doi:10.2498/iti.2012.0483

I.S. Research of Business Practices: Many, One or Zero Academic Disciplines?

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Abstract. *This paper discusses the identity crisis in the Information Systems (I.S.) academic discipline. It reviews how Kuhn's concepts of paradigm and (normal) science apply to I.S. and argues that I.S.'s scope is too broad and too disconnected from practice. The paper proposes that I.S. become a professional discipline, guided by issues faced by practitioners, e.g., Chief Innovation Officers. I.S. research would center around the management of provisioning, operation and maintenance of I.T. Similar to other professional fields (e.g., medicine), I.S. researchers would be practitioners. The paper concludes with a sample of important research questions for I.S. as a professional discipline.*

Keywords. I.S. identity crisis, paradigm, normal science, professional discipline.

1. Introduction

Over the past few decades, a crisis has been debated in the academic field of Information Systems (I.S.), namely an identity crisis [4]. One indication of this crisis is declining enrollments in I.S. programs, possibly caused by offshoring of jobs [9]. Another is that, within several business schools, I.S. departments/units have disappeared into more-traditional departments, e.g., into General Management at Harvard Business School; and into Innovation Management and Strategy and Innovation at the University of Groningen, the Netherlands (the university where I got my undergraduate and master's degree in econometrics). The latter awards the Aart Bosman prize (which I fund) for the best PhD dissertation in Information Systems in the Netherlands and Belgium every two years. New "information schools" have sprung up and have formed a collective (see ischools.org). Members include the School of Information at Berkeley and Heinz College School of Information Systems and Management at Carnegie Mellon University (the university where I got my Ph.D. degree). Various aspects of I.S. research that may be releated to the crisis have been debated, for example, rigor versus relevance [14,15], and lack of focus on the Information Technology (I.T.) artifact [4].

In this paper, I share my views of the identity crisis of I.S. as an academic discipline. They are basically that I.S. is currently too broad, pre-paradigmatic if I.S. were a science (which in my view it is not), and too disconnected from practitioners and their professional issues. I present proposals for giving I.S. a clear identity. They center around focusing on management issues by our core customers (Chief Information Officers (CIOs), Directors of I.T, and the like) and having I.S. researchers practice in the field.

2. Is I.S. a scientific discipline?

This section discusses implications of the definition(s) of I.S., whether I.S. is a discipline, any paradigms of I.S., and whether I.S. is a science (as opposed to a professional discipline). In contrast to the view of others (e.g., in [3]), this section draws heavily from Kuhn's views of scientific revolutions [11]. References in this section are to [11], unless noted otherwise.

2.1. Definition of I.S.

Various definitions of I.S. include I.T. (hardware and software), people (e.g., users), processes (e.g., workflow) and the impact of the I.T. (e.g., on business results) [4]. (Page length restrictions have limited the number of references cited.) I.T. is truly pervasive and ubiquitous. A current example of the ubiquity of I.T. is analytics, an important area of contemporary research and an important plank of strategy of important I.T. vendors, e.g., IBM,

SAP, Accenture and others. Analytics can be viewed as part of statistics, which gives us the methods and techniques to draw insights from data sets, or of mathematics, because analytics engines make use of (sophisticated) mathematics. Analytics can also be viewed as part of I.S., because I.T. systems process the data and generate the results. Or, it can be viewed as part of business functions, e.g., management accounting or marketing, which focus on metrics that are important for running such functions. Whereas I.T. in businesses at first supported mostly accounting activities (e.g., payroll), over the years I.T. has come to support every business function, ranging from purchasing to after-sales service, from day-to-day operations to long-term strategy. Hardly any type of organization (business, non-profit, government) can run efficiently, if at all, without I.T., regardless whether the organization is small, medium-size or large, or where it is located.

Consequently, with I.T. being ubiquitous, its impact encompasses virtually everything. But, I.S. cannot study the impact on everything, because then it would be the study of everything, encompassing large parts of existing fields such as psychology, sociology, public policy, international relations, healthcare, political science, business management and so on. On the face of it, it is clear that such established fields are not, and likely will not become, a specialty within I.S. Moreover, the impact of I.T. on most topics X is, in my view, a subject of the relevant discipline for X. For example, the impact of I.T. on (anti-)social behavior is the subject of, e.g., social psychology or criminology. Impact of I.T. on political processes, e.g., the Arab spring, is the subject of political science or public policy. Impact of I.T. on (public) health is the subject of medicine or public health policy.

Applying systems theory (also advocated in [2]), shows that these various disciplines deal with systems that are different in kind and complexity. Miller, e.g., describes a hierarchy of seven different types of systems, ranging from a (biological) cell to a supranational system (i.e., a group of societies) [12]. In terms of Miller's hierarchy, I.T.'s impact can be studied at the level of cells or organs (e.g., the impact of cell phone handsets on the brain), or of organisms such as humans (e.g., the impact of User Interface design on user satisfaction), or groups (e.g., the impact of Group Decision Support Systems on an executive team's decision making), of organizations (e.g., the impact of ERP on a firm's competitive advantage), or societies (e.g., the impact of the internet penetration on national competitiveness), to groups of societies (e.g., impact of social media on democratization). These are topics for, respectively, medicine, psychology, social psychology, business, economics, and international public policy.

In order to study the impact of I.T. on any topic X, one has to understand *only* those aspects of I.T. that potentially affect X, but should understand *most* aspects of X. For example, my own research on Strategic Use of I.T. [7] revolves around the question "how to use I.T. in order to create/sustain a competitive advantage?". But, that question is a subset of the more general question "how to use X in order create/sustain a competitive advantage?". Hence, in my view, research into Strategic Use of I.T. falls within the discipline of competitive (business) strategy, not within I.S. After all, knowledge of only particular aspects of I.T. is required to reason about its potential to create/sustain a competitive advantage. However, a thorough knowledge is required of many aspects of competitive advantage.

Consequently, in my view, definitions of I.S. are often too broad, particularly when they include the impact of I.T.

2.2. Is I.S. a discipline?

I view a discipline as a field of study/research where there is broad consensus about what the important questions are. Such consensus is an important aspect of what is considered a paradigm. Kuhn [p. 19] states that "a group's first reception of a single paradigm" has usually been associated with "the formation of specialized journals, the foundation of specialists' societies, and the claim for a special place in the curriculum". These three conditions have certainly been met by I.S., as evidenced by prominent journals, e.g., MIS Quarterly and Information Systems Research, societies such as the Association for Information Systems, and several model curricula. In addition, the field has had prominent conferences for decades such as the International Conference of Information Systems and the Hawaii International Conference on Systems Sciences. So, I.S. can be viewed as a (i.e., one) discipline.

However, I.S. is often called inter-disciplinary or multi-disciplinary and even trans-disciplinary [5], perhaps because "in the early stages of a

science's development" a "body of belief [may] be externally supplied, perhaps by […] another science" [p. 17]. So, to the extent that I.S. is incorporating multiple disciplines, I.S. can be viewed as consisting of multiple (i.e., many) disciplines.

But, if I.S. integrates other disciplines, what then is I.S.'s own discipline? Ever since Newton, physics has had a certain interplay with mathematics, and with chemistry and astronomy, but physics is generally not viewed as inter-disciplinary, because it is its own discipline. Is I.S. no (i.e., zero) discipline on its own? Does it have a paradigm of its own?

2.3. Is I.S. pre-paradigmatic?

Kuhn defines paradigm as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of [researchers]" [p. viii]. While a number of commentators have noted the multiple meanings Kuhn attaches to the term paradigm and others noted a change in his thinking about "paradigm" over time, I interpret Kuhn's concept of paradigm to revolve around a consensus among researchers in a given field about the answers to "questions like the following [p. 4]: what are the fundamental entities of which the universe is composed? (and, by implication, which entities the universe does not contain" [p. 7] and "the ways in which those entities behave" [p. 109]) How do these interact with each other […]? What questions may legitimately be asked about such entities and what techniques employed in seeking solutions?" Also, "there is, for example, a multitude of commitments to preferred types of instrumentation and to the ways in which accepted instruments may legitimately be employed" [p. 40]. "Paradigms gain their status because they are more successful than their competitors in solving a few problems that the group of [researchers] has come to recognize as acute" [p. 23].

Various researchers who have written about the identity crisis in I.S. appear to agree that there is no consensus among I.S. researchers about the questions mentioned above. (For a summary of opinions by various researchers, see [1].) To some this appears to be a problem, to others it does not. Regardless it could mean that I.S. is in the midst of a "revolution" in paradigms, i.e., changing from one consensus to another. It could also mean, an interpretation I favor, that I.S. has no single paradigm *yet*, i.e., it is pre-paradigmatic. Kuhn's description of a pre-paradigm period matches I.S.'s situation: It "is regularly marked by frequent and deep debates over legitimate methods, problems and standards of solution" [p. 48]. "Throughout the pre-paradigm period […] evidence of progress, except within schools, is very hard to find" [p. 163]. "The debate is about premises, and its recourse is to persuasion as a prelude to the possibility of proof" [p. 199].

For individual researchers, this means that "being able to take no common body of belief for granted, each writer […] felt forced to build his field anew from its foundations. In doing so, his choice of supporting observation and experiment was relatively free, for there was no standard set of methods" [p. 13].

2.4. Is I.S. a "normal" science?

Kuhn uses "paradigm" for "normal science". "Normal science" is when scientists have widely accepted a single paradigm. Is I.S. a "normal science" in this sense? I am not aware of previous articles about I.S.'s identity crisis that address this question in any substance. What does "normal science" do?

First, it increases "the accuracy and scope" of "a class of facts that the paradigm has shown to be particularly revealing of the nature of things" [p. 25]. I.S., however, does not focus on key facts/observations. Suppose that a certain team of programmers produces an extraordinarily large number of lines of code of fully tested code per day per function point. Clearly, I.S. practitioners would find such a fact very important. For researchers, such a fact would be difficult to establish beyond reasonable doubt. And both I.S. practitioners and researchers would want to know why the team of programmers is so productive and how other teams of programmers can raise their productivity accordingly.

Keep in mind that "measurements are paradigm-determined" [p. 126]. After all, focusing on lines of code per day per function point implies a theory in which such concepts are prominent. Yet, major IS journals are unlikely to publish a paper that reported the extraordinary productivity and how that fact was established beyond reproach. Such a paper would likely be dismissed as "merely" presenting facts without trying to prove or disprove a theory.

Secondly, "empirical work undertaken to articulate the paradigm theory, resolving some of its residual ambiguities and permitting the

solution of problems to which it had previously only drawn attention" [p. 27]. In physics, a contemporary example is the search for Higgs bosons, the existence of which was hypothesized some forty years ago, inferred, in turn, from Einstein's relativity theory. In I.S., I am not aware of a well-known theory that generates problems, hypotheses, predictions that are important to I.S. practice.

A third, "usual but smaller", aspect of normal science is determining facts that "can be compared directly with predictions from the paradigm theory" [p. 26]. As alluded to earlier, I.S. certainly aims to, and does, compare facts to predictions from theory. Whether the facts and theory are relevant to I.S. practice is another matter, however. But, in normal science, facts are "often without much intrinsic interest" [p.26], i.e., outsiders may not find them relevant. And "the areas investigated by normal science are, of course, minuscule; […] a small range of relatively esoteric problems" [p. 24]. Hence, based on two out of the three criteria, I.S. is not a "normal science".

2.5. Is I.S. a science?

If I.S. is not a "normal science", we might ask whether I.S. is even any kind of science. To my knowledge, this question has also not been featured prominently in the debate about I.S.'s identity crisis. Kuhn's contrast between the sciences and professional fields is informative. "In the sciences (though not in fields like medicine, technology and law, of which the principal raison d'etre is an external social need) …" [p. 19]. "Unlike the engineer, and many doctors, and most theologians, the scientist need not choose problems because they urgently need solution and within out regard for the tools available to solve them" [p. 164]. Following this view, I.S. is not even a science. Indeed, Loyola University Chicago, where I work, refers to the business school (of which I.S. is a part) as a "professional" school in contrast to the "school of "arts and sciences."

Also, "novelty for its own sake is not a desideratum in the sciences as it is in so many other creative fields" [p. 169]. However, the I.S. field has consistently focused on (the impact of) new information technologies. In my view, I.S. is seduced too easily by new technologies. We have been happily chasing the Gartner Group's hype curve, instead of separating the truly new from "old wines in new bottles." For example, early on, websites were often considered ("hyped") to be a new kind of system. But, for business systems, they were mostly user interfaces (U.I.) of, e.g., transaction processing systems that included data bases, security modules, etc. As a result, U.I. design principles that were well-known for transaction processing systems were not applied to early websites (at best out of ignorance, at worst out of a belief they were not applicable to this "new" technology). For example, the principles to always give users context information of "where they are" in a dialog and to always provide a way back to a previous screen or to the main screen, were well understood and applied for M.I.S. for decades, but not applied to websites when they appeared. Eventually such principles were reinvented for websites. If I.S. had been a science, it would have had a "disinterested" view of website technology, recognized pre-existing U.I. principles and teased out U.I. principles that are unique to websites (e.g., dealing with pathologies of the browser's "Back" button).

On the other hand, articles written in a style that is accessible to practitioners are less likely to be considered serious by I.S. researchers, particularly editors and reviewers of major journals. I.S. is thus isolated from society, which is normal in the sciences. Kuhn speaks of "unparalleled insulation of mature scientific communities from the demands of the laity and of everyday life […] there are no other professional communities in which individual creative work is exclusively addressed to and evaluated by other [researchers]" [p. 164]. The scientific community views itself as "the exclusive arbiter of professional achievement" and "the sole possessors of the rules of the game or of some equivalent basis for unequivocal judgments" [p. 168]. "One of the strongest, if still unwritten, rules of scientific life is the prohibition of appeals to heads of state or to the populace at large in matters scientific" [p. 168].

Given that I.S. researchers (unlike colleagues professions, e.g., medicine) often have no practical experience in the field, the isolation from society in general and from I.S. practice in particular persists. Some claim that I.S. is researching topics in practice, e.g., as suggested in CIO surveys and the like, but others claim I.S. research has generally been of no relevance to such practitioners.

2.6. Summary of challenges for I.S.

The following summarizes my views described above for I.S. as an academic discipline.

a. I.S. is too broad, possibly because
b. I.S. is pre-paradigmatic,
c. I.S. is not a "normal science",
d. I.S. is not a science, but is isolated like one,
e. I.S. is a professional discipline, but does not behave like one.

3. Proposals

To combat those challenges, my proposal is that I.S. narrow its scope, accept it is a professional discipline and behave like one. (Note that, e.g., the Atlantic Systems Guild (systemsguild.com), with prominent members such as Tom DeMarco, have "guild" in their name and refer to themselves as "master craftsmen", thus evoking "professional" and not "academic".) What are the key questions I.S. should focus on? Particularly key questions that other disciplines do not focus on (i.e., differentiation from other disciplines).

I view I.S. as a professional discipline in business management (and thus in business schools), and therefore driven by issues from business managers. Within businesses, our natural constituencies are Chief Information Officers (CIOs), Directors of I.T. and the like and functional managers who specify requirements for I.T. that are important to their business function. Those constituencies share a concern about I.T. artifacts (hardware and software), but they manage (as opposed to do) activities related to the I.T. artifacts. For example, they *manage* the development of software specifications or the preparation of Requests for Proposal for hardware, but they do *not do* those activities themselves [6].

How to *do* activities related to the creation, operation and maintenance of I.T. artifacts is, in my view, the subject of Computer Science and Computer Engineering. In contrast, I propose that I.S. focus on how to *manage* the provisioning (creation or buying), operation and maintenance of I.T. artifacts. Although management of I.T. is one of several areas within I.S., I believe it has not been emphasized in the debate about relevance of I.S. It would also reduce the risk of I.S. falling victim to hype. After all, knowing how to do computer programming generally needs to evolve along with, e.g., new versions of languages such as JAVA, .NET, etc. But, knowing how to manage I.T.-intensive projects generally does not need to change as fast as the underlying I.T.

I believe that questions about managing I.T.-related activities can be relevant without responding directly to issues du jour. For example, there are more-fundamental questions underlying contemporary issues. For example, for 1979 Nobel Prize winner Herbert Simon, the issue of how business managers make decisions had more-fundamental issues underlying it. For example: How do intelligent people go about making good decisions? That led Simon to studying how (grand) masters played chess. While studying chess playing may at first not have seemed relevant to managers, there was a direct connection with business decision making that was very relevant to managers. Likewise, for I.S., the issue of, e.g., how to manage programmers has more-fundamental questions underlying it. For example: Is managing programmers different from managing other types of professionals or workers? If so, in which respects?

For I.S. to become a professional discipline and behave like one, I.S. researchers should be experienced in I.S. practice. This can be achieved in various ways. For example, I.S. researchers might work in the I.T. departments of their university, or spend sabbaticals or "externships" managing I.T.-related activities in businesses. I.S. units could insist on hiring Ph.D.'s who also have practical experience [10].

Of course, careers in business schools depend on journal publications. I propose that reviews be done such that, for each manuscript, practitioners review the relevance of the research question(s) and researchers review the rigor of the research methodology. For I.S. researchers who are also practitioners, both types of reviewers would be peers. Finally, I believe that, particularly, the elders of our profession should have practical experience in managing I.T.-related work. They drive editorial policies, conference themes, and the agenda for the field as a whole.

4. Conclusions

A narrower scope of I.S., focused on I.S. practitioner concerns would, in my view, help to resolve the identity crisis in I.S. as an academic discipline and help others to recognize the contributions our field can make to I.S. practice.

To turn I.S. into a professional discipline, we need a consensus around key research questions that are guided by practitioners' issues.

While the work of developing such a consensus will need to be done, this section list a few example research questions that I would expect to see among the eventual list. Earlier, this paper already suggested a few research questions related to managing programmers. Other questions are: How should the architecture of ageing legacy systems be managed for optimal business results? Should I.T. operations be managed differently than other technology-based operations, e.g., operations of mechanical machinery? If so, why and how? In my own research [8, 13], I have addressed two additional questions: What is the (in-)applicability of conventional project management (as described in the Project Management Body of Knowledge or PRINCE) to I.T. development and maintenance? Should I.T.-based resources, e.g., software, be managed differently from other resources in order to create or sustain a competitive advantage?

5. Acknowledgements

I greatly acknowledge the support of Loyola University Chicago for this research.

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