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The Information Systems Field: Making a Case for Maturity and Contribution

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Abstract

In this paper, I explore the question of whether the field is progressing well. In doing so, I base my opinion on anchors from four independent studies that I have conducted over the years. These studies treat the field in different ways: as an aggregator of terms, a complex adaptive system, part of a knowledge market, and an evolving biological system. The four perspectives offer different ways of framing the question of progress. I describe these perspectives and make the case based on the conclusions formed from logic and data that the field has indeed progressed splendidly. I argue that the field is maturing and making a contribution, and we should be proud of what we have accomplished. However, through each perspective, I also identify some vicious circles to avoid if we are to continue to progress. The portrait is one of optimism and hope, along with the need for sound stewardship going forward.

Keywords: *Information Systems, Field, Discipline, Progress, Maturity, Contribution, Reference Disciplines, Knowledge Product, Sociometrics, Introspective Study*

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1. Introduction

Historically, the information technologies that are instrumental to our field have undergone dramatic change. This is epitomized by Moore's Law, but can also be more richly described in terms of the positive technological attributes of our current systems: more powerful, flexible, integrated, efficient, embedded, among others. Clearly, over the years information technologies and information have become instrumental resources that have a profound effect on business environments. Some would effectively argue that these are the most important resources of our time. If so, then why does a field that deals with the effective deployment of these resources take such a defensive posture to its existence? In the hallowed halls of our various forums and colloquia, we tend to question our boundary, institutions, contribution, and even our viability. Why? Are we not studying important problems involving the use of the most important resources of our time? Do we not have clear boundaries? Are we not adapting ourselves effectively to changes in our corresponding praxis? Are we not competitive in providing knowledge products on our areas of expertise? Have we not dramatically improved the quality of our methods, cumulative tradition of our literature, and pragmatic implications of our results? The answers to these questions might elicit a wide variance of responses from our stakeholders, and they reflect a fundamental dilemma that has historically plagued our field. No one will argue against the significance of the information and IT we deal with or their importance in the organizational context. Yet, many might argue with our contribution as a discipline. Despite having the omnipotent anchor in IT, we still tend to be defensive. Perhaps it is our youth in the institutional structures where we vie for scarce resources. Or perhaps it is the inability to fully own a resource that can be claimed by other fields.

If I were a casual observer trying to position the field today within its historical context, I would categorize its history into a "pre-field" phase and three phases roughly corresponding to the three decades from 1980 to the present. Prior to 1980, there was certainly a field of IS in some minds, but the institutional structures were weak. The pre-field phase in the 1970s was characterized by academics from other fields (like operations research and computer science) who saw research on management information systems in organizations as an important growing area of inquiry. Some prominent researchers (such as Galbraith, Mason, Mitroff, Argyris, and Ackoff) produced pieces, now regarded as classics, that influenced how to structure and study systems in organizations. These spawned clusters of research on various topics pertaining to implementation of information systems in organizations. For instance, Mason and Mitroff's (1973) piece allowed for structuring of experiments (many of them conducted at one of the earliest doctoral programs in MIS at the University of Minnesota). The clusters however, were largely unrelated, the research was based on ad-hoc frameworks, and it was difficult to identify the fabric of the field. The first ICIS conference in 1980 was in many ways the inauguration of a field. It came with Peter Keen's admonition on the dismal state of research and the need to gain credibility through the use of knowledge from reference disciplines. The 1980s saw the beginnings of theoretical development as the advent of the PC spawned research on decision making and end-user computing. The broader impacts of strategic systems and competitive advantage were also studied toward the end of the decade. Both theoretical and methodological development of the field took off in the 1990s as topics crossed multiple levels from the individual (behaviors), to group, organizational, and inter-organizational. A number of introspective studies catalyzed this development, as the institutional structures (journals, societies) garnered firmer footing. The 2000s saw fragmentation on a number of topics that paralleled the technological environment (mobility, e-business, value) as well as a significant proportion of research on deployment of platforms (e.g., enterprise systems) as well as individual technologies. It seems that over these phases the field has been sensitive to the changing environment as it evolved from basic systems approaches, emphasis on data, and emphasis on decisions to usage deployment and impact at individual, organizational, and industry levels. The case for embeddedness of the IT resource within its context today seems to be stronger, as the field remains open to a variety of epistemological and ontological approaches. This embeddedness accentuates the instrumentality of the IT resource in our time, a trend that is not attenuating. Shouldn't our corresponding importance in the broad research landscape be commensurate with this?

In this commentary I will try to address the basic question of whether we have progressed through these decades as a field. By progression, I look at aspects that might indicate a maturing of the field and an enhancement of its contribution to knowledge discourse [1]. Rather than being purely speculative, I will ground my humble opinions in a number of introspective studies that I have participated in over the years[2]. All these studies take a historical and evolutionary look at the field; most involve data, and the majority have been published. Collectively, my goal is not only to reiterate what has been written, but to use the different ways of framing and studying evolutionary trends in the field as anchors for addressing the basic question above. I will present the field using four perspectives: as an aggregator of terms, as a complex adaptive system, as a knowledge market, and as a biological organism. For each of these, I will summarize the logic and the data I have used to study and assess the field from that perspective. I will then make the case based on conclusions formed from logic and data, that the field has indeed progressed splendidly. I will argue that the field is maturing and making a contribution, and we should take pride in what we have achieved. However, through each perspective, we can also identify some dark clouds that we need to avoid if we are to continue to progress. The portrait is one of optimism and hope, along with the need for sound stewardship going forward. In this sense, I am using historical reflection to benefit future actions.

2. The IS Field as an Aggregator of Terms

In order to address the maturity of the field, we need to have some understanding of its constitution. I would contend that mature fields are generally well understood by their contributing members who feel a sense of pride to be a member and a stakeholder. In contrast, immature fields tend to have an inconsistency in the understanding of what the field constitutes. Members may straddle fields as they evaluate where to disseminate their knowledge products while optimizing parochial interests. This does not imply that mature fields can't be fragmented. However, fragments that are conceived as integral to the debate and rhetoric in the field are healthy. I would summarize by indicating that *mature fields have consistency in views over people and time.*

2.1. Perspective

Over the years, we have tried to harness the field by using typologies or frameworks. These frameworks are largely deductive, and have been useful in espousing not only what constitutes the field but also the kind of research that might be valued. For instance, Gorry and Scott-Morton (1971) asserted that "information systems should exist only to support decisions". They broadened the earlier focus on structured operational problems to broader managerial problems with differing information needs. Mason and Mitroff (1973) categorized five types of variables (psychological type, class of problems, organizational context, method of evidence, organizational context, and modes of presentation) as constitutive of IS research. Ives, Hamilton, and Davis (1980) established a new framework, with five categories of research consisting of different variable groups. It started with the MIS definition as a “computer-based organizational information system which provides information support for management activities and functions.” Nolan and Wetherbe (1980) presented a broader systems perspective for IS research. Barki, Rivard, and Talbot (1988) provided a keyword classification scheme with more than 1,100 keywords under nine top-level categories. More recently, Banker and Kauffman (2004) identified five IS research streams. There are numerous others.

A limitation of these frameworks is that they usually offer an imposed, and perhaps parochial, perspective of the field by their proponents who defend them with data. The evolving nature of the field makes it hard to fully capture its breadth and the dynamics of change over time. Banville and Landry (1989) recognize the diversity of topics pursued and have referred to the field as a "fragmented adhocracy". Can an imposed, "deductive" framework capture these fragments

[1] I do not formally define "maturing" or "contribution" – since I do not want to get mired in the nuances of definitional issues. My main goal is to use this terminology to simply assess whether we can identify positive manifestations of the field, like the value of its knowledge-base, its success in a knowledge market, its ability to learn, its stability, and so forth. In similar vein, I don't really distinguish between maturity and contribution. The main focus of the paper is on maturity, and I imply that a mature field will make a contribution.

[2] Please note that these studies were collaborative and my use of the first person account is not intended to undermine the contribution of my co-authors.

meaningfully? Is an imposed perspective too monistic for a field that attracts scholars from a variety of disciplines, studying rich and diverse phenomena? Most importantly, from our perspective, do such frameworks have widespread acceptance as the representation of the field? Are they consistent over time?

We believe that as a socially constructed field, it is better to examine the content of the field inductively. To the extent that the peer review system filters "acceptable" knowledge into our journals, examination of what we publish over time might be a better way to establish consistency. This knowledge is forged through debate and negotiation, and reflects how field membership resolves conflicts over reputations and interpretations. As such, it represents both cognitive and social dimensions of the field.

2.2. Method

Using a "brute force" content analysis of titles and abstracts in three major IS journals over a 26-year period, we summarize the prominent terminology in different five-year periods (Lim, Rong, and Grover, 2007). The journals selected were *MIS Quarterly* (1980-2005), *Information Systems Research* (1990-2005), and the *Journal of MIS* (1984-2005). Abstracts from 1,197 articles (267,034 words) were pre-processed, and then subjected to content analysis using a tool called CATPAC. By examining the frequency of terms for each period, we can assess the terminology in the field that is both consistent and ephemeral.

2.3. Key Findings

- There are clear terms that appear in the top 25 terms for that period across all five time periods. We argue that these terms have consistency across vast spans of time and help identify the core of the field. These terms are: system, management, decision, strategy, organization, user, development, information, data, model, and process. We call these the field core. While the context of terms could be different (e.g., the term model could mean a data model or a research model), the results suggest that: The core of IS research focuses on data and information systems, their development (modeling), management and strategy, and how they are related to organizations, processes, decisions, and users. This emphasis for IS research is consistent with the objectives of each journal involved (i.e., journals publish what they say they are going to publish), but also with the broader goal of the field[3].

- In examining the three levels of abstraction identified by Iivari (2003), only one of the 11 terms, system, falls in the "technical" level of abstraction. Most fall under the organizational level (management, decision, strategy, organization, user, development, and process), while data and information fall under the infological level of abstraction. Knowledge appears as a core term after 1990.

- There are some core terms (like GDSS, expert) that appear only in one period and disappear. We call these the transitory core. Others (like application, project, and software) are not in every period but come and go. We call these the contextual core, as they set the context when associated with the field core. Finally, there are terms (like knowledge, performance, theory) that appear in the top 25 terms for a period and then reappear in all subsequent periods. These terms, called the evolving core, might become a part of the field core in the longer run.

[3] The Association for Information Systems has expressed its mission in prior statements. For instance, research and pedagogy in Information Systems is primarily concerned with the understanding and advancement of "knowledge in the development, management and use of information technology to improve organizational performance." Recently, AIS modified its mission statement to focus on their broader service role to the community and exclude specific content of research.

2.4. Conclusions for the Field

Table 1 summarizes the conclusions and their implications for the field. While the approach followed may simply describe what we do as a field, it does indicate that there is, indeed, some consistency in terminology across time. Further, the field core terms do form a definition of the field that is consistent across the top journals and the field's expressed goal as represented by its major professional society. Therefore, there is (at the minimum) crude evidence to suggest that there is consistency across people and time[4]. So, while the boundary conditions might be fuzzy due to ephemeral terms, we do have some stability as a field. There is a fair degree of consistency between what we say we are and what we do.

Table 1. The IS Field as an Aggregator of Terms

Conclusions from the Analysis	Indicator of Maturity and Contribution?	Rationale
There is a core set of terms that consistently appear over time. These collectively form a meaningful domain representation of the field.	Yes	This indicates a level of consistency in what the field says it is and what it actually does. Consistency is important for mature fields. The field's core terms have shown remarkable consistency over a very long duration.
There are sets of terms that appear and disappear over time.	Neutral	This indicates that the technological catalyst has an influence on our field as we explore emerging phenomena. Such exploration may be necessary to build the concepts for success.
The core terms might evolve over longer periods of time.	Yes	This indicates that the field engages in higher order learning and adapts to its changing environment. The longer cycles of adaptation indicate that stable pockets of knowledge are being constructed.
Between the technical, organization, and infological levels, the organizational level has the most terms in the field core.	Neutral	This indicates that the field is largely about how IT is embedded in its context. It highlights technology as a means to a broader end.

3. The IS Field as a Complex Adaptive System

Another manifestation of a mature field is its ability to adapt to changes in the environment. I contend that with greater environmental complexity, both in the issues we research and the institutional environment, *mature fields make good adaptations to survive and thrive*. In contrast, immature fields might not adapt, thereby lowering the quality of their knowledge product.

3.1. Perspective

A useful perspective for assessing the field is to consider it as a complex adaptive system (Bar-Yam, Ramalingam, Burlingame, & Ogata, 2004). This perspective considers how interactions between components of a system give rise to self-organized patterns of behavior. Complex systems are sustained by adaptation of these behaviors in response to increased complexity in the environment (Kauffman, 1993; McMillan, 2004). This process occurs as a result of communication, selection, and adaptation strategies within the system itself and between the evolving system and its environment (McMillan, 2004). In the context of this study[5], a system refers to the IS research community: a network of researchers collectively (both individually and collaboratively) involved in IS research. We examine research collaboration, choice of research areas and constituent topics, level of analysis, and organization of published research as a feasible set of adaptive strategies in

[4] It is important to note that later we discuss the field's ability to adapt to its environment. Consistency and adaptation are not necessarily inconsistent. While the field might adapt to changes in technology, as is partially reflected by terms that are ephemeral, the core basis of how we deal with technology should exhibit stability and consistency if we are creating knowledge that can withstand the test of time.

[5] This co-authored study is available in working paper form from the author.

response to the increasing complexity of the environment. The strategies chosen are rational if they (a) reduce the cognitive burden imposed by existing knowledge, (b) help cope with the diversity of IS issues, and (c) help in managing research implementation complexity. This study assesses adaptations made by IS researchers over time.

3.1. Method

The study draws on empirical and review papers from *MIS Quarterly*, *Information Systems Research*, and the *Journal of MIS* over the period 1990-2009. Altogether, 712 papers were coded for research collaboration (number of authors), choice of research areas and constituent topics (research area and topic diversity computed as an index from Vessey, Ramesh, & Glass, 1999), level of analysis (micro vs. macro focus), and organization of published research (research organization index that measures review and meta studies). Trend analysis was performed to observe changes during the period.

3.2. Key Findings

- A clear positive trend was observed for research collaboration involving three or more authors, suggesting authorship as an adaptation strategy to deal with both environmental and institutional challenges (i.e., increasing pressure to publish).

- A few research areas are emphasized (e.g., IT usage), but the diversity of topics within the few broad areas is increasing. This suggests the use of common framing to deal with an increasingly diverse set of topics.

- The proportion of micro-level (individual and group) research is higher than macro-level (organizational and market) research. The micro emphasis could reflect adaptation to the difficulty in pursuing organizational-level research (e.g., obtaining high response rates from companies). However, the trend for macro-research is positive -- arguably a response to calls for more macro-level research (Agarwal & Lucas, 2005).

- No clear trend was observable for research organization. This indicates that the IS community may not be adapting effectively to the growing volume of research. This might make the knowledge barriers to enter an area increasingly challenging.

3.3. Conclusions for the Field

Table 2 summarizes the conclusions and their implications for the field. From a complex adaptive system perspective, the IS field is clearly adapting to its complex environment. I would argue that these adaptations reflect a state of maturity in the field. As the field has become more complex, larger collaborations have developed to handle this complexity and maintain or improve the quality of the knowledge product. The coalescing around a few major topics, but increased diversity within topics, suggests that the field tries to draw from consistent theoretical frames to deal with new topics or emerging phenomena. Even the higher incidence of micro-studies is a rational adaptation to implementation complexity, while the significant trend for macro studies reflects the important focus on digital transformations of firms and industries. Overall, these patterns indicate that the field is a fairly responsive system – one that exhibits rational adaptation and learning behaviors[6]. This is the sign of a maturing discipline. However, as with any change, we need to be wary of adaptations that may lead us into vicious, counterproductive circles.

[6] Recent work by Baskerville and Myers (2009) finds that IS research is, indeed, responsive to practice but plays a limited proactive role in influencing trends.

Table 2. The IS Field as a Complex Adaptive System		
Conclusions from the Analysis	**Indicator of Maturity and Contribution?**	**Rationale**
Collaborative research involving three or more authors is increasing.	Yes	This indicates that as the problems faced by the field get more complex, and pressure for research gets more acute, the adaptation of adding more co-authors maintains the quality of work.
There are few research areas emerging, but the topic diversity within each area is increasing.	Yes	This indicates that as new problems emerge, the field attempts to capture them within existing frames in order to deal with complexity.
Micro-studies predominate but the trend seems to favor macro-studies.	Yes	Micro-studies are a natural adaptation to the difficulty in doing macro-studies. The recent Internet and digital revolution is making it critical to increase the incidence of broader studies.
No clear trend is visible on the incidence of articles that organize IS research.	Neutral	This indicates that the field is not really coping with its increased volume of research, which creates knowledge barriers to entry.

4. The IS Field as a Knowledge Market

The IS field is responsible for the knowledge product that is codified in its journals and conference documents. I contend that the quality of the knowledge product lies not only in its rigor and relevance, but also in its ability to offer superior or unique products from other knowledge producers. Mature fields *create valuable and unique knowledge products that are difficult for other fields to replicate*. Immature fields, on the other hand, create knowledge products that may not have requisite quality, and offer nothing in terms of method or content that cannot be appropriated by other fields if they choose to do so.

4.1. Perspective

Using a resource-based metaphorical model for IS research, we argue that the discipline can be viewed as a knowledge firm, competing in a knowledge market, where the challenge is to position it for sustainability (Grover, Gokhale, & Narayanaswamy, 2009). We further argue that it is not necessary to have employer-employee contracts for firm organization, but such organization can be defined as a community of practice where members (agents) cultivate a shared knowledge base. They (agents) have some "shared mental concepts" and seek to address a market need. We then propose that knowledge firms compete against each other for resources, and buyers, in turn, provide economic resources to sustain them.

In formulating our framework for analysis, we consider X and Y as two knowledge disciplines. X could represent marketing (say) and Y could represent IS. Z represents the buyer base, which could be divided into the internal buyer Z_I (i.e., the academic consumer of research) and the external buyer Z_E (i.e., the practice based consumer of research). The buyers can provide resources to sustain the disciplines. However, to the extent X and Y provide a common product P to fulfill the needs of Z, competition exists between X and Y. Even if the products offered by Y are seen as natural extensions of X, the competitive forces might force X to appropriate these products and serve needs fulfilled by Y. Under these conditions Z will not support both X and Y, and Y will be subject to a hostile takeover by X and not sustain. The simulation can be extended to many X's competing with Y.

In examining the customer base, Z_I provides the primary revenue for both knowledge firms and, given that it is utility maximizing, both X and Y must have different products or both cannot sustain. Z_E desires products that can directly be applied toward its own objectives. Under certain conditions Z_E could generate revenues (either directly to Y and X, or indirectly by providing revenues to Z_I through research funding or academic centers) based on how well Y and X are expected to contribute to revenue generation for Z_E.

4.2. Method

Given the framing above, we logically analyze the nature of knowledge markets from a resource-based view (RBV) in order to derive conclusions (Connor & Prahalad, 1996). A central proposition in the RBV is that tangible product attributes such as heterogeneity or nonimitability, and intangible or interpretational resources such as reputation contribute to performance differences among competing firms (Amit & Schoemaker, 1993; Barney, 1991; Peteraf, 1993;). For simplicity, we use heterogeneity and positioning as the two major product concepts. Heterogeneity confers on Y the ability to extract rents from Z_I, while positioning bestows the ability to extract rents from Z_E.

Following the arguments by Benbasat and Zmud (2003, p. 186), heterogeneity can be taken to imply distinctness between two knowledge firms at both the level of topics studied (phenomena), and at a more theoretical level in the instruments (such as constructs, relationships, etc.) used to study the different phenomena. If X is more established than Y, and if Y draws upon X's concepts to define its product, then there exists no ex-ante reason why Z_I should support redundant firms and bear inefficiencies arising from them. High heterogeneity in Y's products creates opportunities for appropriating rents and keeps those resources from being competed away[7]. Positioning is concerned with Y's basic shift from creating products with concepts and constructs that are theoretically heterogeneous to those offered by X (and, thus, preventing imitation by X), toward products that fare better in terms of being a) interesting to practice in IS, b) operationally valid, c) timely, and d) related directly or indirectly to efficiency or effectiveness or both, and performance in general – in short, products that are goal relevant compared to those offered by X.

4.3. Key Findings

Table 3 summarizes the conclusions and their implications for the field. Over-reliance on reference discipline theories is problematic for the IS field. Based on the RBV analysis, this is due to four issues:

1. Heterogeneity Issue: In order to foster heterogeneity, the IS field should build its independent stock of knowledge. If it cannot do this, the common product P will be high, and there is danger of the field being subsumed by X and unable to generate revenues from Z_I. This is because using theories from X inevitably restricts Y's view of the problem and the corresponding solution. Solutions follow from the way one chooses to frame problems, and in the case of knowledge firms, the way problems are framed is largely a function of the underlying theory used.

2. Choice of Problem Issue: Y becomes susceptible to bypassing/ignoring problems and phenomena that cannot be explained through the theory or lack theoretical explanation, or simply run counter to the theory. The consequence is that interesting phenomena about which Y may be able to develop intellectual capital may be ignored because they do not fit into the perspective sourced from others.

3. Indigenous Theory Issue: Y focuses on fitting the reference theory onto a problem, and this inhibits indigenous theory building in the field, leading to resource and sustainability issues.

4. Positioning Issue: While use of theories can improve efficiency in problem solving, they can deter development of heterogeneous, interesting, and practical knowledge. In terms of our model, sourcing of knowledge from X will deter Y's efforts to be heterogeneous and well positioned in the market. Even if the IS field cannot develop a unique knowledge stock, then positioning can create options for generating economic rents from Z_E. This revenue can be appropriated to the field through Z_I.

[7] In reality, knowledge products are characterized by ex-ante uncertainty as to the outcomes of using such products. Determining whether Z or Y offers superior value is a complex task conducted under incomplete information. Therefore, disciplines might sustain due to these inefficiencies, even under conditions of essentially homogeneous products. Further, reputations of disciplines might symbolize value to the knowledge buyer.

4.4. Conclusion

While it is unclear whether the field creates heterogeneous knowledge products that are well positioned with respect to practice, the reliance on other disciplines for theory is undesirable from a knowledge market perspective. It seems clear that the field should not be used as a context for testing these theories, since the intellectual engine still resides in the other (reference) discipline. At the minimum, the theories should be embedded into IS phenomena, their constructs appropriately modified, thereby creating heterogeneous content. Further, I would advocate that the field should be open to interesting results or solutions – even if there is no theory. Such positioning knowledge can spawn its own heterogeneity and foster alternative sources of economic rents.

Table 3. The IS Field as a Knowledge Market

Conclusions from the Analysis	Indicator of Maturity and Contribution?	Rationale
Align closely with IS practice.	Neutral	Institutional structures like "IS-related Centers" can funnel resources from practice. However, despite these bridges, there is no clear indication that IS research is increasing its alignment with practice.
Reduce focus on use of theories from other disciplines.	No	IS is still reliant on reference discipline theories and deviation from formulaic approaches to adapting theory are met with suspicion.
Foster unique knowledge through indigenous theory building OR interesting pragmatic knowledge.	Neutral	IS struggles with recognizing and assessing unique theory or interesting knowledge. Patterns of progress on these aspects are unclear.
Develop Clear Boundary Conditions for the Field.	Neutral	With pervasiveness of IT, other fields are examining IT-related phenomena. There is debate on whether the field should be restrictive or liberal in its treatment of IT constructs.

5. The IS Field as a Biological Organism

The IS field continues to expand its knowledge base over time. In their early years, when fields are immature, I contend that there is a need to depend on other fields for knowledge. This could be due to the need for legitimacy or simply the need to look toward best practices to benchmark the quality of work. However, I would argue that mature fields are less dependent and perhaps even have their own knowledge base that is drawn upon by other disciplines. In other words, as fields mature *they change from a knowledge sink to a knowledge source.*

5.1. Perspective

Miller's (1978) view of systems, espoused in the biological sciences, provides a useful way to frame this perspective. Miller refers to organic systems as a hierarchy that evolves with respect to its dependencies on other systems for survival. He uses the hierarchy of “totipotential”, “partipotential”, and “fully functional” systems to illustrate his ideas. Highest in the hierarchy are totipotential systems that draw upon other systems, but provide extensive contributions (draw less, contribute more). Partipotential systems, on the other hand, tend to specialize and gain expertise in certain functions but rely on other systems to fulfill those they cannot perform (draw upon other systems). At the same time, partipotential systems may (or may not) also contribute to other systems by providing some functions that other systems are not capable of performing. Fully functional systems are those that perform all assigned functions satisfactorily, but depend on other systems for survival. Therefore, as systems evolve, they draw more on internal resources and less on other (external) resources.

5.2. Method

The approach used (see Grover, Ayyagari, Gokhale, Lim, & Coffey, 2006), follows the concepts of work points and reference points (Culnan & Swanson, 1986) in examining 1,406 IS articles in 12 journals. The work point for an article refers to the field represented by the journal in which the article appears. The reference point for an article refers to the distribution of the article's references. Six work points (from 1990-2003) and their associated journals were carefully selected, and the IS articles were examined for their work and reference points. Besides IS itself, the other five work points were the classical ones: computer science, management science and organizational science, as well as marketing and economics. Analysis involved computation of the mean proportion of references to total references for articles at each of the six work points. For instance, articles in organizational science journals were examined for the proportion of references associated with the six disciplines. A number of conclusion were drawn from these numbers as well as trends regressed over time.

5.3. Key Findings

Table 4 summarizes the conclusions and their implications for the field[8]. A basic test of the premise of the study indicated that the work points are, indeed, distinct. The proportion of references at any work point is greatest at that particular work point. Specific findings from other analyses indicate:

- The mix of reference disciplines for IS is changing. IS is relying less on technical disciplines like computer science, and more on organizational science, as well as marketing and economics.
- IS is relying more on IS references, and there is a clear positive trend in building a cumulative tradition.
- IS is repaying its dept by increasingly contributing to the classical reference disciplines. On aggregate, the field seems to be contributing back to the computer, management and organizational sciences, while on net drawing from marketing and economics.

5.4. Conclusion

From a systems perspective, the IS field seems to be making progress on maturity and contribution. While it is still reliant on marketing and economics, there seems to be less dependence on the classical disciplines. More importantly, there are promising signs that indicate that IS is forming its own intellectual engine by contributing back (as a higher order system) to the classical disciplines. The changing nature of IS is also evident as it takes on a more organizational (drawing from organizational science) focus and a less technical focus (less from computer and management science). However, its dependency on marketing[9] and economics also seems higher. Overall, it seems that IS is increasingly in control of its own knowledge construction and is establishing centrality in research pertaining to its domain.

[8] This study was challenged in *JAIS* by Wade, Biehl, & Kim (2006b) who came to the opposite conclusions in the May 2006 issue of *JAIS*. Interested readers are referred to that issue to see two articles using different methods coming to opposite conclusions regarding the field's contribution, and two articles challenging each article's findings. While there were technical differences in approach, one of the basic differences (Grover, Gokhale, Lim, & Ayyagari, 2006) between the two articles rested on the assumption of whether IS should contribute to all articles in other disciplines (Wade, Biehl, & Kim, 2006a) or only those that are relevant to information and systems (Grover, Ayyagari, Gokhale, Lim, & Coffey, 2006).

[9] One reviewer pointed out that IS could still thrive as a knowledge sink if marketing (for instance) provided fundamental research that could be used by IS in the study or design of (say) CRM software.

Table 4. The IS Field as a Biological Organism

Conclusions from the Analysis	Indicator of Maturity and Contribution?	Rationale
The field is taking on a greater organizational focus and less technical/optimization focus.	Neutral	The changing nature of IS reflects an evolution from its early years where researchers from the technical disciplines migrated to the field. The field is establishing its value in the embeddedness of technology in the social context.
There is more reliance on the internal field itself for knowledge growth.	Yes	This indicates that the field is increasingly valuing the quality of its own knowledge.
The field is contributing back to classical disciplines like organizational, computer, and management science.	Yes	This suggests that other fields value knowledge created in IS as the field becomes a central source of knowledge for its domain.
The field is a knowledge sink for marketing and economics.	No	This indicates that while the nature of the field might be changing, it still has a way to go to reduce its dependency on more mature disciplines.

6. So, What Can We Say About Maturity and Contribution?

I would argue that each of the four approaches described provides a unique way of visualizing and analyzing the field from a historical perspective. At the minimum, the analyses offer "anchor points" that allow us to go beyond mere speculation and ground our assertions regarding the maturity and contribution of the field.

Overall, I am bullish about the field. I think that great strides have been made over the last few decades in building a field that deals with a critically important resource of our time and correspondingly important issues. I have witnessed and partaken in a large part of this evolution. In the early years I observed a field that had the buzz and momentum of something new and important. The research was mainly atheoretical, with ad-hoc frameworks and weakly validated surveys, resulting in descriptions of emerging phenomena. I saw the concerted investment in improvement of method to improvement of theory. And today, I see a field that publishes top-notch research in journals that are widely regarded and compare well in "impact factor" with the best of breed. So, I would make a case as an observer of the field that we have matured and we do make a contribution. Yes, the field has its problems, but they are no greater than those of other fields, and nothing a vibrant global community with a positive disposition cannot handle.

The analyses presented here complement my personal observations. In looking at the conclusions derived from the four analyses, I can see three consistent patterns that indicate that the field has, indeed, matured.

6.1. Pattern 1

There is consistency in the type of research that we do. This consistency exists across journals and across our professional societies. While the field has a faddish element as we examine the latest technologies, the core seems to be comprised of more stable knowledge that evolves over longer periods, but does not change on a whim. Therefore, I would argue that there is evidence to suggest that the field is consistent in its research and its membership. This suggests that there might be agreement across members on what research in IS entails, and even though there are fragments and diverse streams, we seem to have a consistent definitional boundary. This is a characteristic of a maturing field.

6.2. Pattern 2

The field rationally adapts to changes in the environment. This adaptation suggests a field that is responsive to changes at both the individual level and the community level. While some of the adaptations are in response to the growing institutional pressures to publish, others are rational adaptations to management of complexity. For instance, as new phenomena emerge, researchers tap into existing frames to manage complexity rather than invent new ones. Also, as digital transformation increases, researchers are increasingly addressing important macro-questions. When such questions were less prominent, the rational response was to focus on micro-questions due to easier implementation. It seems that the field is engaged in adaptation behaviors that are consistent with the goals of the field and the goals of individuals. Such alignment of goals is an indicator of a maturing field.

6.3. Pattern 3

The field is disseminating knowledge to other fields. From the calls from Keen (1980) to use reference disciplines for benchmarking good research, the field has largely drawn theories from these disciplines. The extent to which researchers can adapt these theories to the IS context brings the intellectual capital closer to IS in the knowledge marketplace, emphasizing our uniqueness in our product. There is clear indication that the tide has turned and the field is now a source of good knowledge for some disciplines while it has a way to go for others. The high quality of journals in the field and the increasing citations by our (traditionally) borrowing disciplines are indicators that the field is maturing.

These patterns are positive and suggest our clear progress as a field. However, we need to be circumspect. There are potential pitfalls that could be detrimental to the field. Below, I briefly describe these pitfalls as vicious circles -- that may regress the field if we are not careful. The correct intervention by members and gatekeepers can help us steer clear of these vicious circles as we continue to build a consistent vision moving forward.

7. Steering Around Vicious Circles

While the indicators for the field indicate positive trends, it is entirely feasible for problems to crop up if the field is not managed effectively. In Table 5, for each of the conclusions drawn, I list corresponding dangers (in extreme cases) that might hurt the field's progress. For instance, too much fragmentation can create silos that reduce the incidence and quality of engagement and discourse. Over-pursuit of the latest "fads" could hurt the field's reputation in its quest for sustainable knowledge. Over-reliance on reference disciplines could inhibit indigenous theory development and put blinders on the way we observe interesting problems (Niederman, Gregor, Lyytinen, Grover, & Saunders, 2009). If we discourage use of reference discipline theories, then there is danger that we will fall into the "framework of the month" trap as we struggle to structure our models. Over-pursuit of individual-level (micro) studies, due to ease of implementation, could reduce our study of digital transformations that are revolutionalizing companies and industries. And, the pervasiveness of IT coupled with an increasing organizational focus for the field could blur boundaries between the field and other (organizational) disciplines. Table 5 maps these vicious cycles explicitly onto the conclusion described in earlier sections.

So, what should we do to alleviate these vicious cycles? While the recommendations for steering the field are not profound, they do require a collective responsibility by every stakeholder of the field, and particularly those that hold gatekeeping roles in our various journals and forum. In the last column of Table 5, I list a series of recommendations that I believe will hold us in good stead. These form broad guidelines for trying to ensure that the vicious cycles don't kick in – or are at least not as debilitating. The recommendations follow a few key principles:

1. We are a field that has consistent boundary conditions, and we need to promote the richest form of discourse within the field as we can. For instance:

    - Monistic theoretical lenses or methods create fragments that don't communicate. We should nurture multi-theoretic lenses to view phenomena and triangulation in methods. This creates integration across fragments and elevates the level of discourse.

    - Enforce definitional boundary conditions to work within IS and encourage integration across fragments of the field.

2. We are unique and need to emphasize this uniqueness in our knowledge products. For instance:

    - Research should focus on the embeddedness of IT (and corresponding morphing of IT-based constructs) within the social context.

    - Theories borrowed from reference disciplines should be adapted rather than merely tested in the IS context.

    - Research problems should drive the use of theory from other disciplines, and not the other way around.

    - Indigenous theory development should be promoted, encouraged, and provided some "slack" (see Grover, Lyytinen, Srinivasen, & Tan, 2008).

3. Our knowledge base should be accessible and focused on sustainable knowledge. For instance:

    - While descriptive studies have value, sustainable knowledge that transcends the current IT environment should be an important consideration for publication in major journals.

    - Theory and research sections that foster research consolidation and meta-analysis should be encouraged to reduce knowledge entry barriers into a stream.

    - Cycles of exploratory and confirmatory research can help manage discontinuities.

4. We should foster both unique theory and interesting (pragmatic) results, but they need not be in the same paper. For instance:

    - Have journal space dedicated to interesting and pragmatic results, without theory. Theory can then succeed results in multi-paper cycles.

    - Special issues and other interventions should be fostered to promote the study of important macro-issues, despite their difficulty to implement.

There could be many other recommendations. However, in my mind, exposure and awareness of vicious circles is half the battle to avoid them.

Table 5. Vicious Circles and Recommendations for Intervention

The IS Field as an Aggregator of Terms		
Conclusions	**Dangers/Vicious Circles**	**Recommendations**
There is a core set of terms that consistently appear over time. These collectively form a meaningful domain representation of the field.	Is the domain so broad that it contains too many fragments? Can this dilute the field's identity?	Monistic theoretical lenses or methods create fragments that don't communicate. We should nurture multi-theoretic lenses to view phenomena and triangulation in methods. This creates integration across fragments and elevates the level of discourse.
There are sets of terms that appear and disappear over time.	Over-pursuit of the latest IT-based phenomena might regress the field as it gains a reputation for being too faddish, descriptive, behind practice, and atheoretical.	While descriptive studies have value; sustainable knowledge that transcends the current IT environment should be an important consideration for publication in major journals.
The core terms might evolve over longer periods of time.	Is there a danger that a large discontinuity or paradigm shift in the IT environment might factionalize the field?	Cycles of exploratory and confirmatory research can help manage discontinuities**.**
Among the technical, organization, and infological levels, the organizational level has the most terms in the field core.	By overemphasizing the ends (context), the field could lose its uniqueness, as similar ends are being pursued in other disciplines.	Research should focus on the embeddedness of IT (and corresponding morphing of IT-based constructs) within the social context.
The IS Field as a Complex Adaptive System		
Conclusions	**Dangers/Vicious Circles**	**Recommendations**
Collaborative research involving three or more authors is increasing.	Artificially induced collaborations promoting cross-disciplinary research could detract from rigorous and relevant IS research.	Co-authorship should evolve naturally based on problems rather than through forced inter-disciplinary initiatives.
There are few research areas emerging, but the topic diversity within each area is increasing.	Over-pursuit of familiar reference discipline theories to frame new ideas could preclude indigenous development of IS theory.	Theories borrowed from reference disciplines should be adapted rather than merely tested in the IS context.
Micro-studies predominate, but the trend seems to favor macro-studies.	Over-pursuit of micro-studies due to "easier implementation" could increase the gap between research and practice -- where the latter grapples with major transformational issues businesses face in the information age.	Special issues and other interventions should be fostered to promote the study of important macro-issues, despite their difficulty to implement. Micro-studies should engage managers to increase their external validity.
There is no clear trend visible on incidence of articles that organize IS research.	Failing to consolidate diverse and expanding research streams could make the sheer volume of literature ominous to navigate for a new researcher, leading to avoidance of potentially important topics.	Theory and research sections that foster research consolidation and meta-analysis should be encouraged to reduce knowledge entry barriers into a stream.

Table 5. Vicious Circles and Recommendations for Intervention (cont.)

The IS Field as a Knowledge Market		
Conclusions	**Dangers/Vicious Circles**	**Recommendations**
Align closely with IS practice.	Overemphasis on practice can foster "research as problem solving" rather than long-term knowledge building.	Foster a symbiotic positive (not a tradeoff) relationship between rigor and relevance. Make relevance a necessary condition for all research.
Reduce focus on use of theories from other disciplines.	Difficult to frame problems without a theoretical lens. Might foster the "framework of the month" issue.	Theories borrowed from reference disciplines should be adapted rather than merely tested in the IS context.
Foster unique knowledge through indigenous theory building or interesting pragmatic knowledge.	Difficult to build indigenous theory. Institutional structures and journals are not open to pragmatic knowledge without strong theory.	Theories adopted from reference disciplines should be adapted rather than merely tested in the IS context. Have journal space dedicated to interesting and pragmatic results, without theory. Theory can then succeed results in multi-paper cycles.
Develop clear boundary conditions for the field.	Overly restrictive approaches could narrow the field and discourage entry. Overly liberal views could create too many ad-hoc fragments that are isolated.	Enforce definitional boundary conditions to work within IS and encourage integration across fragments of the field.
The IS Field as a Biological Organism		
Conclusions	**Dangers/Vicious Circles**	**Recommendations**
The field is taking on a greater organizational focus and less technical/optimization focus.	There could be a potential blurring of boundaries between IS and the organizational sciences.	Research should focus on the embeddedness of IT (and corresponding morphing of IT-based constructs) within the social context.
There is more reliance on the internal field itself for knowledge growth.	Without fundamental principles in place, the field may not be able to sustain the quality of its discourse internally. Its inter-disciplinary nature and need for benchmarking could make external dependencies critical for the field.	Theories adopted from reference disciplines should be adapted rather than merely tested in the IS context.
The field is contributing back to classical disciplines like organizational, computer and management science.	Will the field eventually lose something critical by its increasing disassociation with the technical field of computer science, and the optimization/modeling field of management science?	Have the research problem drive the use of theory from other disciplines, and not the other way around.
The field is a knowledge sink for marketing and economics.	High levels of dependency on a discipline like economics serves only a fraction of its broad constituency.	Monistic theoretical lenses or methods create fragments that don't communicate. We should nurture multi-theoretic lenses to view phenomena and triangulation in methods. This creates integration across fragments and elevates the level of discourse.

Conclusion

In this article, I expose my biases. I am very optimistic about the field, despite all its recent hardships. I see a field that has progressed tremendously over the past two decades. I see a field that is dealing with arguably the most critical and exciting resource of our time. I see a field with stable institutional structures and core journals that compare well to the best. And I see a field that has progressed in both its maturity and contribution. These conclusions are borne out when we examine the field through various perspectives: as an aggregator of terms, as a complex adaptive system, as a knowledge market, or as a biological system. However, despite all the progress, there are dangers that could regress the field. In environments with tight resources, as the youngest field on the block, considerations other than merit could derail it. As stewards of the field, I believe that we have a collective responsibility to ensure that the knowledge we generate, conserve, and transform is, indeed, valuable. Therefore, increased awareness of the vicious circles can help us navigate them and create a responsible and virtuous way to continue our progress.

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