent disciplines because a dominant paradigm may be realized from any one or combination of referent disciplines. A paradigm is an accepted example of actual scientific practice – a law, theory, application and instrumentation – that is accepted, when theories from different fields contribute to give life to a new discipline much like how molecular biology (and its successor genetic engineering) became the dominant discipline as a result of applying physics' technical and cognitive skills to the traditional discipline of biology. Using the paradigm provided by physics, the discipline of biology was reframed, and became "better" (Keller 1990). Which referent discipline will become the dominant paradigm for MIS is anyone's guess, but that paradigm must rise and be agreed upon by the members of the MIS community.

The emergence of paradigms reflects the process of construction of an academic discipline. It is not any more restrictive than attempting to build a "framework" for MIS or classifying MIS into a classificatory scheme. Placing MIS into a classificatory scheme is the necessary initial step in generating theory (Dubin 1969), but is not sufficient for theory building. Banville and Landry's (1989) classification of MIS as a fragmented adhocracy explains the identity crisis within IS, the low functional dependence of findings and weak barriers of entry that IS suffers from, but it does not suggest a direction for the field. This finding is not unlike Kuhn's explanation of the period of "pre-science" where there is an absence of a common paradigm resulting in research that will seem equally relevant such that "early fact gathering is a far more nearly random activity" (Kuhn 1996, p. 15). So, new IS researchers should not be required to spend their energies building paradigms, only to perform the three major foci (Kuhn 1996) of establishing their discipline (1) discovering the set of facts that describe the nature of their discipline (inductive research), (2) show agreement between discovered facts and theories and results of their experiments (deductive research), and (3) articulate their theories clearly (theory building) as a result of doing (1) and (2).

One of the greatest challenge in theory building in IS is determining what units are interacting within a social system. Dubin (1969) describes this challenge as the interplay between the precision paradox and the power paradox. The precision paradox asks how is it possible for researchers to predict anything without knowing something about the phenomena being predicted. The power paradox asks how can researchers build models of understanding without providing at the same time, the precision in predicting. Dubin (1969) answers the first paradox by proposing that researchers can start with predicting *when* persistent changes in the system states will occur and *what* states will succeed each other without the detailed knowledge of how the system operates. He answers the second paradox by proposing that researchers can understand the system by providing a limited, simplified and broad theoretical model that will still contribute significantly to understanding without necessarily being able to predict. This is why it is important that new research should start with simpler units of research. Dubin (1969) provides a classification of units or variables to be studied in research:

1. Enumerative unit – the property of a thing that is always present and measures *how much* of that property is present. Examples of an enumerative unit is organization size or span of control

2. Associative unit – the property of a thing that may or may not exist, can be zero or negative in value and is often missed in the theoretical description (or hidden as intervening variables). Examples of associative units are system accessibility and reliability.

3. Relational unit – the property that exist because of the relationship between two things. Examples of relational units are perceived usefulness, ease of use, flexibility, and user acceptance.

4. Statistical unit – the measure that summarizes the distribution of a property of a thing. Examples of statistical units are frequency of use of IS and mean response time

5. Summative unit – a global unit that stands for an entire complex thing and usually the result of the interaction of many properties. Examples of summative units include system quality, system success and organizational impacts.

A survey of the measures used in IS research (Delone et al. 1992) suggest that most IS researchers prefer to use summative and relational units, even during initial stages. Dubin (1969) strongly advises against the use of summative units ("such units are useless in theories and theoretical models", p. 62), and advise care when using relational units. New researchers should focus on the simpler enumerative and associative units because they are the building blocks of theory. With the proliferation of relational and summative units it is little wonder that many research results in IS are contradictory.

Socializing Practice

The fourth criterion for IS to qualify as an academic discipline is the need for a socializing practice. Socializing practices refer to the ensemble of practices that makes modern discipline possible, including what Foucault (1977) refers to as a set of strategies and technologies of power, or Whitley's standards for organizing and controlling research within a reputational system (Hoskin 1993; Whitley 1984). Hoskin explains Foucault's concept of discipline as both a form of knowledge and as a form of power. Hoskin (1993) relates the significance of this concept in the case of the rise of education as a discipline in the late eighteenth century when educational practices started to apply constant rigorous examination, numerical grading of results and insistent practice of writing by students. It was these paradigmatic shifts in educational practices that transformed the field into a discipline. Similarly, Whitley (1984) applies sociology to analyze the relationships between the members of a discipline and their ability to produce knowledge and interpret each others results. In this matter, the IS discipline has progressed, with its highly regarded institutions and journals. Unfortunately, these highly regarded institutions and journals however are being held back by the weaknesses of the earlier three criteria for disciplinarity. Until and unless the members of the IS discipline demonstrate progress with regard to all these criteria of disciplinarity, the field will have difficulty establishing itself as a mature discipline.

Having satisfied myself with an analysis of the discipline, I searched for a philosophical approach that would be capable of advancing the maturity (and breathing life into) of the field and perform the same transformations that strategic management, education and accounting had experienced. I have found such an approach within the study of the philosophy of technology.

Toward a Imperative for Responsibility for IS

Lee (1999) defines information system as an "instantiation of intellectual technology". Lee describes "intellectual technology" as a kind of technology that is not only shaped by humans but also influences the intellects of its implementers and users. Intellectual technology does not have a fixed set of functionalities and can therefore be innovated endlessly such that, depending on its recursive interaction with the human intellect, will extend and contribute to the social system in ways that its creators never imagined.

This description of information systems as the interaction between technology and social systems is consistent with the study of social philosophy or rather a branch of social philosophy called the philosophy of technology (Feenberg 1991). The development of the field of philosophy of technology in North America mirrors in many ways the development of IS. Both started at about the same time (the Society for Philosophy and Technology was founded in 1975), and with the advent of information and communication technologies such as the Internet, both have been transformed and challenged.

The initial philosophy of technology viewed technology as instruments. This instrumentalism approach (or often referred to as the functionalist view) assumes that the means (the technology) and the ends (the problem to be solved) are independent, and that technology is a neutral instrument, a pure means, based on universal knowledge serving natural needs. Although the people managing the technology are political beings, the technology itself is apolitical and is subject to human control. Impacts are considered as side effects of the use of technology. The early research in information systems followed this paradigm (in the Kuhnian sense) and consequently focused on "management information system" which included working on information requirements techniques in order to build technology that was most useful and functional, reporting formats that was most meaningful, data modeling and analysis techniques that was most accurate, decision support technologies for decision making (Markus 1999). The main customer of IS organizations were the internal users and the mission was basically to develop effective technologies that managed numeric, data-oriented computing. As Markus notes, this narrow instrumentalist approach has caused IS to ignore many important changes in the environment and have caused IS efforts to fall continually behind technology's ever increasing pace. Currently, not only has the nature of the technology changed (e.g. multimedia-based information as opposed to numeric, data-based information), the providers of these technologies are no longer internal IS organizations, adding to an overwhelming feeling of loss of control. Clearly the paradigm of IS has to shift from the instrumentalist and functionalist approach.

In 1955 the German philosopher, Martin Heidegger, a student of Husserl, the founder of Phenomenology, wrote "The Question Concerning Technology", an essay that proposed a different approach to understanding technology. This essay was translated by William Lovitt into English and available in Heidegger (1977). Heidegger explains that traditionally, techné (the term that defines the principles involved in producing an object or bringing about an end; technology in the broadest sense) was as a kind of activity conceived as a response to necessity rather than an independent activity with an ultimate goal. Traditional analysis said that techné did not change the essential nature of human or other non-humans. Heidegger argues that this is not the case. Techné instead affects the metaphysical aspect of things by becoming a specific mode of "revealing" (e.g. a hydroelectric dam changes the essence of a river from a producer of water to become a produce of power). Heidegger asserts that the ends cannot be separated from the means. Humans as inventors of technology are not outside the technology; instead, human actors are part of the technology. This may not be so apparent with common physical technology (such as a drill), but is obvious with information technology, where the tools not only form the actors' environment and shape, but also transform their lives. The tasks they perform with information technology determine who or what they are (e.g. Internet chatting). The impact of the technology no longer becomes merely a side effect; it is an essential consequence of technology and has substantive value implications. This is Heidegger's substantive philosophy. His student, Hans Jonas, also a student of Husserl, extended Heidegger's philosophy in understanding technology to introduce another approach that I feel is most appropriate for information technology – the "imperative of responsibility".

Jonas (1984) summarizes the imperative of responsibility as "The concept of responsibility implies that of an ought -- first of an ought-to-be of something, then of an ought-to-do of someone in response to the first." Jonas argues that traditional sense of responsibility, where no one was held responsible for a later unintended effect of a well-intentioned, well-considered act, can no longer be applied. Everything has changed because technology has "introduced actions of such novel scale, objects, and consequences that the framework of former ethics can no longer contain them" (p. 6). Goodpaster (1983) applies Jonas's idea of responsibility to corporate responsibility and explains it as a ternary relationship where the subject of responsibility (a person, organization or system) is responsible for the object of responsibility (some other person, organization, task or system), and is accountable to some authority (another person, organization or system). Responsibility has several attributes including time, grounds (reasons for responsibility) and context. In terms of time, responsibility can happen at different times contingent on when the subject acquires responsibility or when the object occurs. In terms of grounds, responsibility can be based on principles or values, an agreement, contract or role.

In discussing context, responsibility is used in three contexts, causal, rule-following, and decision-making. In the causal use of the term an actor is responsible if a certain action or event was wholly or in part caused by the action of that particular actor (e.g. who was responsible for a computer virus). "In the causal sense, we are concerned with determining such matters as intent, free will, degree of participation, as well as reward and/or punishment" (Goodpaster 1983). In the rule-following use of the term, we can focus our attention not on determining who or what brought about a certain action or event, but on the socially expected behavior associated with certain roles (e.g. analysts have a responsibility for the accurate delivery of information from a systems). When an actor is responsible in the rule-following context, it is essentially a commendation for following the rules or meeting the expectations of his or her station. The third context is in the decision-making sense of responsibility that relates to the way in which an actor thinks about and responds to choice situations. "When we say of Bill Jones that he is a responsible person, we convey that he is reliable and trustworthy, that he can be depended upon to interpret situations and take actions that manifest both integrity and concern for those affected by them" (Goodpaster 1983). So for example, the CIO may be held responsible for the successful implementation of change in a business process.

Why Is the Imperative of Responsibility Critical to Information Systems

This imperative of responsibility goes beyond ethics in information systems – rather it becomes a teleological issue. I am proposing a teleological commitment for information systems to prescribe to this philosophy. The adoption of this philosophy offers a multitude of benefits for the discipline of IS.

Imperative of Responsibility for Legitimacy of the IS Discipline

By moving away from the instrumentalist approach to Jonas's substantive approach, the IS discipline is anchored to a teleological basis which legitimizes its existence. Information systems are no longer extensions of human activity, instead, intellectual technology can be "the Calling of Mankind" (Jonas 1984, p. 9) because intellectual technology is capable of becoming an "infinite forward-thrust of the race, its most significant enterprise, in whose permanent, self-transcending advance to ever greater things the vocation of man tends to be seen, and whose success the maximal control over things and himself appears as the consummation of his destiny" (p. 9). Although this statement is applicable to all kinds of technologies, it is the IS discipline at this stage of its development that will benefit most from it. The IS discipline is to assume an ethical significance in human purpose, necessary to fill the rule-following and decision-making gap of responsibility within organizations or society. Computer scientists cannot be held accountable for the computers that wrongly label an organ for a transplant, or a doctor mistakenly reading that same label, resulting in the death of the recipient of that organ. However, the IS expert can be held accountable for failing to meet the expectations of reliability and accuracy, or for failing to institute adequate checks within the surgery process, checks that could have spotted the error before the surgery was performed. The lack of care in this case can be attributed to ascribing to an ill-suited philosophy that the information technologies used in medicine are mere instruments for doctors, when in fact, the technologies have become doctors, or in Husserl's and Heidegger's terms, the "essence" of the doctor has been transformed by information technology. Who besides information systems specialists are more qualified in figuring out the best "infostructure" that will be able to provide the necessary safeguards against fatal mistakes in the medical environment, and will be able to suggest to computer engineers how to incorporate that "infostructure" into a suitable computer architecture. Similarly, at another level, who besides the information systems specialists was in the best position to predict and help avert the dot-com crash given that they have the combined technical, business and economic training to understand the interplay between intellectual technology and industry?

The Imperative of Responsibility is Independent of the Nature of the Intellectual Technology and Level of Analysis

Markus (1999) laments the inability of IS research to address fundamental organizational and technological changes (e.g. change from internal IS to inter-organizational IS and from numerical data to imagery-related information) in the environment. This inability can be partly attributed to the philosophy that limits the field of study to functional measures, as opposed to Heidegger's concept of the essence of technology. Using Heidegger's concept of the essence of the technology, the social system regardless of the level of interaction and the nature of the technology, becomes the focus of attention (e.g. the river as the source of power as opposed to the dam as the source of power). The imperative of responsibility carries this concept further from organizational boundaries and technology, and questions the ethical values related to the essence of the technology. So, regardless of the next technological marvel to come along, if IS research has all along focused itself on how to care for, while transforming the essence of the social system, IS research becomes less dependent on the changes in organization and technology.

The Imperative of Responsibility Clarifies the Customer and the Mission of Information Systems

The imperative of responsibility clarifies the customer of information systems. As Markus (1999) explains, IS groups may suffer if they attempt to choose to serve either from internal users or external vendors, or try to become everything to everyone, in which case their loyalties will be questioned by all parties. The imperative of responsibility resolves this by allowing society and unifying ethical standards to decide who should be the customer for IS groups. In the case of the tussle between the user groups and external developers, legal considerations might supercede any one's interest. In the example of the hospital malpractice case, the patients are the ultimate customer and all efforts are focused in fulfilling the patient's care and safety over and above the needs of the internal organization, the hospital or the vendors. In the case of the Ford Pinto explosions in the 1980's, although the company was responsible for directing the engineers not to install safety features despite clear dangers from the design, the engineers failed to care for their ultimate customers, the people who will be driving the car.

As far as the mission of IS, Markus (1999) discusses the dichotomy between the need to improve the organization as opposed to improving the IT infrastructure. Markus proposes that the mission of IS should be the integration of technical, socio-technical, governance, managerial, vendor and socio-economic issues all at the same time. This task is problematic because each social system has their vested interest in IS and often conflict with one another. The IS specialist might reside in any one of these social systems forcing them sometimes to make decisions that are not to the advantage of one or more of the other social systems. This is where the imperative of responsibility becomes instructive. Depending on the ultimate customer in each case, the IS specialist is responsible for the care of that customer. So if it makes "good sense" to not implement an enterprise-wide system in an organization because, according to the experience of the IS specialist, it will cause delays and disrupt critical operations (e.g. in a hospital), the IS specialist is responsible for explaining these risks to the organization, even at the expense of not expanding their business.

The Imperative of Responsibility Uncovers Fundamental Dependent Variables for IS

Because of the prevailing functionalist philosophy, DeLone and McLean (Delone et al. 1992) found that most dependent variables in IS revolves around either the amorphous technology (system quality, information quality, use) or around the equally subjective measures interpreted by human actor or actors using the technology (user satisfaction, individual impact and organizational impact). The proliferation of variables made comparison difficult and failed to add to the cumulative tradition of the field. The imperative of responsibility will force researchers to either use generally accepted legal or social measures as dependent variables or proven measures from other disciplines. This does not mean that IS will not have its own measures, only that research needs to start with simpler enumerative and associate measures from established disciplines before concluding with relational or summative measures of its own. Research in IS also needs to become more creative in discovering new units as opposed to using associative financial measures (profit and economic performance) without first testing for other intervening social variables.

Conclusion

I have analyzed IS as an academic discipline and noted which areas need to be worked on for the field to progress. In the area of genealogy, new researchers should focus on applying core theories from referent disciplines instead of building on research that had not applied those core theories appropriately. I have also stressed the importance of IS researchers to erect boundaries for the discipline by producing knowledge that maintains social order, instead of looking for "natural" epistemological structures. This act of erecting boundaries through invention, innovation and creativity is called progress and is the reason for any field to be called a discipline. I have answered questions pertaining to paradigm development, specifically how IS can accept a unifying paradigm by allowing laws, theories, applications and instrumentation from within or from outside the field to shape the direction of the field through mutual agreement among its experts. This agreement can only come about if new IS researchers develop their units of research with care. I commend the development of the socializing practice within IS and propose a philosophy of technology, called the substantive philosophy of technology to replace the prevailing instrumentalist philosophy of technology. This approach is extended further to arrive at an operational ideology for IS – the imperative of responsibility. This ideology is significant for IS because it offers the teleological basis for the legitimacy of the field, it frees the discipline from its organizational and technological limitations, it clarifies who the customers of IS should be and provides a clear mission for the discipline and it opens up the discipline to a more fundamental list of dependent variables that it can choose from. With these principles in hand, I can now start on my area of research.

References

Adam, F., and Fitzgerald, B. "The Status of the IS Field: Historical Perspective and Practical Orientation," *Information Research* (5:4) 2000.

Amariglio, J., Resnick, S., and Wolff, R. “Division and Difference in the Discipline of Economics,” in: *Knowledges: Historical and Critical Studies in Disciplinarity,* E. Messer-Davidow, D.R. Shumway and D.J. Sylvan (eds.), University Press of Virginia, Charlottesville, 1993.
Banville, C., and Landry, M. “Can the Field of MIS be Disciplined?,” *Communications of the ACM* (32:1) 1989.
Barney, J.B. “Strategic Management: From Informed Conversation to Academic Discipline,” *Academy of Management Executive* (16:2) 2002.
Ciborra, C.U. “Crisis and Foundations: An Inquiry into the Nature of Limits of Models and Methods in the Information System Discipline,” *Journal of Strategic Information Systems* (7) 1998, pp 16-May.
Ciborra, C.U. *From Control to Drift: The Dynamics of the Corporate Information Infrastructures* Oxford University Press, New York, 2000.
Ciborra, C.U. *The Labyrinths of Information: Challenging the Wisdom of Systems* Oxford University Press, New Yori, 2002.
Corbett, C., and van Wassenhoff, L. “The Natural Drift: What Happened to Operations Research?,” *Operations Research* (41:4) 1993.
Culnan, M.J. “The Intellectual Development of Management Information Systems, 1972-1982: A Co-Citation Analysis,” *Management Science* (32:2) 1986, pp 156-172.
Culnan, M.J. “Mapping the Intellectual Structure of MIS, 1980-85: A Co-Citation Analysis,” *MIS Quarterly* (11:3) 1987, pp 340-353.
Culnan, M.J., and Swanson, E.B. “Research in Management Information Systems, 1980-1984: Points of Work and Reference,” *MIS Quarterly* (10:3) 1986, pp 289-302.
Delone, W.H., and McLean, E.R. “Information System Success: The Quest for the Dependent Variable,” *Information Systems Research* (3:1) 1992.
Dubin, R. *Building Theory* The Free Press, New York, 1969.
Feenberg, A. *The Critical Theory of Technology* Oxford University Press, New York, 1991.
Fildes, R., and Ranyard, J.C. “Success and Survival of the Operational Research Groups: A Review,” *Journal of the Operational Research Society* (48:4) 1997.
Foucault, M. *Discipline and Punish* Allen Lane, London, 1977.
Fuller, S. “Disciplinary Boundaries and the Rhetoric of the Social Sciences,” in: *Knowledges: Historical and Critical Studies in Disciplinarity,* E. Messer-Davidow, D.R. Shumway and D.J. Sylvan (eds.), University Press of Virginia, Virginia, 1993.
Fuller, S. *Science* University of Minnesota Press, Minneapolis, 1997.
Galliers, R.D. “Choosing Information Systems Research Approaches,” in: *Information Systems Research: Issues, Methods and Practical Guidelines,* R.D. Galliers (ed.), Blackwell Scientific Publications, Oxford, 1992.
Gieryn, T.Y. “Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists,” *American Sociological Review* (48) 1983, pp 781-779.
Goles, T., and Hirschheim, R. “The Paradigm is Dead, the Paradigm is Dead...Long Live the Paradigm: The Legacy of Burrell and Morgan,” *Omega* (28:3) 2000, pp 249-268.
Goodpaster, K. “The Concept of Corporate Responsibility,” *Journal of Business Ethics* (2:1) 1983.
Heidegger, M. *Basic Writings from Being and Time to the Task of Thinking* Harper & Row, New York, 1977.
Hirschheim, R.A. “Information Systems Epistemology: An Historical Perpective,” in: *Research Methods in Information Systems*, Elsevier Science Publishers B.V., 1985, pp. 13-36.
Hoskin, K.W. “Education and the Genesis of Disciplinarity: The Unexpected Reversal,” in: *Knowledges: Historical and Critical Studies in Disciplinarity,* E. Messer-Davidow, D.R. Shumway and D.J. Sylvan (eds.), University Press of Virginia, Charlottesville, 1993.
Hoskin, K.W., and Macve, R.H. “Accounting as Discipline: The Overlooked Supplement,” in: *Knowledges: Historical and Critical Studies in Disciplinarity,* E. Messer-Davidow, D.R. Shumway and D.J. Sylvan (eds.), University Press of Virginia, Charlottesville, 1993.
Ives, B., Hamilton, S., and Davis, G.B. “A Framework for Research in Computer-Based Management Information Systems,” *Management Science* (26:9) 1980, pp 910-934.
Ives, B., and Olson, M.H. “User Involvement and MIS Success,” *Management Science* (30:5) 1984.
Jonas, H. *The Imperative of Responsibility* University of Chicago Press, Chicago, 1984.
Keller, E.F. “Physics in the Emergence of Molecular Biology,” *The Journal of the History of Biology* (23) 1990.
Khazanchi, D., and Munkvold, B.E. “Is Information Systems a Science? An Inquiry into the Nature of the Information Systems Discipline,” *The Database for Advances in Information Systems* (31:3) 2000.
Klein, J.T. “Blurring, Cracking, and Crossing: Permeation and the Fracturing of Discipline,” in: *Knowledges: Historical and Critical Studies in Disciplinarity,* E. Messer-Davidow, D.R. Shumway and D.J. Sylvan (eds.), University Press of Virginia, Charlottesville, 1993.
Kuchinke, P.K. “Why HRD is Not an Academic Discipline,” *Human Resource Development International* (4:3) 2001.

Kuhn, T. *The Structure of Scientific Revolutions* University of Chicago Press, Chicago, 1996.

Lee, A.S. "Researching MIS," in: *Rethinking Management Information Systems,* W. Currie and B. Galliers (eds.), Oxford University Press, Oxford, 1999.

Lee, A.S., Liebenau, J., and DeGross, J.I. *Information Systems and Qualitative Research: IFIP WG8.2 Working Conference* Chapman and Hall, London, 1997.

Lowry, P.B., Anderson, H.W., Wilson, D.C., Leroy, G., and Lin, L. "MIS Legitimacy and the Proposition of a New Multi-Dimensional Model of MIS," Annual Conference of the Southern Association for Information Systems, Atlanta, GA, 2000.

Lucas, H.C. "The State of the Information Systems Field," *Communications of the Association for Information Systems* (1:5) 1999.

Manicas, P.T. *A History and Philosophy of the Social Sciences* Blackwell, New York, 1987.

Markus, M.L. "Thinking the Unthinkable: What Happens If the IS Field as We Know It Goes Away?," in: *Rethinking Management Information Systems,* W. Currie and B. Galliers (eds.), Oxford University Press, New York, 1999.

McKelvey, B. "From Fields to Science," in: *Point/Counterpoint: Central Debates in Organization Theory,* R. Westwood and S. Clegg (eds.), Blackwell, Oxford, 2001.

McKelvey, B., and Baum, J.A.C. "Donald T. Campbell's Evolving Influence in Organization Science," in: *Variations in Organization Science: In Honor of Donald T. Campbell,* B. McKelvey and J.A.C. Baum (eds.), Sage, Thousand Oaks, 1999.

Messer-Davidow, E., Shumway, D.R., and Sylvan, D.J. "Disciplinary Ways of Knowing," in: *Knowledges: Historical and Critical Studies in Disciplinarity,* E. Messer-Davidow, D.R. Shumway and D.J. Sylvan (eds.), University Press of Virginia, Charlottesville, 1993.

Nissen, H.-E., Klein, H.K., and Hirschheim, R. *Information Systems Research: Contemporary Approaches and Emergent Traditions* Elsevier North-Holland, Amsterdam, 1991.

O'Donovan, B., and Roode, D. "A Framework for Understanding the Emerging Discipline of Information Systems," *Information Technology and People* (15:1) 2002, pp 26-41.

Pfeffer, J. "Barriers to the advance of organizational science: Paradigm development as a dependent variable," *Academy of Management Review* (18:4) 1993, pp 599-620.

Ramasamy, B., Chakrabarty, A., and Cheah, M. "Malaysia's Leap into the Future: An Evaluation of the Multimedia Super Corridor," 08/2002, Centre for Europe-Asia Business Research, University of Nottingham, Kuala Lumpur, 2002.

Sprague, R.H., Jr. "A Framework for the Development of Decision Support Systems," *MIS Quartely* (4:4) 1980, pp 1-27.

Stowell, F., and Mingers, J. "Introduction," in: *Information Systems: An Emerging Discipline?,* J. Mingers and F. Stowell (eds.), McGraw-Hill, London, 1997.

Weber, R. "Toward a theory of Artifacts: A Paradigmatic Base for Information Systems Research," *The Journal of Information Systems* (1:2) 1987, pp 19-Mar.

Whitley, R. *The Intellectual and Social Organization of the Sciences* Clarendon Press, Oxford, 1984.