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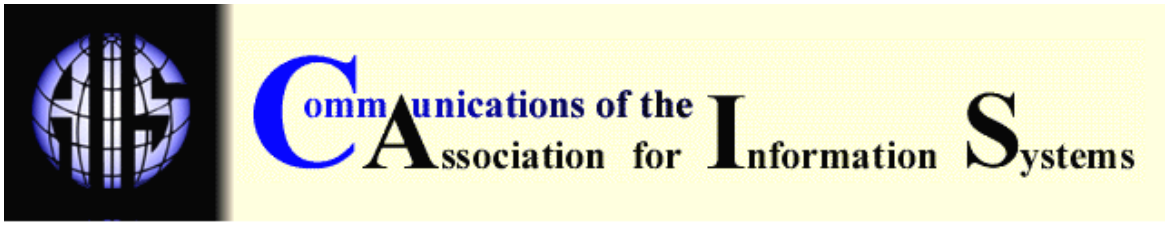

AN INDUCTIVE APPROACH TO DOCUMENTING THE "CORE" AND EVOLUTION OF THE IS FIELD

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ABSTRACT

This article inductively examines the question of the IS field's core. We argue that as a socially constructed field, the core aspects of IS can be identified from the work conducted and published by members of the IS community. The abstracts (including titles) of 1,197 IS studies in three premier IS journals for the past 26 years were examined to identify the core of the field and explore its evolving nature with the help of a neural network software as the analysis tool. The field, contextual, transitory, and evolving core of IS are identified through the analysis of 267,034 words in the knowledge base constructed. The results show both stability and evolution of the core of IS field. The three journals examined show sufficient commonality on the core of the field, with slightly different preferences for research topics and methods. Given the diverse nature of the IS field, we believe that such a retrospective and descriptive study can document evidence of the "core" and facilitate a better understanding of the evolution of the field.

I. INTRODUCTION

The IS field has endured and grown over the past three decades. Some would characterize the growth of the field as healthy, as the field's young institutional structures and journals improve in incidence, prominence, and quality [Holland 2003]. Others disagree, and suggest that the field has made little progress in its primary goal of serving the IS practitioner [McCubbrey, 2003]. Central to the debate about the field's value is often the elusive question of the field's core. This question still elicits a diversity of responses from those who consider themselves as members of the IS academic community. For instance, Benbasat and Zmud's [2003] view of the field is tied to the IT artifact, application, and immediate nomological network. This is considered too restrictive by many who argue for a broader systems-based view [Alter 2003] or suggest that the whole notion of the "core" is ephemeral, and tying the focus to the IT artifact could be disastrous [Meyers 2003].

While we consider these debates about the diversity of the field useful, our intent is not to take a position here. Instead of *deducing* the core of the field from espoused positions or frameworks, we prescribe an *inductive* approach. We argue that IS can be best characterized as a socially constructed field, constituted and defined by its members [Banville and Landry 1990]. Members are those who identify themselves as stakeholders of the IS community and who publish their work in widely accepted IS outlets. From this premise, we then examine questions of the core by inductively deriving it from the IS's socially constructed knowledge base. Thus, our question

regarding the core is not normative, but descriptive. The social institutions represented by the outlets themselves are also examined in order to gain insight into the field's constituents and its influences.

In order to speak to the question of the IS field's core,[1] we analyze 26 years of published IS work using the smallest reasonable item of induction, the word, as the unit of analysis. While we address the issue of the field's core, we also recognize its evolving nature, and the broader issue of the boundary conditions of the field. At a macro-level, we hope that for most IS scholars, this work will reaffirm their own broad understanding of the field's evolution and will represent a formal document of record. However, we also believe that the granularity offered through our data adds rich insight into the field and its evolution, far greater than simply identifying a core set of issues.

II. IS AS A SOCIALLY CONSTRUCTED FIELD

In the classical Kuhnian view of science, knowledge is constructed in terms of a paradigm that defines the major issues, theoretical lens, and the methods used to assess knowledge. We do not believe that such an approach would be appropriate or relevant to the IS field. Banville and Landry [1990] recognized the diversity of topics and methods used in IS, referring to it as a "fragmented adhocracy." It is doubtful that any paradigm could capture the fragments together. Unlike physics, which deals with the laws of hard objects, a paradigm seems restrictive for IS which represents a variety of sociological, economic, and technological engagements that require creative discourse. Further, a paradigm seems unduly monistic for a field that has attracted scholars and theories from a variety of related disciplines like operations research, management, decision theory, accounting – each with their own background and perspective.

Alternatively, we would argue that it is better to represent IS as a socially constructed field. To the extent the peer-reviewed system represented the field's view of what is considered acceptable knowledge, the knowledge repository in journals is representative of that view. This knowledge is forged through social processes of negotiation, conflict, and competition. Therefore, published IS research is a reflection of how the membership resolves conflicts over reputations and interpretations. It has both cognitive and social dimensions and is influenced by prior knowledge as well as the formal and informal social structure created by scholars interacting in professional societies or on editorial boards of journals specializing in IS.

There have been a number of occasions during the field's chronology where the normative content of the field has been proposed. A framework is presented, and then research is mapped on to the framework. While these frameworks are also socially constructed as they are often based on conceptual logic and literature, they have greater imposition of a viewpoint or paradigm. Obviously, a field cannot thrive if there is a top-down imposition of a paradigm that members do not endorse. However, we distinguish these approaches from pure socially constructed ones where a field's core ideas are assessed inductively, through grass root approaches and without using a framework as the starting point for analysis. Following, we briefly review the frameworks, definitions, and typologies that have been proposed over the years.

III. FRAMEWORKS, DEFINITIONS AND TYPOLOGIES OF IS

Since Leavitt and Whisler [1958] announced the coming of "Information Technology," IS has gone from a focus on EDP and operational control in the 1960s to MIS and information reporting in the 1970s, inclusion of end-user service support in the 1980s, its front office strategic role in the late 1980s, a facilitator of process change in the 1990s, and e-business and integrated enterprise

[1] We avoid the provocative question of whether IS should have a core. Our position is that the core indicates the boundary conditions of the field, and any field must have at least a fuzzy boundary. Therefore, it is appropriate to interpret every use of the term "core" as qualified.

systems in more recent years. Accordingly, numerous frameworks have been proposed on the definition and boundary of the IS field. These views can (and have) influenced research agendas [Davis 1999].

Gorry and Scott Morton asserted in 1971 that "information systems should exist only to support decisions." Unlike prior focus on structured problems at the operational level, they established a MIS framework from the perspective of decision-making, focusing on matching managerial activities with information needs for those activities. Mason and Mitroff [1973], based on their definition of MIS, categorized five types of variables (psychological type, class of problems, organizational context, method of evidence, organizational context, and modes of presentation) which constitute the core of MIS research. They, along with Lucas [1973] and Mock [1973] expanded the dimensionality of IS research by bringing environmental and behavioral factors into the picture.

Ives, Hamilton, and Davis' [1980] attempt to establish a new framework started with the MIS definition as "computer-based organizational information system which provides information support for management activities and functions." In their framework, MIS research is constituted by five different categories of research consisting of single variable groups (environmental constraints and resources, information systems' characteristics, and process variables used for performance measures) and their relationships. Nolan and Wetherbe [1980] presented a comprehensive framework broad enough to facilitate categorization of all previous IS research. Also, Elam et al. [1986] attempted to trace the trends in research methodology, topics, and application areas through examining the decision support systems literature. Huber [1984] argued that post-industrial organizations are specialized, diverse, interdependent, and highly efficient and IS should focus on information acquisition and distribution.

Banker and Kauffman [2004] reviewed IS research published in *Management Science* only and identified five IS research streams: decision support and design science, value of information, human-computer system design, IS organization and strategy, and economics of information systems and technology. They also described possible evolving streams that could grow in importance. Ramesh and Glass [2002], mapped IS literature onto a framework of IS research that incorporated reference discipline, level of analysis, topic, research approach, and research method.

In addition, in the 1990s and 2000s, there was a broader thrust on process and competitiveness issues [Ives and Learmonth 1984; Bakos and Treacy 1986; Parsons 1983; Segars and Grover 1999; Sambarmurthy, Bharadwaj, and Grover 2003]. There was also work focused on specialized research areas such as knowledge transfer [Lin et al. 2005], IT skills training [Piccoli et al. 2001], database [Lai 1996], human-computer interaction [Zhang and Li 2005], e-commerce customer relationship management [Romano and Fjermestad 2001], and group support systems [Nagasundaram and Bostrom 1994; Pervan 1998].

Correspondingly, the definition of IS represented in research has evolved from Davis' [1974] proposal that "MIS is an integrated, man/machine system for providing information to support the operation, management, and decision making functions in an organization" to the more recent one proposed and accepted by the AIS council [1995][2], "information systems are the artifacts (the combinations of technology, data, and people) that produce the information resource for the use of individuals, organizations and society."

In addition to frameworks and definitions, there have also been useful attempts at creating typologies for IS. The Computing Reviews classification scheme [Communication of the ACM 1982] was the first keyword classification scheme of IS topics, but it did not provide sufficient detail of IS topics because it was designed for computer science and IS was placed as a subtopic [Barki et al. 1988]. MIS Quarterly's keyword list [MIS Quarterly 1985] included 115 terms, but was

[2] Approved by AIS Council 12/95 (http://www.aisnet.org/adm/policy.shtml)

not enough to cover the emerging topics. Hurt et al.'s [1986] work was limited to decision support systems research and only contained 25 keywords. Finally, Barki et al.'s [1988] keyword classification scheme for IS covered over 1,100 keywords under nine top-level categories. Based on Barki et al.'s [1988] keyword classification scheme, Alavi and Carson [1992] presented nine the most popular topics of IS from the investigation of 908 articles published at eight selected journals in the 1968-1988 periods. Lee et al. [1999] explored the 48 thematic areas of IS articles for the 1991-1995 periods to determine popular topics of research.

One limitation of these frameworks and typologies is that they are top-down and reflective, in that they are conceived by their proponents, who then seek to defend them based upon data. Also, they do not reflect the dynamic evolution of the field nor are they sensitive to concerns about the core of the field. Experienced researchers continuously challenge the boundary conditions of these frameworks, in response to changes in IT and its environment. Another limitation pertains to the increased diversity of the field which makes it more difficult to conceptualize frameworks comprehensive enough to cover the whole domain of the field. Kochen [1985] describes the limitations of frameworks in the pursuit of research. Noting that the derivative in calculus was discovered and developed before it was defined and recognized as a concept, he argues that perhaps IS, as a hybrid research field, is following the same path as differential calculus. While IS evolves, its definition remains elusive and difficult to capture through deductive frameworks. IS, once narrowly defined as decision support systems [Gorry and Scott Morton 1971], has incorporated technology, social setting, and the interaction of these two in its later definition [Lee 1999].

Some scholars did take a more inductive approach to study the field. Inductive methods such as work point and reference point analysis [Cheon et al. 1991; Culnan and Swanson 1986] and co-citation analysis [Culnan 1986, 1987] were used to examine the distinctiveness of IS field in relation to its reference fields (Cheon et al. 1991; Culnan 1987; Culnan and Swanson 1986) and subfields of IS research (Culnan 1986, 1987). However, these studies, conducted more than a decade ago, examined the status of IS field and research from 1970 to 1980s.

Therefore, we depart from the deductive approaches described above, and conduct an inductive approach to *describe* the IS field based upon published research. We adopt neural network analysis to capture the static and the dynamic development of core topics of the IS field. Investigating IS's knowledge-base of abstracts and titles over the past 26 years:

1. We define the socially constructed field's core so that members and non-members can identify the boundary conditions (albeit transient) for entry, engagement and success.

2. We study the changing boundary conditions of the field so that members can better appreciate the changes in the field's core and the dynamics involved in these changes.

3. We study whether major distribution channels (journals) reflect the field's core or have their own parochial influence in shaping the field.

IV. METHODOLOGY

The input data consist of the titles and abstracts of all research articles for the period 1980-2005 from three premier IS journals, *MIS Quarterly* (MISQ), *Journal of Management Information Systems* (JMIS), and *Information Systems Research* (ISR). MISQ has been in circulation since 1977, JMIS since 1984, and ISR since 1990. These journals were selected, to reflect the premier IS research outlets based on previous studies that compared and ranked journals in IS field. Among the more recent studies, Lowry et al. [2003] compared 25 worldwide IS journals. MISQ, ISR, and JMIS are rated as top three journals. Peffers and Tang [2003] studied 50 IS journals and reached the same conclusion that the three journals are among the top three. We therefore assume that all published articles in these three journals form the cognitive and socially constructed knowledge base in IS.

Titles and abstracts of all articles are collected from these three journals for the appropriate time period. The final dataset includes titles and abstracts from 1,197 articles (267,034 words) in 26 years of MISQ (1980-2005), 22 years of JMIS (1984-2005), and 16 years ISR (1990-2005).

DATA ANALYSIS

The analysis tool used in this study is a software for content analysis called CATPAC. It is designed and optimized to read text. Unlike traditional text analysis programs, which require researchers to make all the model-building assumptions,[3] CATPAC is a self-organizing "neural network program which has been designed to read and understand text of any kind." CATPAC works by examining the interrelationships among words and phrases in the text, and can identify the underlying concepts in a text after only a single reading.[4] It can make dendograms and perceptual maps directly from the text. It does not require any precoding and makes any linguistic assumptions.[5]

CATPAC assigns a neuron for each word while it is reading through the text. Thus, a set of artificial neurons is generated. The analysis is "initiated by passing a scanning window of N (typically 7) consecutive words through the text,"[3] and these N words (e.g. 1 to N) are in the window at once. When the word is in the scanning window, its corresponding neuron is activated. The window then slides to the right, including a new set of words (2 to N + 1). The process repeats till the end of the text. The connections between neurons are strengthened by a small amount if both of them are active, i.e. in the same scanning window. Connections can be weakened through a simulation of forgetting[4]. These connections, or weights, among neurons generate patterns or associations among words in the text. The patterns provide information (for instance) about words that have the closest proximity to each other in the entire text.

CATPAC, as a powerful content analysis tool, has been used extensively in many areas in order to identify the underlying main concepts and the associations among them. It has been used in marketing research for major corporations, such as Boeing and Hewlett-Packard.[6] The software is used to reveal word clusters and associated concepts in the in-person interview transcripts. Similarly, Schmidt [2001] used the software to analyze focus group responses. Some researchers have recommended the use of CATPAC in marketing research [Moore et al 1995, Malhotra and Peterson 2001, Murgolo-Poore et al. 2002]. In the field of public relations, Maynard [1997] used the software to study the difference in paid versus unpaid internship. In social psychology, Sares [1998] used the software to analyze the sociopolitical views. Later studies, including Lockyer [2002, 2003], and Gay and Hembrooke [2002], used the software to study different topics.

To enhance the analysis results, CATPAC allows application of an exclusion list before starting the analysis. The list, by default, includes the words that will contaminate the results, such as common propositions (e.g. how, why, what, when, etc.). Researchers can customize the list by adding other generic words (e.g. findings, paper, article, research, etc.). The exclusion list may require further revision after initial data analysis, to remove frequently appearing but not research topic-related-words.

Besides the exclusion list, researchers have to be concerned about the consistency of words with the same meaning, since different forms of words will be assigned different neurons. The first type of problem is about the singular versus plural format of the words (e.g. systems and system, users and user, technologies and technology, models and model, etc.), the noun versus verb (e.g. plan and planning, development and developing, etc.), or the noun versus adjective (e.g. organization and organizational, useful and usefulness, etc.). The second type is about different

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[3] http://www.mic.cbs.dk/marcus/GBPapers/25_Tourism/25_Software%20review%20Catpac.htm

[4] http://www.pbelisle.com/library/reviews/catpac6.htm

[5] http://www.galileoco.com/N_catpac.asp

styles of expression. For example, some researchers use “end user,” while others use “enduser,” or “end-user.” The same problem occurs when “ecommerce,” “e-commerce,” and “electronic commerce” are used interchangeably. The last type of problem concerns the use of acronyms, such “electronic data interchange” versus “EDI.” These problems will reduce the efficiency of the analysis and distort the final results.

Therefore, before the final analysis is conducted, the data were pre-cleaned and processed by taking the following steps: (1) all plural words were converted into corresponding singular forms; (2) words used as both nouns and verbs/adjectives were converted into their respective noun forms; (3) the words and phrases were adjusted to appear in consistent forms, to solve the second and the third types of problems mentioned previously.[6]

One potential concern with this approach is whether the exclusion of common words and the selection of the number of words (N) contained in the scanning window for data analysis will influence the results and may not reveal the true degree of associations between words. We believe that abstracts of research papers represent a synthesis of the paper, and are carefully constructed. Excluding common words which are not research-topic-related will not affect the results significantly. To evaluate the impact of the selection of the number N on the analysis results, a sensitivity test is conducted. The results of data analysis with N as 5 and 10 are compared with the results with N as 7, the default value of the software. No significant difference is detected. Therefore, we believe the current approach is valid for our research purpose.

INTERPRETATION OF RESULTS

Despite these precautions, there is an issue with examining words outside of their natural context. The tradeoff is between gaining a fundamental, purely inductive, unadulterated descriptive view of the field by using as basic a unit as a word, and the contextual interpretation that gets lost in this unit. While we cannot eliminate subjectivity, we take three steps to alleviate this concern.

First, by using large numbers of words (267,034), we hope that any non-systemic bias in interpretation would be nullified. Second, even though the analysis unit of CATPAC is a word, we try to interpret the results not only on the word of interest, but also on the context produced by the software. CATPAC returns immediate proximity/proximities for each of the 25 most frequent words,[7] and produces a dendogram for each. The proximity indicates the tight or loose association between the words and the immediate proximity term appears with the focal term most often. In addition, the dendogram displays the results of the 25 most frequent words in clusters. The terms of the same cluster appear together more often. For the clusters, if peaks of co-occurring terms are high, it indicates that the semantic clusters comprised by the terms are more recurrent. Similarly, a deep valley indicates more discrete semantic clusters [Steward et al. 2006]. The proximity and the dendogram together provide the context necessary for better interpretation of each word. Third, we try to provide broad or multiple interpretations of words, wherever necessary.

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[6] To avoid confusion in the meaning, the “compute” verb was converted into “computing” (not computer) and the general “make” (vs. buy) verb was converted into “making. “ Also, “electronic” was used in the adjective form. Some acronyms were used as one word if they are usually accepted as a word. However, these are exceptional cases. The list of these acronyms includes only IT, GDSS, DSS, and EDI.

[7] While the use of 25 words is somewhat arbitrary, it represents the default number of unique words produced by the software. We also find that 25 words are suitable for our analysis because it provides the best interpretation for the most relevant words in the text, after applying the exclusion list. When we used more words, we found that the frequency of the additional words was too small and including them would make the discussion unwieldy.

A: field core
B: contextual core
C: transitory core
D: evolving core

Figure1. The Core of IS Field

V. RESULTS

Results of overall data analysis including all three journals are presented in Table 1. The data were grouped into five time periods: 1980-1984, 1985-1989, 1990-1994, 1995-1999, and 2000-2005.[8] Data for each period were analyzed and presented separately in Table 1. The table shows the 25 most frequently used terms in the titles and abstracts of the articles included, together with the frequency (%) of each term compared to other top 25 terms. Also, provided in parenthesis are the most immediate proximity/proximities of each term as computed by the neural software. This helps provide a context for the top 25 terms. For example, in the period 1980-1984, the term "system" accounts for 21 percent of all occurrences of the top 25 terms. It is the most frequently used term in that period in the combined titles and abstracts of all three journals, with the term "information" found most often in the closest proximity.

[8] Periods are numbered from period one for the 1980-1984 period to period five for the period 2000-June 2005.

Table 1 is divided into four main sections. The first section (A in Figure 1) identifies the terms that appear in the top 25 list[9] (based on frequency) *throughout all five time periods*. We argue that these terms help identify the core of the field. We refer to these terms (system, information, management, organization, development, etc.) as the *field core* terms studied during the 26-year period. The second section (B in Figure 1) identifies the terms that appear in the top 25 lists of certain (>=1) time periods, but not in all five time periods. For instance, *DSS* appears as the top 25 most frequently used terms throughout the first and the second time periods (from 1980 to 1989), but not for the remaining three time periods. These terms help explore the evolution of the field and also serve as the *contextual core* as they are close to the field core and help provide a context for it. Contextual core (B) implies a boundary scanning set of terms. Within the contextual core, two specific groups of terms are identified and presented in Table 1 as well. The third section (C in Figure 1) identifies the terms that appear in *one* time period only. These terms help reveal the *transitory core* and reflect ephemeral or faddish research topics in the field. These terms may either fade away or proliferate as research accumulates. The last section (D in Figure 1) identifies the terms that appear in a certain time period and *remain in the list* for all subsequent time periods. These terms help our understanding of new trends in the field; possibly reflecting the *evolving core* or issues that may become core topics (field core) in the future. Figure 1 illustrates the structure of Table 1.

WHAT DOES THE CORE OF THE FIELD INCLUDE?

Eleven core terms dominate the literature over the past 25 years for the three IS journals examined. These terms appear consistently for all five periods in the top-25 list. Other terms are added and remain or drop out of the top-25 set in later periods. We describe the 11 terms as the (stable) field core and others as the contextual, transitory, and evolving cores.

The field core consists of the terms system, management, decision, strategy, organization, user, development, information, data, model, and process. While these are not unanticipated, they do provide an inductive working definition of the core of the field as assessed from published work. 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.*[10]

To explore trends in the core terms, we mapped all 44 terms in Table 1 (from panels A, B, C and D) onto three levels of abstraction identified by Iivari and Koskela [1987]: organizational, conceptual/infological, and technical levels. According to Ivari [2003], the technical level covers technological structure of information systems, the organizational level represents people and their activities, and the conceptual/infological level deals with concepts of information and outcomes. The mapping is presented in Table 2.

Among the eleven core terms that appear throughout all the time periods, only one term, *system*, falls into the technical level of abstraction. System constitutes the generic term of the field, information systems, but during recent years (2000-2003) it has been paired with a term, *process*. The specific IT artifacts such as DSS, computer, database or software are transitory terms

[9] Every period has a different combination of 25 terms that are the most frequently used.

[10] Some might argue that liberties have been taken in putting this "core" together. For instance, the same terms could be cobbled as "the core of IS research focuses on how management in organizations make decisions to engage in development of strategy based on data and information derived from modeling systems and processes." Such a definition represents a slice of IS research. We provide the broadest definition that reflects the *focus* on information systems and its development and impact.

appearing only in some time periods, but do not constitute the field core. These indicate the temporal context or emphasis of specific technologies. The abstraction of organizational level has the largest number of field core terms. These include *management*, *decision*, *strategy*, *organization, user, development, and process* and demonstrate the major organizational activities and stakeholders involving IS. Management, decision, and strategy are focal managerial activities that impact and are influenced by IS. The historical change in the proximity of *management* shows that researchers perceived *management* as an organizational process for a long time, but recent focus ties it to *value*. Strategy has been associated with *development* the most for the last 10 years, possibly reflecting an emphasis on linking strategy with system development. *User* is the major stakeholder and perhaps reflects the generic nature of the term. Interestingly, *development* is spotted frequently as one of the field core terms, but specific development and implementation phases such as *design*, *plan*, and *support*, are not in the field core. For the conceptual/infological level of abstraction, *information* and *data* are a major focus. *Knowledge*, as shown in later discussion, appears as core terms only after 1990. The field also emphasizes *model* in relation to decision as a conceptual representation.

HOW HAS THE IS CORE EVOLVED OVER THE LAST 26 YEARS?

Changes in the field can be explored through examination of terms in the contextual, transitory, and evolving cores in Table 1, which are organized in Table 2 by the three levels of abstractions.

Unlike *system* which is in the field core, specific technical abstractions demonstrate temporal importance. For example, *DSS* (contextual core) seems to be the main reference to system through the decade of the eighties. The use of the term GDSS (transitory core) was more ephemeral as it was prominent only from 1995-99. However, the term *group* (evolving core) seems to have far more sustainability as it remains in the top 25 for all periods except the first. This would suggest that the group focus of systems is important in IS research, even though the term GDSS might not be. The term *system* can be contextualized as evolving from an individual DSS to a broader group focus over time. *Technology* (evolving core) appears on the top-25 list during 1985-1989 period and remains in the list. *Computer*, *software* (contextual core*)* and *IT* (evolving core) also show their importance in IS research since they are listed as core terms for three time periods. The newer *electronic* and *Internet* trend in technology becomes the focus in the 2000-2005 period. The use of general technology/IT terms seems to have sustenance, while electronic and internet might reflect the recent transitory core. It remains to be seen whether a focus on the Internet and electronic (business) will be an innate part of IS research or will be subsumed within broader terms like system and technology.

Core terms at the organizational level of abstraction can be described in terms of organizational activities and stakeholders. Organizational activities include managerial activities such as management, strategy, decision and organization. Earlier years emphasized *computing* (transitory core). However, terms like *group* reflect the continued emphasis on how IS facilitates group processes, and *project* (contextual core) reflects the study of the organization and management of IS initiatives. *Support* (evolving core) becomes a core item from the 1985-1989 period and has proximity to decision-making and user. However, what is particularly interesting is the presence of the term *business* (evolving core) over the past three periods (15 years). Its close proximity to performance, suggests a broader emphasis on business related outcomes (e.g., financial performance) in addition to decision and group impacts. Other primary activities include studies of *plan* (contextual core) in the 1980-89 period and *design* (contextual core) in all periods except 1995-1999.

While *user* is the term used in the field core, the term *manager* (contextual core) appears prominently in the first 15 years, while *expert* (transitory core) reflects the “faddish” research on expert systems in the 1985-1989 period. What is surprising is that no particular stakeholder other than the general user stands out after the 1990-1994 period. Arguably this could be reflective of the changing focus on processes, groups, and business – rather than individual decision makers.

Conceptual/infological level of abstraction includes concepts (objects) of IS and outcomes. For objects, *information* and *data* stay in the core set through all periods. Researchers started to pay more attention to *knowledge* (evolving core) since the 1990-1995 period, which reflects recent interest in knowledge management. A shift in focus is conspicuous in outcomes (IT impacts). *Cost,* a transitory core term tied to efficiency concepts, stayed in the top-25 list only for the first period of 1980-1984. Studies during the 1980-1989 period emphasized *success* and *effectiveness* (contextual core). Since 1990, *performance* (evolving core) has been heavily used in IT impact research. This can be traced to "productivity paradox" research at the organization level, or could reflect individual performance research including technology acceptance studies. *Quality* (evolving core) also has become one of the core terms since the 1995-1999 period, reflecting, in part, the acceptance of DeLone and McLean's IS success model in the IS field. The last period introduces the broader notion of *value* as an important term – again reflective of the role of IS in creating business value.

The IS field does spend time and effort on developing conceptual work such as *model* (field core) in relation to decision studies, which are found in the early days of information systems field. As the field matures, *theory* (evolving core) is pursued more than before as we see the term appear more often since the 1995-1999 period.

Terms that are identified in the proximity of the field's core terms based on the neural analysis offer further insight. *Information, system*, *organization* and *management* are the most frequently used and highly associated set of words across the first four periods, but in the 2000-2005 period, *information* and *organization* are both used in the context of *knowledge*. *Decision* is a highly used word across all periods, but it is used in differing contexts in each period. The focus has changed from general decision models in the 1980-1984 period, to the importance of information in decision-making in the 1985-1989 period, to group decision making in the 1990-1994 period, to user/organizational change in the 1995-1999 period, and to strategic decisions for the use of technology in the 2000-2005 period. Similarly, the term *process* is initially tied to development and user, but then evolves to IT and technology ties. Most recently it is tied to information and systems. The latter reflects the increasing focus on process visibility and improving system (human and technological) system performance. Finally, the term *model* is initially close to decision and DSS, reflecting the early days' focus on decision and the influence of management science. The 1995-1999 period, model was close to technology/user reflecting the technology acceptance research stream. Most recently, model is tied to information, reflecting the growing importance of representing information and its characteristics.

Table 3 provides a snapshot of the field's evolution by summarizing the results in greater detail for each of the five periods.

WHAT ARE THE INFLUENCES OF THE LEADING DISTRIBUTION CHANNELS ON THE CORE?

A within journal analysis was conducted for each of MISQ, JMIS, and ISR in order to explore their varying influence on the field. The results as well as the classification of terms are presented in Tables 4-9. Table 4 for MISQ covers all five periods, Table 6 for JMIS only has four periods, and Table 8 for ISR has three periods. Distinctive characteristics of journals can be found through the examination and comparison of these tables.

The dataset for each individual journal varies in the number of field core terms while the combination of all journals produces the eleven field core terms shown in Table 1. MISQ, with the longest history, yields the lowest field core set of terms with ten. JMIS has 11 field core terms. The youngest journal in terms of age among the three journals, ISR, has the largest with 14 field core terms. Furthermore, the core set of terms is more stable in ISR than in the other two journals. This indicates that these leading IS journals might differ in their core research focus.

Our purpose here is to explore the evolution of each journal across the time periods. To do this, Tables 4-9 are assessed and interpreted. The findings are summarized in Table 10 and briefly discussed as follows.

The three journals show similar patterns in their evolution. Each journal has a dynamic nature, where new core terms are added and remain in the journal, suggesting a new trend, while some transitory terms appear in only one period of the journal. Even for the same core terms, such as *information, system, management, decision, strategy*, etc., the contexts of these terms are not stable over time, which indicates the changing focus of these same research topics. However, while aggregate patterns were discussed earlier, we are particularly interested in noteworthy differences across journals.

The core terms of MISQ show some explicit differences from JMIS and ISR. For example, *information* replaces *system* as the most frequently used term in period five in JMIS and ISR, while *system* remains number one throughout all five time periods in MISQ. *Electronic* (market) and related *investment* are among the top-25 list in JMIS and ISR (Table 6 and 8) though ISR covers the investment issue earlier than JMIS, whereas these terms do not appear in the list of MISQ.

MIS Quarterly has ten field core terms. Compared to those of combined data, MISQ does not have *decision* and *strategy* in its core set, but has *technology*. However, the emphasis on the technological level seems to be diminishing as MISQ uses the generic IT term more, while focusing on the organizational level like business, strategy, and group. MISQ also has the largest set of unique research topics identified in the top-25 most frequently used terms compared to the other two journals. These unique research topics include conceptual/infological level terms such as *effectiveness*, *evaluation, influence,* and *satisfaction*, organizational level activities terms such as *task*, *implementation*, *resource,* and *behavior,* and stakeholder terms such as *executive* and *individual*. MISQ is the only journal that has resource featured prominently, perhaps reflective of its substantial inputs from resource-based theory in strategic management. It also shows its particular emphasis on IT impact outcomes and measures as compared to the other two journals. However, MISQ does not pay as much attention as the other two journals on Internet or electronic business research.

Journal of Management Information Systems has the same number of field core terms as the combined dataset, but with some different components. JMIS does not have *user* and *strategy* on its core list, but instead, it has *support* and *group* among the core term list. This indicates its emphasis on group issues. Core terms do not cover stakeholders and IT impact. Consistent with ISR, JMIS emphasizes the IT artifact and its context, but gives less attention to the areas of organizational activities, IT impact, and stakeholders than MISQ. However, while IT impact is not among the field core terms during the early periods, it gradually gains attention. JMIS starts to focus on *knowledge* earlier than the other two journals. The unique research topics of JMIS include *database*, *framework*, and *GDSS*. Again, this indicates its emphasized focus on group decision issues, perhaps an artifact of the number of special issues on group related tracks from HICSS. JMIS is the only journal that lists *framework* as one of its core set of terms. However, unlike MISQ and ISR, *theory* does not appear as a frequently used term in this journal.

Information Systems Research has the largest number of field core terms. Surprisingly though, compared with the core set of terms for all journals combined, ISR does not have *management* in its field core term list, but includes *IT*, *performance*, *theory* and *technology* instead. *Electronic* emerges as a core term earlier than the other two journals. During the last period, IT artifact research shows an explicit focus on electronic/Internet issues. In fact, both JMIS and ISR have research focused on *investment in electronic system*, but ISR shows this emphasis in period four and retains it in the period five (earlier than JMIS). ISR also emphasizes *value* in electronic (system or commerce), while JMIS emphasizes the *value* of IT. ISR is the only journal that listed learning issues in the top-25 list. Unlike the other two journals, *theory* is among the core terms for ISR in all periods.

VI. CONCLUSIONS AND IMPLICATIONS

Debates on the core of the IS field have been vociferous and divisive. There have been many attempts to propose frameworks to represent the field and its research. However, the diverse and dynamic nature of IS, makes these top-down approaches challenging. For instance Gorry and Scott Morton's perspective that IS should only exist to support decisions reflects an important viewpoint that stimulated the field to channel energy. It is an artifact of a singular perspective in place and time. Similarly, Mason and Mitroff had an acute interest in bringing a behavioral research perspective to the field. Ives, Hamilton and Davis provided a framework to classify research and then mapped existing research to validate their deductive perspective. While these frameworks are very useful as interventions from thought leaders to "shape" the field, they do not represent the field in any objective way. We would argue that they are important "inputs" to the myriad of research voices rather than "outputs" reflecting a socially constituted field.

This paper takes the position that as a socially constructed field, research published in its distribution channels reflects the cognitive and social elements of the field and can be used to inductively define the core. While we do not engage in the debate on the core, we provide a descriptive study that attempts to assess the field's essence. In doing so we examine the field, contextual, transitory and evolving cores of IS through an analysis of 267,034 words published in the top-three IS outlets.

The eleven field core terms such as *information, organization, system, model, process, management, data, decision, user, development,* and *strategy* demonstrate stability and consistency of the field. The nine evolving core *terms such as IT*, *theory, support, group, technology, knowledge, quality, business*, and *performance* have the highest potential to settle in the field core set. Contextual core terms that are in over three periods such as *design, software, application*, *project*, and *manager*, might be subsumed in other terms, but are clearly important aspects of the field. Meanwhile, some transitory terms like c*haracteristics*, *expert,* and c*hange* seem to have only ephemeral value. Transitory terms for the last period like *Internet, electronic* and *value* require further examination to identify their sustainability. The field also shows subtle changes in word association – reflecting the changing nuances of research. For example, links with *management* range from system, IT, and process to organization and value. Links with *strategy* focus move from project and group to development and performance. Links with *decision* that are made upon *information, group, change* and *user* change to upon *technology* and *performance*. And, links with *knowledge* change from *software* and *group* to *organization*.

The three leading IS journals show sufficient commonality to suggest that the field reflects a stable core despite the diverse origins and affiliations of its three major outlets. The differences across journals seem to reflect preferences for research topics (and possibly methods) rather than a fundamental disagreement on the core.

To become and maintain a distinct and separate discipline, a field has to show stability in its core research issues while keeping some extent of dynamism to deal with environmental changes. The IS field shows that the field does have an innate field core in its use of terms, and at the same time, that it is evolving with more core research topics being established. Retrospective research such as this study will help us better understand the identity and the evolutionary development of the IS field.

In sum, we have presented a purely descriptive study. Our focus on word as the unit of analysis has limitations. First, some topics might have more than one key word. This has the potential to decrease the frequency of a specific topic by separating counts of each word. For example, the topic "assimilation" can be alternatively replaced by "implementation." Second, the analysis ignores the synonym problem (i.e., data and information could mean the same thing in different contexts), thereby not capturing broader concepts behind the words themselves. Third, the semantics of the word are often dependent on context. While we tried to use the context as much as possible, we could not eliminate all subjectivity. Finally, the analysis presumes a single field with a single core – and the approach does not examine the possibility of multiple cores. Finally,

the approach requires some interpretation of the terms and how they fit together. It is difficult to provide richer descriptions and a clear boundary of IS field. Therefore, the cores and the evolution of the field have been described in a general thematic level. However, to the observer who responds to this work as something that is already known, we would say that at the minimum it serves as a reaffirmation and a document of record. To others we would present this inductive approach as a grass roots approach to describing the IS "core" and its stable and transient components.

Table 1. All Journals by Period

	1980-1984		1985-1989		1990-1994		1995-1999		2000-2005	
	%	Term (immediate proximity)	%	Term (immediate proximity)	%	Term (immediate proximity)	%	Term (immediate proximity)	%	Term (immediate proximity)
	A: Terms in top 25 throughout all periods (Field Core)									
1	20.8	system (information)	19.8	system (information)	17.4	system (information)	14.9	system (information)	10.2	information (knowledge)
2	16.1	information (system)	15.0	information (system)	13.6	information (system)	13.1	information (system)	9.1	organization (knowledge)
3	9.3	management (process)	6.4	management (system/organization)	7.6	organization (management)	7.7	organization (IT)	9.1	system (process)
4	6.0	organization (plan)	4.9	decision (information)	4.6	model (manager)	5.6	model (technology/user)	5.9	model (information)
5	5.8	development (information)	4.8	organization (management)	4.3	user (system)	5.3	process (technology)	4.6	process (information/system)
6	3.9	process (user)	4.2	user (development)	3.9	development (information)	3.8	user (model/decision)	3.6	management (system/value)
7	3.2	user (process)	3.8	process (development)	3.9	management (organization/IT)	3.0	management (process)	3.0	data (strategy)
8	2.4	data (computer/design)	3.3	data (effectiveness)	3.4	process (IT/technology)	2.8	development (strategy)	2.6	decision (technology/strategy)
9	1.9	decision (model)	3.1	development (user/process)	3.1	strategy (group)	2.8	decision (user/change)	2.4	user (support)
10	1.3	model (decision)	2.8	model (DSS)	3.0	decision (group)	2.5	strategy (development/performance)	2.3	development (decision/strategy)
11	1.3	strategy (software)	2.6	strategy (manager)	2.0	data (work)	2.5	data (GDSS)	2.2	strategy (development)
	B: Terms in top 25 in some but not all periods (Contextual Core)									
12	3.7	DSS (effectiveness)	3.8	support (making)	5.0	IT (management/process)	6.2	IT (system/organization)	8.0	IT (process)
13	3.0	manager(technique/database)	3.0	computer (application)	3.0	group (strategy/decision)	3.3	group (knowledge)	4.6	knowledge (organization)
14	2.7	computer (data)	2.7	DSS (model/computing)	2.9	technology (process)	3.1	business (information)	3.9	technology (decision)
15	2.5	design (data/technique)	2.5	plan (expert)	2.6	computer (development/relationship)	2.7	technology (process/model)	3.5	internet (group)
16	2.5	application (development)	2.4	design (model)	2.5	support (decision)	2.5	support (change)	3.5	business (electronic)
17	2.4	plan (organization)	2.0	group (manager)	2.4	knowledge (software)	2.4	performance (strategy)	3.1	electronic (business)
18	2.8	project (database)	1.9	manager (group)	2.2	manager (model)	2.2	computer (software)	3.1	performance (value)
19	1.6	effectiveness (success)	1.8	making (support)	2.0	performance (data)	2.1	software (computer)	2.4	value (performance)
20	1.5	technique (design/manager)	1.6	computing (DSS)	1.9	software (knowledge/business)	2.1	GDSS (data)	2.4	theory (quality)
21	1.3	cost (decision)	1.6	technology (effectiveness)	1.8	design (application)	2.0	project (group)	2.2	support (user)
22	1.3	software (strategy)	1.5	application (computer)	1.8	business (performance)	1.9	change (decision/support)	2.1	design (data)
23	1.3	success (effectiveness)	1.5	expert (plan)	1.8	relationship (work)	1.8	knowledge (group/theory)	2.1	project (internet)
24	1.2	characteristics (cost)	1.4	success (group)	1.6	application (design)	1.8	theory (knowledge)	2.0	quality (theory)
25	1.2	Database (manager)	1.4	effectiveness (technology)	1.6	work (data)	1.8	quality (system)	2.0	group (internet)
	C: Terms in top 25 in one period only (Transitory Core)									
	1.5	technique (design/manager)	1.8	making (support)	1.8	relationship (work)	2.1	GDSS (data)	3.5	internet (group)
	1.3	cost (decision)	1.6	computing (DSS)			1.9	change (decision/support)	3.1	electronic (business)
	1.2	characteristics (cost)	1.5	expert (plan)					2.4	value (performance)
	1.2	Database (manager)								
	D: New terms that are added remain in all subsequent periods (Evolving Core)									
			3.8	support (development/process)	5.0	IT (management/process)	1.8	theory (knowledge)		
			2.0	group (manager)	2.4	knowledge (software)	1.8	quality (system)		
			1.6	technology (effectiveness)	2.0	performance (data)				
					1.8	business (performance)				

Table 2. Terms Categorized in Abstraction Levels

Category	Field Core terms	TERMS IN THE CONTEXTUAL, TRANSITORY OR EVOLVING CORE				
		80-84	85-89	90-94	95-99	00-05
Technical level	System	DSS Computer Technique Software Characteristics Database Application	Computer DSS Technology* Application	IT* Technology Computer Software Application	IT Technology Computer Software GDSS	IT Technology Internet Electronic
Organizational level	Management Decision Strategy Organization User Development Process	Project Manager Design Plan	Making Computing Group* Manager Expert Support* Plan Design	Business* Work Relationship Group Manager Support Design	Business Project Change Group Support	Business Project Group Support Design
Conceptual/Infological level	Information Data Model	Effectiveness Cost Success	Success Effectiveness	Knowledge* Performance*	Knowledge Performance Quality* Theory*	Knowledge Performance Value Quality Theory

* First period for an evolving core term

Table 3. Evolution of Core Ideas in the IS Field

1980-1984	1985-1989	1990-1994	1995-1999	2000-2005
• An important part of the terms identified for this period is at the technological level of abstraction. *Information system*, as in most other periods, is the most frequently cited term. This period also emphasizes specific technological level of abstraction terms such as *computer*, *software*, *DSS*, and *database*. *Characteristics* among technological level terms is one of the key research topics for this period only. • Technological level terms are always examined together with their impacts. Researchers study *DSS* and its impact on *effectiveness*, *software* and its impact on *strategy*, and *characteristics* and their impact on *cost*. The tasks range from process management to decision-making. • The term strategy in this period is associated with software problems. • Specific technological level terms such as *technique and database* are associated with stakeholders such as *manager and designer*, indicating a focus on using database for managers. • Organizational level terms involve research on organizational activities such as *planning* and *design* in order to build technological *applications.* • This period also emphasizes the involvement of stakeholders, i.e. *users*, in the process of organizational activities. • Conceptual/Infological level of abstraction in this period focuses on how *data*, *information* and *models* (decision) are tied to *cost* and *success*	• Terms at the technological level of abstraction examined in this period do not differ much from the previous period, although characteristics of the terms are not emphasized. • Specific technological level terms such as *computer* is associated with *application*, *DSS* with *modeling* and *computing*, and *technology* with *effectiveness* – reflecting the broader positioning of the IT artifact within a developmental environment. • The term *strategy* is associated with *managers*… seeking to formulate strategic impacts. • The target of management extends from system to organization. • Different from the first period when stakeholder is mainly organizational, *group* becomes another important stakeholder at the organizational level of abstraction. • Studies in this period examine the role of *user* in the IT *development process*, *expert* in the *planning process*, and *manager* in *group processes*. • Three terms, *support, group* and *technology*, first appear in this period and remain in all the subsequent periods. *Support* is prominent, reflecting the trend of end-user computing. • Research on organizational activities is more process-oriented (i.e. *planning*, *design*, *application*, *support*) in this period than in all other periods.	• Research at the technological level of abstraction focuses on general terms such as *computer, software, technology* and *IT*. • These terms are more tied to *process, relationships*, and *business*, reflecting the process redesign in this period. The term *work* also appears prominently. • The term *strategy* is tied to groups, reflecting the importance of group processes and decisions. • *Management* targets *organizations* and broader IT rather than specific systems. • *Design* and *application* are main concepts tied together. *Support* is tightly associated with *decisions*. • The focus on the conceptual/infological level moves beyond *data* and *information*, and instead focuses on approaches to contextualized *knowledge*. • The terms representing IT impact, effectiveness and success, lose weight and are replaced by *performance*, reflecting the business impacts. • *Business, IT, knowledge*, and *performance* first appear in this period and remain in all the subsequent periods.	• The term *GDSS* appears in the top twenty-five list only in this period. • For organizational level of abstraction, *process* management is prominent, while *change* is an important topic. Research on change is tied to *decision* and *support.* • The term *strategy* is tied to *development* and *performance*, reflecting its role in productive system building outcomes. • For stakeholders, there is more emphasis on *user* involvement in the *decision* making processes. • Development and implementation are not as prominent and only *support* retains prominence, reflecting the broad role of IS in supporting change initiatives. • *Quality* gets more attention than before, particularly system quality. • Researchers start to put more effort in drawing from or developing *theory* for the field. • *Theory* and *quality* first appear in this period and remain in all the subsequent periods.	• Research at the technological level shows an explicit shift of focus in this period by including terms such as *Internet*, and *electronic* reflecting the prevalence of the Internet and e-commerce. • New research topics added to the IS field: online community (internet group), and electronic business. • *System* is no longer the number one term. *Information* becomes the most frequently used term, replacing system for the first time. • *Information* is tightly related to *knowledge* and knowledge begins to show more importance. • Organizational activities of management are on managing *system* and *value.* • *Decision* is also involved with broader issues such as *technology* and *strategy*. • *Value* is a new term for this period. Research examining the relationship between electronic business value and *performance* emerges. • *Models* and *process* focus on *information*.

Table 4. MIS Quarterly

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2005
	% Term (immediate proximity)	% Term (immediate proximity)	% Term (immediate proximity)	% Term (immediate proximity)	% Term (immediate proximity)
	Terms in top 25 throughout all periods				
1	20.5 system (information)	19.6 system (information)	18.3 system (information)	18.6 system (information)	11.6 system (organization/model)
2	15.7 information (system)	15.6 information (system)	15.2 information (system)	16.8 information (system)	11.2 information (knowledge)
3	9.9 management (process)	7.2 management (system/user)	7.7 organization (management)	6.7 organization (management)	9.8 organization (knowledge)
4	6.2 organization (effectiveness)	5.2 organization (process/data)	6.2 user (system/organization)	3.9 model (process)	4.7 management (process)
5	5.5 development (information)	3.7 data (strategy)	4.9 management (organization/IT)	3.7 process (model)	4.5 model (theory)
6	4.1 process (management/t plan)	3.7 process (implementation)	4.3 development (information)	3.5 management (organization)	3.5 process (management)
7	3.4 user (plan)	3.5 user (management)	2.7 technology (IT/manager)	2.9 technology (knowledge)	3.4 technology (support)
8	2.3 data (manager)	3.1 development (computer)	2.6 process (relationship)	2.8 user (knowledge/group)	2.6 data (information)
9	1.3 model (decision)	2.3 model (support)	2.3 data (cost)	2.0 development (project/change)	2.3 development (support/strategy)
10	1.3 technology (design/cost)	1.8 technology (making)	2.2 model (executive/support)	1.7 data (manager)	2.0 user (project)
	Terms in top 25 in some but not all periods				
11	3.5 DSS (evaluation)	4.4 decision (IT)	5.2 IT (management)	7.9 IT (system/organization)	10.1 IT (theory)
12	3.4 manager (computer)	3.5 computer (development)	3.1 manager (technology/strategy)	3.6 business (information)	6.9 knowledge (organization)
13	2.7 computer (manager)	2.8 support (model)	2.8 strategy (knowledge)	3.0 group (user/project)	2.9 theory (model/IT)
14	2.2 application (success)	2.6 DSS (analyst)	2.4 software (knowledge)	2.3 decision (theory)	2.6 performance (business)
15	2.2 design (technology)	2.6 strategy (data/design)	2.2 computer (application)	2.2 computer (expert)	2.4 business (performance)
16	2.2 plan (process/user)	2.3 plan (application)	2.1 relationship (satisfaction/process)	2.2 performance (change)	2.4 group (behavior)
17	2.0 project (evaluation)	2.2 IT (decision)	2.0 decision (executive)	2.2 knowledge (technology/user)	2.1 project (group/user)
18	1.8 effectiveness (organization)	2.0 making (group)	1.9 satisfaction (relationship)	2.1 theory (decision)	2.1 support (technology/development)
19	1.7 decision (model)	1.9 design (strategy)	1.9 support (group)	2.0 project (group/development)	2.0 design (factor)
20	1.5 cost (technology)	1.9 group (making)	1.8 application (computer)	1.8 expert (computer)	2.0 influence (factor)
21	1.4 software (resource)	1.9 manager (technology)	1.7 executive (decision)	1.7 manager (data)	2.0 strategy (development)
22	1.4 success (application)	1.8 implementation (process)	1.7 group (implementation)	1.7 quality (expert)	1.8 factor (influence)
23	1.3 change (success)	1.7 success (decision)	1.7 knowledge (strategy/software)	1.7 task (support)	1.8 resource (performance)
24	1.3 evaluation (DSS)	1.5 analyst (DSS)	1.7 cost (data)	1.6 change (development/performance)	1.8 behavior (group)
25	1.2 resource (DSS)	1.4 application (plan)	1.7 implementation (group)	1.6 support (task)	1.8 individual (business)
	Terms in top 25 in one period only				
	1.8 effectiveness (organization) 1.3 evaluation (DSS)	2.0 making (group) 1.5 analyst (DSS)	2.1 relationship (satisfaction/process) 1.9 satisfaction (relationship) 1.7 executive (decision)	1.8 expert (computer) 1.7 quality (expert) 1.7 task (support)	2.0 influence (factor) 1.8 factor (influence) 1.8 behavior (group) 1.8 individual (business)
	New terms that are added remain in all subsequent periods				
		2.8 support (model) 2.2 IT (decision) 1.9 group (making)	1.7 knowledge (strategy/software)	3.6 business (information) 2.2 performance (change) 2.1 theory (decision)	

Table 5. Classification for MISQ

Category	Core terms	Transitory Terms				
		80-84	85-89	90-94	95-99	00-05
Technical level	System Technology	DSS Computer Software Application	Computer DSS IT Application	IT Software Computer Application	IT Computer	IT
Organizational level	Management Organization User Development Process	Project Decision Change Manager Design Plan Resource	Decision Strategy Making Group Manager Analyst Support Plan Design Implementation	Strategy Relationship Decision Group Manager Executive Support **Implementation**	Business Decision Project Task Change Group Expert Manager Support	Business Project Strategy Group **Individual** Support Design Behavior Resource
Conceptual/Infological level	Information Data Model	Effectiveness Cost Success Evaluation	Success	Knowledge Satisfaction Cost	Knowledge Performance Quality Theory	Knowledge Performance **Influence** **Factor** Theory

Table 6. Journal of Management Information Systems

	1985-1989	1990-1994	1995-1999	2000-2005
	% Term (immediate proximity)	% Term (immediate proximity)	% Term (immediate proximity)	% Term (immediate proximity)
	Terms in top 25 throughout all periods			
1	19.5 system (information)	16.7 system (information)	12.2 system (information)	9.1 information (model)
2	14.2 information (system)	11.8 information (system)	9.8 information (system)	8.2 system (technology/IT)
3	5.2 decision (plan/data)	6.7 organization (management/model)	8.3 organization (system/model)	5.9 model (information)
4	5.1 management (organization/support)	4.7 model (organization)	6.4 process (business)	5.6 organization (knowledge)
5	4.6 support (user)	4.2 group (GDSS)	5.4 model (organization)	5.1 process (technology)
6	4.2 organization (system)	4.1 management (system/organization)	3.9 group (GDSS)	4.0 management (investment)
7	3.7 process (user/plan)	3.9 process (technology)	3.4 support (management)	2.9 decision (GDSS)
8	3.4 development (computer)	3.6 development (strategy/decision)	3.2 management (support)	2.7 group (software)
9	3.1 model (making)	3.4 support (user/IT)	3.1 development (decision/user)	2.5 data (quality)
10	2.8 data (decision/strategy)	3.2 decision (development/technology)	2.8 data (quality)	2.3 support (internet)
11	1.9 group (model)	1.8 data (design)	2.7 decision (process)	2.2 development (knowledge)
	Terms in top 25 in some but not all periods			
12	4.6 user (support)	5.2 IT (support/strategy)	4.5 user (development)	7.3 IT (system/value)
13	2.9 design (strategy)	3.4 strategy (IT)	4.5 IT (technology)	4.4 Knowledge (development/organization)
14	2.8 DSS (computing)	3.2 technology (process)	3.8 GDSS (group)	4.1 business (information)
15	2.7 plan (decision)	3.0 user (support)	3.0 technology (IT)	4.0 electronic (market)
16	2.4 computer (development)	3.0 business (design)	3.0 software (project)	3.9 technology (process/system)
17	2.4 strategy (data/design)	2.9 knowledge (cost)	2.9 business (process)	3.5 internet (support)
18	1.9 expert (knowledge)	2.8 computer (information)	2.6 market (communication)	3.3 value (IT)
19	1.9 knowledge (manager)	2.2 performance (cost/data)	2.4 quality (data)	3.2 market (electronic)
20	1.9 computing (DSS)	1.8 application (project)	2.3 project (software)	3.0 investment (data)
21	1.9 database (framework)	1.8 project (application)	2.3 strategy (performance)	2.9 performance (value/development)
22	1.9 application (computer)	1.8 relationship (project)	2.1 change (performance)	2.6 quality (data)
23	1.8 framework (database)	1.7 GDSS (group)	1.9 communication (market)	2.5 project (support)
24	1.6 manager (knowledge)	1.7 cost (knowledge)	1.8 performance (strategy)	2.5 GDSS (software)
25	1.6 making (model)	1.7 design (data/business)	1.7 application (communication)	2.3 software (GDSS)
	Terms in top 25 in one period only			
	2.9 DSS (computing)	1.8 relationship (project)	2.1 change (performance)	4.0 electronic (market)
	2.7 plan (decision)	1.7 cost (knowledge)	1.9 communication (market)	3.5 internet (support)
	2.0 expert (knowledge)			3.3 value (IT)
	1.9 computing (DSS)			3.0 investment (data)
	1.9 database (framework)			
	1.8 framework (database)			
	1.6 manager (knowledge)			
	1.6 making (model)			
	New term that are added remain in all subsequent periods			
		5.2 IT (support/strategy)	3.0 software (project)	
		3.2 technology (process)	2.6 market (communication)	
		3.0 business (design)	2.4 quality (data)	
		2.2 performance (cost/data)		
		1.8 project (application)		
		1.7 GDSS (group)		

Table 7. Classification for JMIS

Category	Core terms	Transitory Terms			
		85-89	90-94	95-99	00-05
Technical level	System	DSS Computer DATABASE Application	IT Technology Computer GDSS Application	IT GDSS Technology Software Application	IT Electronic Technology Internet GDSS Software
Organizational level	Decision Management Organization Group Support Development Process	Strategy Computing Making User Expert Manager Design Plan	Strategy Business Project Relationship User Design	Business Project Change Strategy COMMUNICATION MARKET User	Business Project Market Investment
Conceptual/Infological level	Information Data Model	Knowledge FRAMEWORK	Knowledge Performance Cost	Quality Performance	Knowledge Value Performance Quality

Table 8. Information Systems Research

	1990-1994	1995-1999	2000-2005
	% Term (immediate proximity)	% Term (immediate proximity)	% Term (immediate proximity)
	Terms in top 25 throughout all periods		
1	16.1 system (model)	13.4 system (information)	9.6 information (user)
2	13.3 information (model)	12.9 information (system)	9.1 model (organization)
3	8.3 model (system)	7.5 model (IT)	8.5 system (user)
4	4.4 decision (development)	7.3 organization (IT)	6.8 organization (model)
5	4.3 IT (technology)	6.6 IT (organization)	5.2 IT (technology)
6	4.2 organization (user)	4.9 process (learning)	4.1 technology (organization)
7	3.7 development (information)	3.9 strategy (theory/performance)	4.0 data (information)
8	3.8 process (IT)	3.4 user (performance/knowledge)	4.5 process (system)
9	3.1 strategy (organization/process)	3.2 performance (strategy/user)	3.7 user (information)
10	2.9 user (organization)	3.1 decision (development)	3.1 decision (internet)
11	2.7 performance (data)	3.0 development (decision)	2.7 performance (strategy/relationship)
12	2.6 theory (design)	2.7 data (information)	2.4 strategy (design/performance)
13	2.6 technology (IT)	2.6 theory (strategy)	2.2 development (effect)
14	1.8 data (work)	1.8 technology (group)	2.1 theory (relationship/decision)
	Terms in top 25 in some but not all periods		
15	3.1 task (expert)	2.8 computer (empirical)	5.7 Internet (decision)
16	2.8 group (communication)	2.8 business (data)	3.6 business (model)
17	2.7 computer (performance)	2.3 group (technology)	3.5 electronic (value)
18	2.7 design (theory)	2.3 software (technology)	3.3 network (commerce)
19	2.6 knowledge (effect)	2.2 learning (process)	2.6 commerce (network)
20	2.4 work (knowledge)	2.0 knowledge (user/decision)	2.5 effect (development)
21	2.2 communication (group)	2.0 management (electronic)	2.4 value (electronic)
22	2.0 plan (role)	1.9 change (empirical)	2.1 design (strategy)
23	1.9 effect (knowledge)	1.9 investment (electronic)	2.1 support (data)
24	1.9 expert (task)	1.9 empirical (change)	2.0 quality (network)
25	1.9 role (performance)	1.8 electronic (investment)	2.0 relationship (development)
	Terms in top 25 in one period only		
	3.1 task (expert)	2.3 software (technology)	5.8 Internet (theory)
	2.4 work (knowledge)	2.2 learning (process)	3.4 network (commerce)
	2.2 communication (group)	2.0 management (electronic)	2.7 commerce (network)
	2.0 plan (role)	1.9 change (empirical)	2.4 value (electronic)
		1.9 investment (electronic)	2.1 support (data)
	1.9 expert (task)	1.9 empirical (change)	
	1.9 role (performance)		2.1 quality (network)
			2.1 relationship (development)
	New term that are added remain in all subsequent periods		
		2.8 business (data)	
		1.8 electronic (investment)	

Table 9. Classification for ISR

Category	Core terms	Transitory Terms		
		90-94	95-99	00-05
Technical level	System IT Technology	Computer	Computer Software Electronic	Internet Electronic Network
Organizational level	Decision Strategy Organization User Development Process	Task Work Communication Group Role Expert Design Plan	Business Learning Management Change Investment Group	Business Commerce Relationship Design Support
Conceptual/Infological level	Information Data Performance Model Theory	Knowledge Effect	Knowledge Empirical	Value Quality Effect

Table 10. Comparison of Journals by Period

	MIS Quarterly	JMIS	ISR
1980-1984	Research on organizational level focuses on information system and technology in general, and DSS/computer/software in specific. IT artifacts are examined together with their effectiveness and management issues. For organizational level, stakeholder analysis focuses on users' involvement in development process, and managers' management of computers. Organizational activities research covers resource, planning, design, application, management and technology decisions. For the conceptual/infological level, information and data are the core topics of research on content of IT. IT impact studies are the most popular, addressing effectiveness, cost, success, and evaluation issues. Conceptual work on models and processes focus on decision problems.	Journal did not exist during this period.	Journal did not exist during this period.
1984/1985 [a]-1989	Research on technological level has a similar focus to those in the previous period, but is broadly associated with other research topics such as tasks, development process, and stakeholders. Organizational level research involves system/user management and IT decisions. Group becomes another important context. Analyst is taken as another important stakeholder. Organizational activities further emphasize support and implementation. Implementation is among the core terms only in MISQ. Conceptual/infological level studies frequently focus on decision success.	Database, one of the foci of intechnological level research, is unique to this period and to this journal. In this period more effort is given to stakeholder studies such as the roles of users, experts and managers. For conceptual/infological level research, knowledge becomes a core term in addition to information and data. Framework is one anchor of conceptual work, which is unique to this journal too. But no terms for the IT impact are identified.	Journal did not exist during this period.
1990-1994	Technological level terms include general ones such as IT and computer. Tasks receive more weight while the focus is on such topics as organizational/IT management and executive decisions. Knowledge emerges as the focus of research for the first time and lasts thereafter. Satisfaction appears as a new measure of IT impact.	GDSS appears as a core term in technological level research for this and all the following periods. Stakeholder, and organizational level studies are losing weight among researchers.	No specific technological level terms are identified as the core terms. Organizational studies do include new research topics such as group communication. Stakeholder studies focus on user and expert. [b]
1995-1999	Research on technological level and onorganizational activities is losing weight. Instead, research that focuses on context is attracting more attention. Expert is added as a stakeholder for this period only. The focus of IT impact research shifts to performance and quality. Decision theory begins to draw more attention from IS researchers.	Emphasis is on task related context in this period. Communication market is a new focus here, which is unique to this journal. Less effort is given to stakeholder and organizational activities studies. Knowledge is not the research focus here.	Electronic (system or commerce) emerges as one of the technological level research, earlier than the other two journals. Learning is an organizational level activity term unique to this journal. Studies on stakeholders, IT development/implementation, and IT impact are losing weight.
2000-2005	Technological level research gains less attention compared to other research topics. Decision is no more a core context. Individual level analysis emerges as a stream. Resource is first and only mentioned by MISQ in this period. Capabilities show up first in this period. IT impact research starts to examine the influence of IT. [b]	Technological level research is the most prominent in this period. Electronic market and Internet, and investment are emerging as core topics. IT impact research extends to include assessment of value as a core measures. [b]	The organizational level research in this period focuses on electronic/Internet/network. IT impact is emphasized but the other topics are given less attention.

a: The issues of JMIS 1984 are included in this category.

b: Information in the proximity of system is not one of the core terms for the marked three cells: 2000-2005 with MISQ and JMIS, and 1990-1994 with ISR. .

REFERENCES

Alavi, M. and P. Carlson. (1992). "A Review of MIS Research and Disciplinary Development," *Journal of Management Information Systems*. 8(4), pp. 45-62.

Alter, S. (2003). "The Is Core – XI Sorting Out Issues about the Core, Scope, and Identity of the IS Field," *Communications of the AIS.* 12, pp. 612-628.

Bakos, J. Y. and M. E. Treacy. (1986). "Information Technology and Corporate Strategy: A Research Perspective," *MIS Quarterly*. 10(2), pp. 106-119.

Banker, R. D. and R. J. Kauffman. (2004). "The Evolution of Research on Information Systems: A Fiftieth-Year Survey of the Literature in Management Science," *Management Science*. 50(3), pp.281-298.

Banville, C. and M. Landry. (1989). "Can the Field of MIS Be Disciplined?" *Communications of the ACM*. (32) 1, pp. 48-60.

Barki, H., Rivard, S. and J. Talbot. (1988). "An Information Systems Keyword Classification Scheme," *MIS Quarterly* (June). 12(2), pp. 299-310.

Benbasat, I. and R. W. Zmud. (2003). "The Identity Crisis within the IS Discipline: Defining and Communicating the Discipline's Core Properties," *MIS Quarterly*. 27(2), pp.183-194.

Cheon, M. J., C. C. Lee, and V. Grover. (1991). "Research in MIS – Points of Work and Reference: A Replication and Extension of the Culnan and Swanson Study," *Data Base*. Spring, pp. 21-29.

Communication of the ACM. (1982). "The Proposed New Computing Reviews Classification Scheme," 24(7), pp. 419-433.

Culnan, M. J. (1986). "The Intellectual Development of Management Information Systems, 1972-1982: A Co-Citation Analysis," *Management Science*. 32(2), pp. 156-172.

Culnan, M. J. (1987). "Mapping the Intellectual Structure of MIS, 1980-1985: A Co-Citation Analysis," *MIS Quarterly*. 11(3), pp. 341-353.

Culnan, M. J. and E. B. Swanson. (1986). "Research in Manangement Information Systems, 1980-1984: Points of Work and Reference," *MIS Quarterly*. 10(3), pp. 289-302.

Davis, G. B. (1974). *Management Information Systems: Conceptual Foundations, Structure, and Development*. New York, NY: McGraw-Hill.

Davis, G. B. (1980). "The Knowledge and Skill Requirements for the Doctorate in MIS," First International Conference on Information Systems, Philadelphia, PA, 1980, pp. 174-186.

Davis, G. B. (1999). "A Research Perspective for Information Systems and Example of Emerging Area of Research," *Information Systems Frontiers.* (1) 3, pp. 195-203.

Elam, J. J., G. P. Huber, and M. E. Hurt. (1986). "An Examination of the DSS Literature (1975-1985)," In E.R. McLean and H.G. Sol, eds., "Decision Support Systems: A Decade in Perspective," Proceedings of the IFIP WG 8.3 Working Conference on Decision Support Systems, the Netherlands (June 1986), pp.1-17.

Gay, G. and H. Hembrooke. (2002). "Collaboration in Wireless Learning Networks," Proceedings of the 35th Hawaii International Conference on System Sciences.

Gorry, G. A. and M. S. Scott Morton. (1971). "A Framework for Management Information Systems," *Sloan Management Review*. 30(3), pp. 49-61.

Huber, G. P. (1984). "The Nature and Design of Post-Industrial Organizations," *Management Science*. 30(8), pp. 928-951.

Hurt, M. E., J. J. Elam, and G. P. Huber. (1986). "An Examination of DSS Content in Major IS Conference Proceedings (1980-1985)," Proceedings of the Seventh International Conference on Information Systems, San Diego, CA, December 15-17, pp.27-45.

Ivari, J. (2003). "The IS Core-VII Towards Information Systems As a Science of Meta-Artifacts," *Communications of the AIS*. 12, pp. 568-581.

Ivari, J. and E. Koskela. (1987). "The PIOCO Model for Information Systems Design," *MIS Quarterly*. 11(3), pp. 401-419.

Ives, B., S. Hamilton, and G. B. Davis. (1980). "A Framework for Research in Computer-Based Management Information," *Management Science*. 26(9), pp. 910-934.

Ives, B. and G. P. Learmonth. (1984). "The Information System as a Competitive Weapon," *Communications of the ACM*. 27(12), pp. 1193-1201.

Kochen, M. (1985). "Are MIS Frameworks Premature?" *Journal of Management Information Systems*. 11(3), pp.92-100.

Leavitt, H. J. and T. L. Whisler. (1958). "Management in the 1980s," *Harvard Business Review*. 36(6), pp.41-48.

Lee, A. (1999). "Inaugural Editor's Comments," *MIS Quarterly*. 23(1).

Lee, Z., S. Gosain, and I. Im. (1999). "Topics of Interest in Is: Evolution of Themes and Differences between Research and Practice," *Information and Management*. 36(5), pp. 233-246.

Lin, L., X. Geng, and A. B. Whinston. (2005). "A Sender-Receiver Framework for Knowledge Transfer," *MIS Quarterly*. 29 (2).

Lai, V. S. (1996). "An Assessment of Database Research Interest in MIS," *The DATA BASE for Advances in Information Systems*. 27(2), pp. 37-43.

Lockyer, T. (2002). "Business Guests' Accommodation Selection: The View from Both Sides," *International Journal of Contemporary Hospitality Management*. 14(6).

Lockyer, T. (2003). "Hotel Cleanliness - How Do Guests View It? Let Us Get Specific. A New Zealand study," *Hospitality Management*. 22, pp. 297 –305.

Lowry, P. B. and D. Romans. (2003). "New Perspective on Global Information Systems Journal Rankings and Reference Disciplines," Proceedings of the Ninth Americas Conference on Information Systems, pp. 2801-2812.

Lucas, H. C., Jr. (1973). "A Descriptive Model of Information Systems in the Context of Organization," *Data Base*. 5(2), pp.27-36.

Malhotra, N. and M. Peterson. (2001). "Marketing Research in the New Millennium: Emerging Issues and Trends," *Marketing Intelligence & Planning*, 19(4).

Maynard, M. (1997). "Opportunity in Paid vs. Unpaid Public Relations Internships: A Semantic Network Analysis," *Public Relations Review*. 23(1), pp. 377-391.

Mason, R. O. and I. I. Mitroff. (1973). "A Program for Research on Management Information Systems," *Management Science*. 19(5), pp. 475-487.

McCubbrey, D. J. (2003). "The IS Core – IV: IS Research: A Third Way," *Communications of the AIS.* 12(34), November, pp. 553-556.

MIS Quarterly. (1985). "Cumulative Subject and Author Indices," Supplement to December 1985 Issue, pp.1-32.

Mock, T. J. (1973). "A Longitudinal Study of Some Information Structure Alternatives," *Data Base*. 5(2,3,4), pp.40-45.

Moore, K., R. Burbach, and R. Heeler. (1995). "Using Neural Nets to Analyze Qualitative Data," *Marketing Research*. 7(1), pp. 35-??.

Murgolo-Poore, M., L. F. Pitt, P. R. Berthon, and M. T. Ewing. (2002). "Re-Inquiring and Progressing People as Products: A Research Agenda for New Media, New Methods and New Theories," *Journal of Marketing Management*. 18, pp. 463-480.

Nagasundaram, M. and R. P. Bostrom. (1994). "The Structuring of Creative Processes Using GSS: A Framework for Research," *Journal of Management Information Systems*. 11(3), pp. 87-114.

Nolan, R. L. and J. C. Wetherbe. (1980). "Toward a Vomprehensive Framework for MIS Research," *MIS Quarterly*. 4(2), pp. 1-20.

Parsons, G. L. (1983). "Information Technology: A new Competitive Weapon," *Sloan Management Review*. 25(1), pp.3-14.

Peffers, K. and Y. Tang. (2003). "Identifying and Evaluating the Universe of Outlets for Information Systems Research: Ranking the Journals," *The Journal of Information Technology Theory and Application (JITTA)*. 5(1), pp. 63-84.

Pervan, G. P. (1998). *A Rewiew of Research in Group Support Systems: Leaders, Approaches and Directions, Decision Support Systems*. 23, pp. 149-159.

Piccoli, G., R. Ahmad, and B. Ives. (2001). "Web-Based Virtual Learning Environments: A Research Framework and a Preliminary Assessment of Effectiveness in Basic It Skills Training," *MIS Quarterly*. 25(4).

Romano, N. C. and j. Fjermestad. (2001). *Electronic Commerce Customer Relationship Management: An Assessment of Research*. 6(2), pp. 61-113.

Sambamurthy, V., A. Bharadwaj, and V. Grover. (2003). "Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms," *MIS Quarterly*. 27(2), pp. 237-263.

Sares, T. A. (1998). "Sociopolitical Viewpoints As Narrated by Family and Educational Background," *The Journal of Social Psychology*. 138(5), pp. 637-645.

Schmidt, M. (2001). "Using an ANN-Approach for Analyzing Focus Groups," *Qualitative Market Research: An International Journal*. 4(2), pp. 100-111.

Stewart, C. M., G. Gil-Egui, Y. Tian, and M. I. Pileggi. (2006). *Framing the Digital Divide: A Comparison of US and EU Policy Approaches, in New Media and Society*. Sage Publications. Available online: http://nms.sagepub.com/cgi/reprint/8/5/731.pdf.

Segars, A. H., and V. Grover. (1999). "Profiles of Strategic Information Systems Planning," *Information Systems Research*. 10(3), pp. 199-232.

Vessey, I., V. Ramesh, and R. L. Glass. (2002). "Research in Information Systems: An Empirical Study of Diversity in the Discipline and Its Journals," *Journal of Management Information Systems*. 19(2), pp. 129-174.

Zhang, P. and N. Li. (2005). "The Intellectual Development of Human-Computer Interaction Research: A Critical Assessment of the MIS Literature (1990-2002)," *Journal of the Association for Information Systems*. 6(11), pp. 227-292

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