CHANGES IN IS RESEARCH: A COMPARATIVE ANALYSIS

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Abstract

Information Systems (IS), as a scholarly discipline, has been characterized as very diversified and has evolved considerably over the years. The purpose of this study is to present an overview of the changes in IS research that occurred between two periods 1984 to 1986 and 1996 to 1998, based on articles published in IS journals: MIS Quarterly and Information Systems Research. The articles were analyzed according to main topic, technological approach, research methods, keywords and contributing disciplines such as humanities and social sciences. Significant differences were found between the two periods. Cognitive maps of keyword-main topic associations are presented for each period. The various findings are discussed and linked to current trends. They show the beginnings of a promising tendency toward the development of an evolutionary and cumulative research tradition. The findings will provide food for thoughts for researchers of all disciplines.

Keywords: Information Systems, ICT, Research, Literature, Methodology, Document Analysis

1. INTRODUCTION

Information Systems (IS) as a scholarly discipline, has been characterized as very diversified, whether one considers the problems it addresses, its theoretical foundations, contributing disciplines, or the methods used to investigate these problems. It is still a fairly new research area compared to other business domains, and newer compared to humanities. The University of Minnesota launched the first doctoral program in management information systems in 1968 (Barki et al. 1988). *MIS Quarterly*, the first scholarly journal devoted to publishing IS research, was founded in 1977. The IS discipline evolved considerably over the last forty years. Because of its ties with both business and computing, researchers within the IS community as well as from other business disciplines were and are still questioning our domain: What is the field's identity? How is it unique? How does it differ from other fields? (Ayanso et al. 2007). To answer these questions and to improve continually IS scholarly outputs, a new stream appeared, IS meta-research, where IS research itself is the object of interest. IS meta-research stems from the field's quest for identity and examines the rigor, relevance, diversity and essential core of IS research (Raghupathi & Friedman, 2009).

The present study examines the evolution of IS research that occurred between the periods 1984-1986 and 1996-1998, based on 202 articles published in two IS journals: *MIS Quarterly* (MISQ) and *Information Systems Research* (ISR) (Table 1).

>"For IS research to progress, it is essential to critically assess the research methods employed by the community. To be able to do this, one has to know the historical development of the various research methods" (Riedl & Rueckel 2011, p. 1).

The same applies to other aspects of IS research such as topics, perspectives, impacts of Information and Communications Technologies (ICT). In order to orient their efforts and strive for excellence, the IS community should understand the history and evolution of their research. In order to introduce this investigation, a review of literature was conducted to formulate our research questions. Research methodology is described in section 3. Findings are presented in section 4. Section 5 offers the conclusion and implications for future IS research as well as the study's limitations.

2. REVIEW OF IS META-RESEARCH LITERATURE AND RESEARCH QUESTIONS

IS research, as evidenced by published studies, evolves over time. Research paradigms exemplify this evolution. Two research paradigms are prevalent in IS: positivism and interpretivism. "Positivists believe that reality exists objectively and independently from human experiences while interpretivists emphasize the subjective meaning of the reality that is constructed and reconstructed through a human and social interaction process" (Chen & Hirschheim 2004, p. 201). Orlikowski & Baroudi (1991) examined 155 North American IS research articles published between 1985 and 1989. They found that positivism clearly dominated with a frequency of 150 positivists articles compared to 5 interpretative studies. Evaristo & Karahanna (1997) studied the potential differences between European and North American research by scrutinizing IS doctoral theses of the years 1985 and 1990, for their research methods, contributing disciplines and epistemologies.

They found that European dissertations in 1985 were predominantly non-empirical and interpretivist, drawing principally from artificial intelligence and computer science, whereas North American dissertations were more positivist, empirical and based on behavioural science and management. In 1990, they found that computer science and management were the main reference disciplines in both samples. Chen & Hirschheim (2004) examined 1893 articles, published from 1991 to 2001, from eight IS outlets. They found that positivism still dominated in 2001 but interpretivism was gaining a wider acceptance. In 1991, they found 63 positivist articles versus only 3 interpretative ones. However, in 2001, 26 interpretive articles were published compared to 83 positivist studies (Chen & Hirschheim 2004). Over an eleven year period, they found overall that 81% of positivist articles compared to 19% interpretative. These three meta-studies point to an ongoing evolution in the IS field. The present studies examines whether other aspects of IS research have evolved between the 1984-1986 and the 1996-1998 periods.

2.1 ICT Impact Models

The way researchers model the impact of information and communications technology (ICT) on individuals and organizations is an aspect that merits further examination. Kimble & McLoughlin (1995) found that managers generally adopted one of two perspectives to understand the relationship between ICT and organizations, groups or individuals. The first perspective, the technology impact model, leans towards technological determinism where ICT are viewed "as a substitute for labour (…). The central argument is that technology can perform the work of managers more efficiently than a human being" (Kimble & McLoughlin 1995, p. 57). Conversely, tenants of the social impact model hold that ICT is the agent of intentional change. "It is not the technology but the way it is designed and used: subjective social values impact upon a technology and its use" (Kimble & McLoughlin 1995, p. 57). They proposed a third technology impact model integrating the two others. The integrationist model "portrays an 'impact' not as a linear outcome, but as a complex, interactive and ongoing process. The principal mechanism for this is the interactions of groups and individuals free to act within the constraints of their current milieu" (Kimble & McLoughlin 1995, p. 58). If managers are influenced by their ICT impact perspective, might their own perspective influence IS researchers as well? It is conceivable that researcher's ICT impact model might have a bearing on other aspects such as research methods. Scholars' ICT impact models may influence research objectives, methodological choices, and eventually findings.

For example, an integrationist perspective should be favourable to a longitudinal study, rather than a cross-sectional one, in order to emphasize the ongoing process. Our next research question is related to ICT impact models.

RQ1. What were the dominant impact models used in the articles? Was any changes observable from period 1 to period 2? What research methods were associated with each impact model?

2.2 Relevance and Generalizability

A common thread to all three perspectives discussed in the previous paragraph is how they view the role of ICT. ICT (or IT) is the core artefact of IS research (Orlikowski & Iacono 2001).

> Benbasat & Zmud (2003) "conceptualize the IT artefact as the application of IT to enable or support some task(s) embedded within a structure(s) that itself is embedded within a context(s). Here, the software/hardware design of the IT artefact encapsulates the structures, routines, norms and values implicit in the rich contexts within which the artefact is embedded" (p. 185).

Because of its centrality in the IS discipline, we decided to investigate the focus placed on ICT itself. Given the proliferation of new ICT in recent years, we examined whether they were given attention during the two periods covered. Our question considers whether or not the object of an article is focused on a specific ICT. This research question was not derived directly from our review of literature, but was inspired by the discussions about diversity and the IT artefact (Benbasat & Weber 1996; Robey 1996, Orlikowski & Iacono 2001, Benbasat & Zmud 2003). It also pertains to the relevance and generalizability of IS research. A study focusing on a specific ICT would be more relevant for practitioners. Relevance for practitioners means whether or not the IS study "produces implementable outcomes" (Raghupatti & Friedman 2007, p. 337). Conversely, a study focusing on ICT or IS in general might increase generalizability of the results. Generabilizability includes "a conceptual dimension of generalizability of the theoretical constructs from research findings to theory" (Raghupatti & Friedman 2007, p. 336).

RQ2. Do the articles examine IS in general or does it focus on a specific ICT? Were there any changes in IT focus between the two periods?

2.3 Identity of IS Discipline

Although ICT is the artefact of an IS paper, it is not always its main topic (Orlikowski & Iacono 2001, Benbasat & Zmud 2003). This raised many questions about the IS discipline's identity (Neufeld et al. 2007, Raghupathi & Friedman 2009, Ayanso et al. 2007). Neufeld et al. (2007) used a descriptive approach which "characterizes the central identity of the IS field in terms of what IS researchers (or practitioners) 'do' " (p. 446). With the help of specialized software, they extracted keywords from 6466 IS articles titles and abstracts. They used these keywords to classify articles according to the top-level the Barki et al. (1988, 1993) IS Keyword Classification[1] (Table 2). Automation allowed them to provide an overall view of IS papers published from 1973 to 2004.

However, Neufeld et al. (2007) noted that their study was limited by lack of a detailed view. For example, they identified all topics covered by an article without identifying its main topic. We are interested in identifying the main topic of each article which brings the following questions:

RQ3. Was there an evolution in main topics of the articles between the two periods?

2.4 Associations between Topics

Swanson & Ramiller (1993) examined all papers submitted to ISR between 1987 and 1992, whether they were published there or not. They classified them by themes, relationships, categories, and research questions, in order to identify patterns and trends. However, their findings were limited because their study was restricted to one journal and included rejected articles. In this study, the use of different keywords with a main topic in an article is indicative of the use of different viewpoints to examine a question. Thus, the evolution of keyword usage would be indicative of cognitive maps' evolution.

RQ4. Which keywords appear most frequently by period and by journal?
RQ5. Which keywords were most frequently associated with which main topics, by journal and by period?

2.5 Research Method Diversity

> "Casual observation does not provide a satisfactory empirical foundation for general descriptive laws. (…) Without systematic observation, our observations will be severely filtered by our preconceptions. (..) An important part of the history of social sciences (…) can be written in terms of advances in the tools for empirical observations." (Simon 1980, p. 72)

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[1] In this paper, BRT refers to the Barki, Rivard & Talbot IS Keyword Classification Scheme (1993).

Moreover, Riedl & Rueckel (2011) emphasized the ongoing importance of a critical assessment of research methods "After all, one way in which IS research can have sustainability and longevity is to enforce rigor in its research elements of theory, methodology and findings" (Raghupathi & Friedman 2009, p. 341). Therefore, a study comparing changes in IS research over time must examine research methods as well.

RQ 6. Do the two periods analyzed show a diversity of methods? Is there a notable preference for a particular method? Is there a difference between the two periods with respect to the selected methods?

2.6 Contributing Disciplines

In the early 1970's, Dearden (1972) claimed that "It is difficult even to describe the MIS in a satisfactory way, because this conceptual entity is embedded in a mesh of fuzzy thinking and incomprehensible jargon". The following year, Mason & Mitroff (1973) published "A Program for Research on Management Information Systems". Since these beginnings, IS scholars strove to improve the rigor and relevance of IS research (Raghupathi & Friedman 2009). IS scholars borrowed theoretical models, such as the Theory of Planned Behaviour (Ajzen 1991), and research methods, such as statistics and hermeneutics, from what was called at first reference disciplines (Table 3).

Thirty years after Dearden's (1972) provocative article, the IS field had achieved a level of maturity such that it contributed to the development of other disciplines (Baskerville & Myers, 2002). Examples of disciplines that benefited from IS contributions include accounting, geography and information science. Foreign language and culture teaching is another area that gained from developments in ICT (Deneme, Ada & Uzun 2011). Because of this maturation, Lee (2001) proposed the term 'contributing disciplines' instead of 'reference disciplines'. The maturity of IS as a field does not negate the contributions of an expanding number of disciplines. Kroeze et al. (2011) suggest that humanities offer a great deal to address new and more complex problems. They offer ontology and aesthetics as examples of humanities contributions to IS. This brings us to our final research question:

RQ7. Which were the contributing disciplines referenced during the two periods?
To answer these questions, we used the methodology described in the following paragraph.

3. METHODOLOGY

MIS Quarterly and Information Systems Research were selected to be included in the study. Their value is largely accepted by IS and business faculties. They were recognized among the best journals specialized in IS during period 2 (Hardgrave & Walstrom 1997) and still are today (Barnes 2005). To evaluate significant changes in IS research, an interval of about ten years between the two periods of analysis appeared to be desirable. Following this criteria, two periods were selected, 1984-86 and 1996-98 giving us a sample of 202 articles (Table 1). ISR is included in the second period only because of its 1990 inception date. Although we acknowledge that our sample may not be representative of all MIS scientific research, the scope of these two journals enables our sample to reflect the more significant changes in the field. These 202 articles were read and coded by the three researchers, following the classification criteria described in paragraphs 3.1 to 3.5. The sample was divided randomly and each researcher worked independently. Following this first step, each article was verified by another coder. The few disagreements that arose from the process were resolved by group discussion.

Where applicable, the statistical significance of the results was verified. χ^2 tests were performed to determine whether the proportions obtained differed significantly between two groups. The proportions tabulated for MISQ period 1 were compared respectively to results for MISQ period 2, for ISR and all period-2 articles. As well, proportions for MISQ period 2 were tested with those for ISR.

Finally, cognitive maps were built to examine the associations between keywords and topics. Figures 4, 5, 6 illustrate associations between main topic and keywords, using BRT top-level codes, for each period and journal. If an article had four keywords, there would be four main topic-keyword associations. In these three figures, the thickness of the lines is proportional to the number of times two categories were associated in an article via a main topic-keyword pair. The thinnest lines indicate that only one such pairing was found.
All articles were classified according to their ICT impact model, focus, main topic, keywords and research methods, and contributing disciplines.

3.1. Technology, Social or Integrationist Impact Models.

Articles were categorized the articles according to the ICT impact model adopted to analyze the relationship between information systems and organizations, groups or individuals. The coders used the definitions of the three impact models from Kimble & McLoughlin's (1997).

3.2. ICT Focus: 'General' or 'Specific'

Our primary analysis was to assess whether the article examines ICT or IS in 'general', i.e. as a broad and comprehensive group of technologies or whether if it focused on a specific ICT application or system. Bakos & Treacy (1986) about the influence of ICT on competitive strategy of organizations was classified as 'general'. An example of a study categorized 'specific' is Dennis & Carte (1998) concerning the effects of a Geographic Information System on the decision making process.

3.3. Research Methods

The third classification criterion was the research method designed for each article in our sample. We followed a two-step process to compile a list of IS research methods. We first selected the classification presented by Miller (1991) for its parsimony (Table 5). We chose not to adopt a more exhaustive and varied classification because, in many instances, the abstracts contained only summary information about the method used. However, during the coding procedure, we found some IS methods excluded from the initial list. To improve the quality of our analysis, the most important of these methods were added to form the final list (Table 5).

3.4. Main topic and Keywords

The BRT scheme was used as in Alavi & Carlson (1992). For each article in our sample, keywords used in the abstract were codified according to the second level of the BRT classification (two letters). Within an article, several keywords could appear from within the same second-level category. In those cases, only one two-letter code was used. We chose between one and four of the most relevant keywords among those provided for each article. The most representative of these was elected as the main topic. Main topics and keywords were coded according to the BRT scheme because it presented the most comprehensive approach to classification of the MIS territory. BRT (1993) contains over 1100 keywords distributed throughout nine categories and several subcategories (Alavi & Carlson 1992). We only used the second level of the BRT scheme in order to facilitate analysis. Using the complete scheme would result in too many keywords which would have been meaningless. For this reason, only the first level codes were used for main topics.

The following example will better illustrate this procedure. Four keywords were attributed to the article: "User Response to an Online Information System: a Field Experiment" (Franz et al. 1986): DD 'Organizational Dynamics', EE 'IS Project Management', FD 'IS Implementation' and GE 'Type of Processing. However, only one - DD - was selected as the main topic because the article is about 'organizational change', which pertains to the organizational dynamics area. As top-level codes are used for main topics, Franz et al. (1986) main topic code was D 'Organizational Environment'. The following keyword-main topic pairs were added to the period 1 cognitive map: D - E, D - F, D - G.

3.5 Classification of Contributing Disciplines

We extracted from BRT a subset of second-level codes: all those from A (Reference Disciplines) plus keywords from other categories related to contributing disciplines ((Table 3).

We then compared the results from the keyword and method results with this list. Findings for each research questions are present next.

4. FINDINGS
4.1 Dominant Impact Models

RQ1 What were the dominant impact models used in the articles? Were any changes observable from period 1 to period 2? What research methods were associated with each model?

The analysis of the two periods allowed us to observe a decrease of studies adopting technological determinism as impact model (Table 6 & Figure 1). During period 1, 89% of articles adhered to the Technology Impact Model. That proportion dropped to 76% for period-2 articles.   In ISR, articles were classified as follows: 81% Technological Impact Model, 12% Social Impact Model and 7% integrationist model. MISQ showed 89% Technological Impact Model, 7% Integrationist Model and 4 % Social impact during period 1 and 71% Technological Impact Model, 16% Integrationist Model and 13% Social Impact during Period 2.

This difference demonstrates an important increase in Integrationist and Social Impact Studies, particularly of the former between the two periods. ISR published Social Impact studies more frequently than integrationist studies. The social impact model was most often associated with the following methods: conceptual, case studies and descriptive surveys. The integrationist model was most often associated with conceptual and case study methods. Most sample survey articles were associated with the technological impact model. These results reflect a notable change. They inform our understanding about the evolution of ICT impact perspectives, where deterministic models are starting to evolve towards more complex and multidimensional models. For many years, the prevalent perspective on IS studies was characterized by epistemological and methodological presumptions oriented by positivist beliefs that technology shapes organizational structure (i.e., the Technological Impact Model). This dominance was revealed by research models (unidirectional causality) and research designs (cross-sectional, surveys and laboratory studies) present in the majority of the studies reviewed by Orlikowski & Baroudi (1991, in Table 4). We chose to scrutinize how the authors in our sample perceived ICT impact. In fact, the IS field has been characterized by a serious dilemma: despite its unquestionable importance, there was a lack of consistent research findings and theoretical frameworks to explain the interaction between ICT, organizations and users. A felt need for new conceptualizations and integrationist frameworks was reflected in the emergence of studies adopting integrationist models. Therefore, these findings merit emphasis.

4.2 IS in General or Specific ICT

RQ2 Do the articles examine IS in general or does it focus on a specific ICT? Were there any changes in IT focus between the two periods?

When ISR articles were compared to MISQ period 1 ones, 33.3% of the former were focused on a specific ICT versus 21.1% of the later. The difference was significant ($\alpha < 0.05$). Further analysis shows significant results ($\alpha < 0.10$), when comparing MISQ period 2 to ISR period 2. These results seem to indicate an editorial decision at ISR to differentiate itself from MISQ (Figure 2). The number of MISQ articles focused on a specific ICT did not increase significantly between period 1 (21.1%) and period 2 (24.2%). As discussed earlier, articles focusing on a specific ICT should be more relevant for practitioners but are they generalizable? A corpus of knowledge extendable to emerging ICT may develop, if specific studies are used to build and test theoretical models. A case in point is the Cognitive Fit Theory (Vessey 1991). Over the span of several decades, studies in various disciplines to determine which representation type, either graphs or tables, supported best problem-solving. Overall, results seemed inconclusive. Some studies supported graphs as the better tool, others pointed to tables. Vessey (1991) conducted a meta-analysis of previous results and concluded the following. "Performance on a task will be enhanced when there is a cognitive fit (match) between the information emphasized in the representation type and that required by the task type" (p. 991). Vessey's model successfully explained the results of previous articles. The findings of many of these individual papers were not generalizable to other ICT. However, Vessey used these findings as a corpus to build an enduring theoretical model. The Cognitive Fit Theory was applied successfully to various decision support systems (DSS) including geographic information systems and e-shopping interfaces.

4.3 Evolution in Main Topics

RQ3: Was there an evolution in main topics of the articles in the two publications between the two periods?

During period 1, the most frequent main topics in MISQ concerned IS Management (31%), IS Development and Operations (27%) and Information Systems (16%). These were also found to be the most frequent from 1968 to 1988 among the eight journal analyzed by Carlson & Alavi (1992). In their sample, Information Systems was the main topic most frequently addressed from 1968 to 1973, followed by IS Management from 1974 to 1988.
During period 2, Reference Disciplines (22%), IS Management (20%) and Information Systems (15%) were the most popular main topics. IS Development and Operations was reduced to the fifth rank (9%). Organizational Environment (11.5% from 2.8%) and External Environment (8.4% from 1.4%) became more frequent (Table 7).

These findings demonstrate that IS research evolved towards a more systemic approach between the two periods. The importance of linking IS to its environment rose in researchers' preoccupations. This trend was a lot stronger in IRS than in MISQ for period 2. The differences between periods were statistically significant ($\alpha < 5\%$).

4.4 Keywords

RQ4: Which keywords appear most frequently by period and by journal?

For the 202 articles of our sample, 627 keywords were codified to describe the contents (Table 8). Research (AI) did not appear as a keyword in any article published in MISQ for the first period. It appeared 8 times in ISR and 21 times in MISQ.

In addition, Management Science (AK) appeared only 4 times in MISQ as keyword for both periods, compared to 10 times in ISR. In these cases, AK referred to statistical methods. This is indicative of a greater emphasis placed on mathematical methods in ISR during that period. In MISQ, keywords pertaining to IS Development and Operations fell from 9.77% period 1 to 2.49% period 2. Keywords referring to IS management appear more often in MISQ than in ISR, whereas keywords related to Organizational Environment were more frequent in ISR than in MISQ.

4.5 Cognitive Maps

RQ5: Which keywords were most frequently associated with which main topics, by journal and by period?

Figures 4, 5 and 6 illustrate, by period and journal, associations of an article's main topic with its keywords. Associations within the same top-level category are not represented. If an article had four keywords, there would be four main topic-keyword pairs. The thickness of the lines is proportional to the number of times two categories were associated among all the articles. The thinnest line indicates that only one such pairing was found. This design allows us to examine how researchers associated different research topics in their papers.
In MISQ period 1(Figure 4), the following pairs were found most frequently:
a) A (Reference Disciplines) - H (Information Systems);
b) A - F (IS Development. and Operations);
c) A- E (IS Management);
d) H– F; and
e) E – F.

In period 1 (Figure 4), keyword A was linked neither with B (External Environment) nor with C (Information Technology). In MISQ period 2 (
Figure 5), the strongest links are between A (References Disciplines) and E (IS Management) and between A and H (Information Systems).

When examining the two MISQ cognitive maps, the strongest links are between the same pairs. However, in period 2, these links are much stronger and associations were found between almost all categories. In period 2, associations appeared between A and B (External Environment) as well as A and C (Information Technology).

In ISR period 2 as well, associations are found between A and each of the other categories. The strongest links are between A and E and between A and H. Compared MISQ period 1, a great number of main topic-keyword pairs were identified linking A and each of the other categories.

For both journals in period 2, the breadth of keyword-main topic association increased compared to period 1. A possible explanation could be that authors started to leverage contributing disciplines as theoretical or methodological foundations for their articles (Robey 1996) more often in period 2 than in period 1.

4.6 Research Methods

RQ 6: Do the two periods analyzed show a diversity of methods? Is there a notable preference for a particular method? Is there a difference between the two periods with respect to the selected methods?

There was clearly a diversity of methods during both periods (Table 9). During the first period, conceptual articles represented 32 % of articles, followed by sample surveys in 24 %. We found case studies, description of project, descriptive surveys used with less frequency. During the second period (for both journals), a greater diversity of methods can be observed and a change in dominance: 26 % conceptual, 18 % descriptive surveys, 15 % case study and 11 % sample survey. Although used less frequently in period 2 than in period 1, conceptual articles still dominated IS literature. In period 2, 26% of all published articles were conceptual with 29% in IRS and 23% in MISQ. Conceptual articles in MISQ decreased from 32% to 23% between periods. This could be indicative of the growing maturity of IS research as it evolves towards from purely theoretical papers to formulating and testing a conceptual model. Another sign of evolution is the decreased use of the 'Description of Project Development' method, in period 2 (2.3%), particularly in MISQ (1.6%), compared to period 1 (8.5%).

We interpret this trend as a positive evolution because the description of application method, however popular in MIS, is less rigorous methodologically because of its lack of theoretical bases (Benbasat, Goldstein & Mead, 1987). Research method diversity increased, given that case studies rose from 9.9% to 15.3% and descriptive surveys (secondary data) grew from 7% to 18% between the two periods.

The two publications were compared for the second period. All three action research papers were published in MISQ. On the other hand, ISR published a greater proportion of conceptual studies. As for the other methods, the numbers are very similar for the two publications.

4.7 Contributing Disciplines

RQ7 Which were the contributing disciplines referenced during the two periods? Was there a notable evolution?

When Table 3 was compared to Table 8, all second-level keywords related to contributing disciplines were highlighted. Four keywords came from A (Reference Disciplines): AA Behavioural Science, AK Management Science, AH Management Theory and AI Research. Two additional keywords were related to contributing disciplines: Organizational Dynamics and Economic Environment. Table 8 shows an increase of keywords related to contributing disciplines between the two periods. Organizational dynamics, management science, management theory, are branches of business studies. Behavioural Science is derived from applied behavioural psychology. Economic environment stems from economics. All of these contributing disciplines are classified as social sciences.

The last keyword, Research, refers to research methods which should provide additional indications about contributing disciplines (Table 9). Sample survey, case study, action research were developed in social sciences. Sample survey makes extensive use of statistics, a child discipline of mathematics. Descriptive survey (secondary data) is the only method stemming from humanities. Descriptive survey grouped two methodologies: document analysis from information science, a child discipline of library science, and hermeneutics from religious studies. There was only one study using hermeneutics out of the 202 articles. Although the IS discipline would benefit from increased contributions from the humanities (Kroeze et al. 2011), there were few signs pointing in that direction during period 2.

5. CONCLUSION

Analyzing these 202 articles allowed us to pounder important questions that have affected the IS discipline over the years. However, we must note two limitations. First, the sample is limited to 202 articles from two periods and two journals. Second, all findings may not apply to other journals and other time periods. However, this smaller sample allowed for a more in-depth analysis.

The answers to the seven research questions have improved our understanding of trends involving approaches, research methods and main topics that are becoming more crucial in IS and other fields of business. Among interesting findings, our study revealed that diversity, which characterizes IS, showed promising results toward an evolutionary and cumulative research tradition. Such results were found in research methods, main topics, ICT specificity and ICT impact models.

a. Diversity of research methods increased in period 2, as well as the number of case studies.
b. The main topics and keywords analyses revealed that IS Development and Operation issues decreased in importance, while Reference Disciplines became more preeminent in period 2.
c. In period 2, the Organizational Environment starts to increase in importance, reinforcing the idea that purely technical approaches in the analysis of fit between Information Technology and organizations, groups or individuals are not enough. Social, cultural and political approaches seem to be necessary in order to comprehend the role of ICT in organizations.
d. There were more studies focusing on a specific ICT in period 2, despite the fact that general-based perspectives still dominated. DSS, previously the most specific ICT studied, began to be replaced by other ICT.
e. A decrease in technological impact models was observed from period 1 to period 2. The rise of the social impact model and integrationist models is consistent with the emergence of methods such as case study as well as research action.

f. Most contributing disciplines belonged to business and other members of the social sciences family. As users seek to leverage the multimedia capabilities of ICT for their work, communications or entertainment needs, IS researchers should turn more to humanities such as arts, philosophies and languages as contributing disciplines.

We believe that an ongoing emergence of qualitative methods, such as case studies and action research, as well as of ICT interactionist models would improve IS research. Discussions about opposing perspectives or methods should be abandoned in favour of greater integration in order to reap the rewards from potential synergies.

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APPENDICES

Appendix A Tables

Table 1 Number of Articles Analysed per Journal and Period

Journal	Period	Number of Articles
MIS Quarterly	(1) 1984-1986	72
MIS Quarterly	(2) 1996-1998	62
Information Systems Research	(2) 1996-1998	68
Total		**202**

Table 2 Keyword Classification Scheme – BRT Top-level categories (p. 304)

A: Reference Disciplines
B: External Environment
C: Technological Environment
D: Organizational Environment
E: IS Management
F: IS Development and Operations
G: IS Usage
H: Information Systems
I: IS Education and Research

Table 3 Keywords Related to Contributing Disciplines from BRT

A: Reference Disciplines	IS Keywords Related to Contributing Disciplines
AA Behavioural Science	BA Economic Environment
AB Computer Science	BB Legal Environment
AC Decision Theory	BC Political Environment
AD Information Theory	BD Social Environment
AE Organizational Theory	DA Organizational Characteristics
AF Management Theory	DB Organizational Functions
AG Language Theories	DC Task or job Characteristics
AI RESEARCH (includes research methods)	DD Organizational Dynamics
AJ Social Science	EB Personnel Resource Management
AK Management Science	EH IS Staffing
AL Artificial Intelligence	IA IS Education
AM Economic Theory	ID History of IS
AN Ergonomics	
AO Political Science	
AP Psychology	

Table 4 Orlikowski & Baroudi (1991) Research Methods in IS

Research Method	Number of Articles	Percentage
Survey	76	49%
Lab Experiment	42	27%
Case Study	21	13%
Other	16	11%
Total	155	100%

Table 5 Research Methods Classification Scheme

Miller's (1991) Research Methods
1. Sample Survey
2. Descriptive Survey - Cross-Sectional
3. Descriptive Survey – Longitudinal
4. Field Study
5. Controlled Experiment (laboratory, natural and field experiments)
6. Case Study
Methods Added to Miller's List
7. Action Research
8. Quasi-experiment
9. Conceptual
10. Description of Development or Process
11. Not Indicated

Table 6 Results for Impact Model

Model	Period 1 (%)	Period 2 (%)		
	MISQ	MISQ	ISR	Both Journals
Technological Impact Model	89	71	81	76
Social Impact Model	4	13	12	12
Integrationist Model	7	16	7	12

Table 7: Results for Main Topics

BRT Codes	Main Topic	Period 1 (%)	Period 2 (%)		
		MISQ	MISQ	ISR	Both Journals
A	Reference Disciplines	11.3	21.0	23.2	22.1
B	External Environment	1.4	3.2	13.0	8.4
D	Organization Environment	2.8	6.5	15.9	11.5
E	Is Management	31.0	24.2	15.9	19.9
F	IS Development And Operation	26.8	11.3	7.3	9.2
H	Information Systems	15.5	21.0	10.1	15.3

$\chi 2$ tests results: MISQ: Period 1 & MISQ Period 2: α <1%. MISQ Period 1 & Both Journals Period 2: α < 5% .

Table 8 Results for Keywords

BRT Codes	Keywords	Period 1 (%)	Period 2 (%)	
		MISQ	MISQ	ISR
A	**Reference Disciplines**			
AA	Behavioural Science	4.19	4.98	7.11
AF	Management Theory	5.12	4.98	4.27
AI	Research	0	10.45	3.79
AK	Management Science	1.4	0.50	4.74
B	**External Environment**			
BA	Economic Environment	0.93	1.49	6.16
D	**Organization Environment**			
DD	Organizational Dynamics	0.47	4.48	8.53
E	**Is Management**			
EE	IS Project Management	4.65	1.0	2.37
EI	IS Evaluation	4.65	7.96	3.79
EL	IS Management Issues	3.72	5.47	2.84
F	**IS Development And Operation**			
FB	IS Life Cycle Activities	9.77	2.49	3.32
GA	Organizational Use of IS	6.98	1.99	0
HA	Types of IS	8.37	9.95	9.00

Table 9 Results for Research Methods

Method	Period 1 (%)	Period 2 (%)		
	MISQ	MISQ	ISR	Both Journals
Sample survey	23.9	11.3	11.6	11.5
Case study	9.9	16.1	14.5	15.3
Conceptual	32.4	22.6	29.0	26.0
Descriptive survey (secondary data)	7.0	17.7	17.4	17.5
Description (project development)	8.5	1.6	2.9	2.3
Research Action	0	4.8	0	2.3

$\chi 2$ tests results: MISQ: Period 1 & MISQ Period 2: α <1%. MISQ Period 1 & Both Journals Period 2: α < 1% .

Appendix B Figures

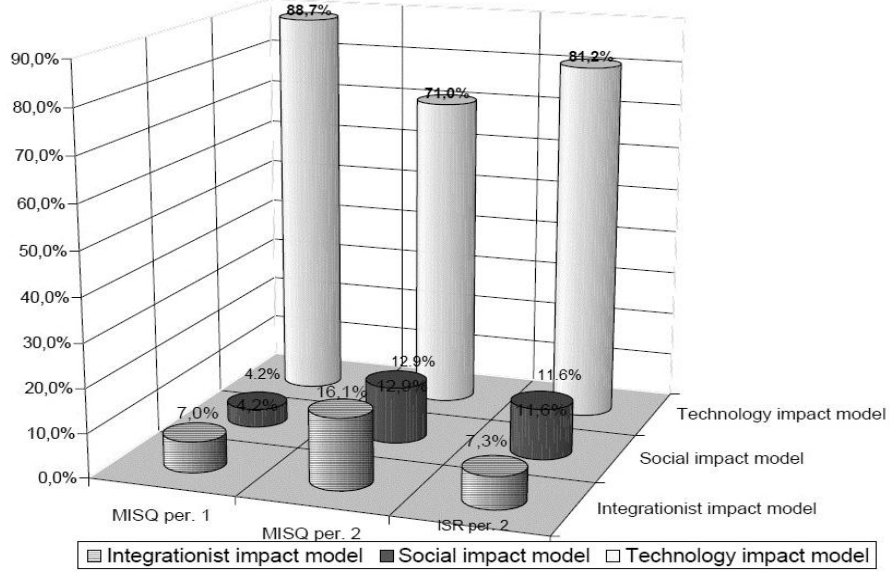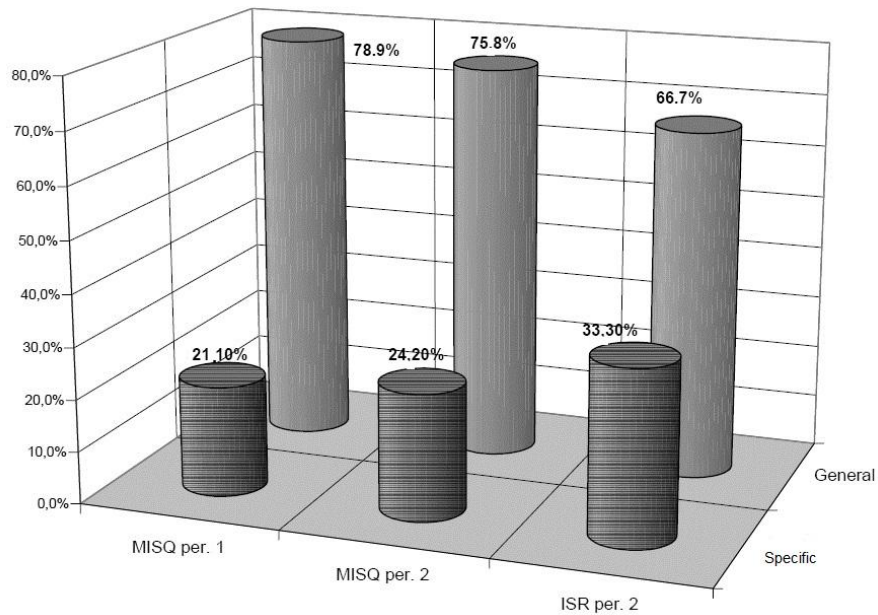**Figure 1 Results for Impact Models**

Figure 2 Results for Technological Focus

χ^2 tests results: MISQ: Period 1 & ISR Period 2: $\alpha < 5\%$. MISQ Period 2 & ISR Period 2: $\alpha < 10\%$

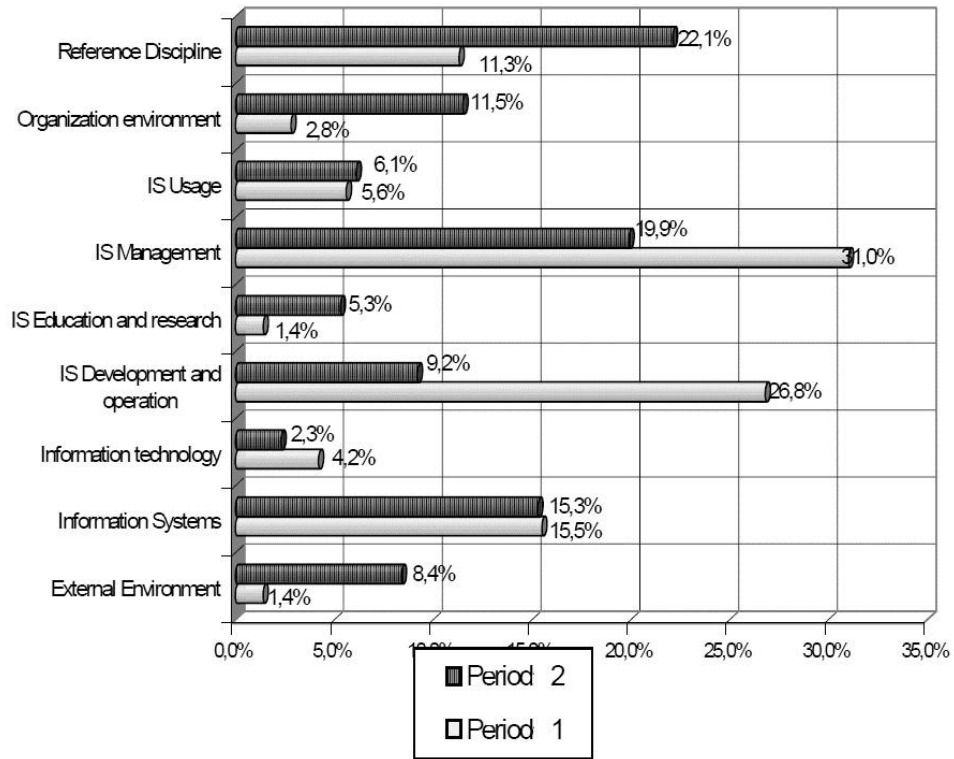**Figure 3Main Topics Results**

Figure 4 Associations between Main Topic and Keywords in MISQ Period 1 (1984-1986)
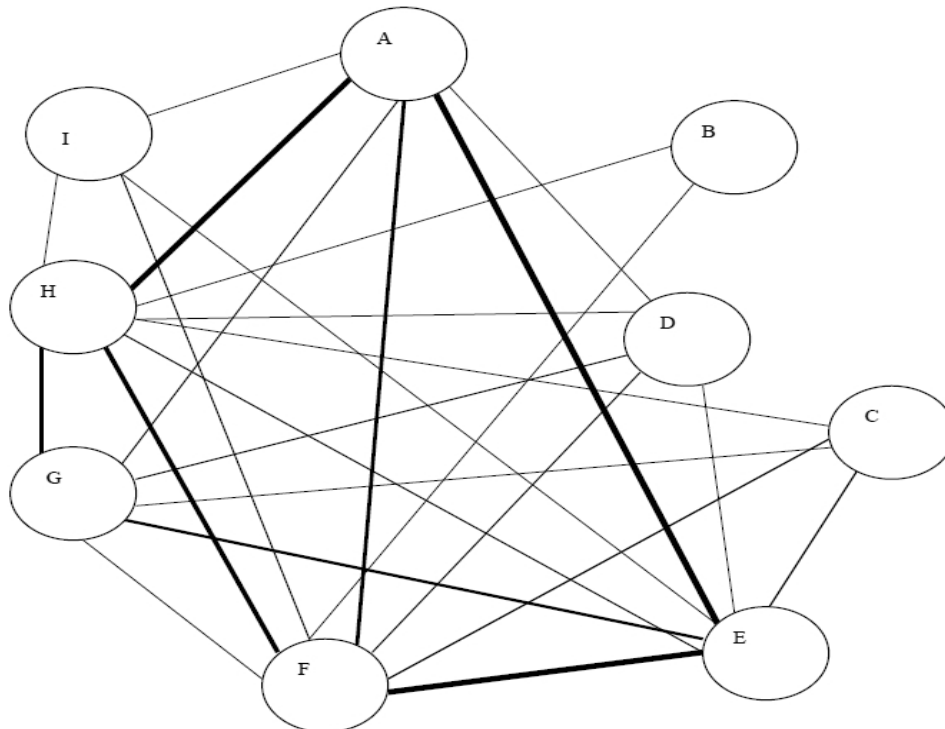(Refer to top-level keywords in Table 2, Appendix 1)

Figure 5 Associations between Main Topic and Keywords in MISQ Period 2 (1996-1998)
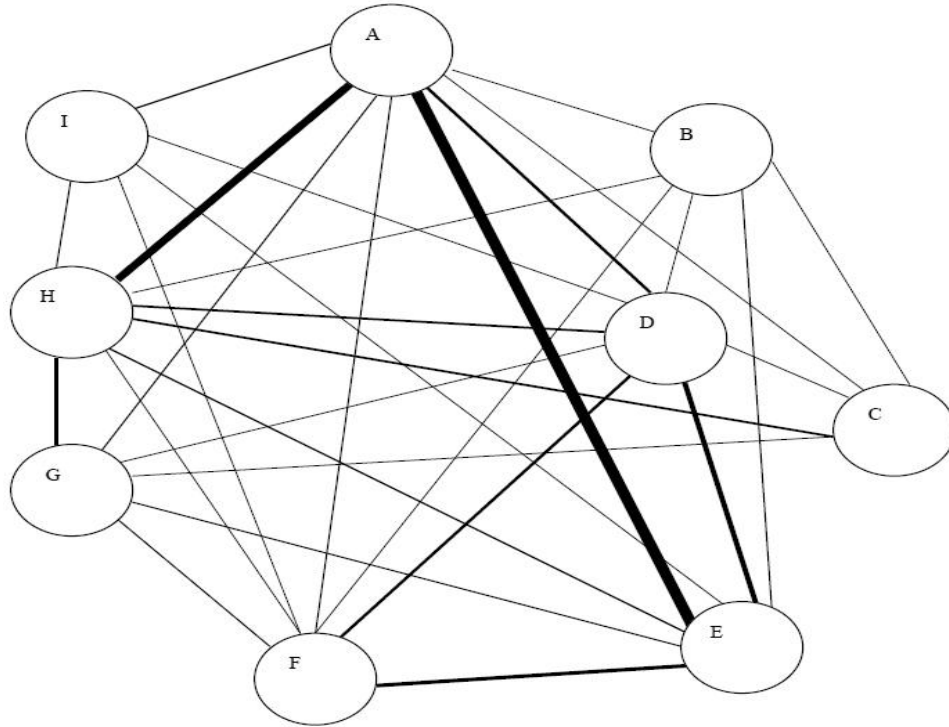

Figure 6 Associations between Main Topic and Keywords in ISR Period 2 (1996-1998)