Association for Information Systems
AIS Electronic Library (AISeL)

PACIS 2004 Proceedings

Pacific Asia Conference on Information Systems (PACIS)

December 2004

Overview of Information Systems Research in China: An Empirical Study

Shaobo Ji
Carleton University

Qingfei Min
Dalian University of Technology

Weihe Han
Dalian University of Technology

Overview of Information Systems Research in China: An Empirical Study

Shaobo Ji, Ph.D.
Sprott School of Business
Carleton University
Ottawa, Ontario, Canada
Email:
sji@business.carleton.ca

Qingfei Min
School of Management
Dalian University of Technology
Dalian, Liaoning, China
E-mail:
minqingfei@sohu.com

Weihe Han
School of Management
Dalian University of Technology
Dalian, liaoning, China
E-mail:
hanweihe@sohu.com

Abstract

The study aims to develop an overview of information systems (IS) research in China in recent years and to identify the similarities and the differences between North American and Chinese IS research from four perspectives: reference discipline, research topics, research methods, and unit/level of analysis. A total of 604 research papers published in 18 leading Chinese academic journals from 1999 to 2003 were identified and reviewed. A categorization approach developed in previous studies was adopted to classify the IS research. The results show: 1) IS itself represented the major reference discipline used as the theoretical basis for the studies, and IS research in China does not demonstrate reliance on a single theory; 2) IS researchers in China have been clearly focused on organizational and system/software issues; 3) Non-Empirical Study was dominant in the field of IS research in China; 4) the majority of studies were conducted at the organization and system level. Group/team and individual level issues were not studied extensively.

Keywords: IS research in China, research method, reference discipline, unit of analysis

1. Introduction

Information Systems (IS) as a discipline has less than four-decades of history. In China, the IS discipline is even younger than that in North America and Europe. Not until the mid 1980s was the first undergraduate MIS program established at a few leading universities such as Beijing University (Hu, 1999). In 1998, the Ministry of Education of China consolidated five IS-related specialties into a single one, Information Management and Information Systems (IMIS). Since then, the IS discipline has developed quickly. To date, a total of 173 universities have established the IMIS specialty (Zha, 2003). Meanwhile, more and more scholars have chosen IS field as their research fields in China. Despite the rapid development of IS field in teaching and research, few researchers have attempted to examine the current state of IS research activities in China.

The primary objective of this study is to review IS research in China through direct and systematic analysis of IS research papers published in the main Chinese academic journals from 1999 to 2003. According to Vessey et al. (2002), the issue for the discipline of Information Systems centers on what constitutes the Information Systems field. This study aims to investigate IS research in China by examining **Reference Disciplines**, **Research Topics**, **Research Methods**, and **Unit/Level of Analysis**. The importance of this work is that it provides an opportunity to reflect on what has been achieved and what needs to be accomplished in the future for IS researchers in China. As such, it may promote informed debates and help IS researchers in China to direct their efforts in the most productive manner (Alavi and Carlson, 1992). In addition, the authors wish to identify the similarities and differences in IS research between the west and China, and explain why such similarities and differences might exist.

2. Literature review

Since the first IS program was established at the University of Minnesota in 1968 (Nolan, 1980), the Information Systems discipline has engaged in extensive self-examination (Vessey et al., 2002). Many studies published in the last few decades reviewed and examined many different aspects of IS field. Ives, Hamilton, and Davis (1980) developed a comprehensive taxonomy of potential IS research areas and used it to classify over 300 IS doctoral dissertations. Culnan (1986) conducted a co-citation analysis of the IS literature from 1972 to 1982 in order to identify intellectual subfield in IS and the reference disciplines within which these subfields are founded. Culnan and Swanson (1986) examined research papers published from 1980-1984 and evaluated the emergence of IS as an independent scholarly field of study, differentiated from reference disciplines such as computer science, management sciences, and organizational behavior. Other studies were couched in terms of “the intellectual structure of MIS” (Alavi and Carlson, 1992), the evolution of IS (Farhoomand and Drury, 1999), building a cumulative research tradition (Alavi, Carlson, and Brooke, 1989). These inquiries were most often achieved by examining reference disciplines (Culnan and Swanson, 1986; Hamilton and Ives, 1982b), research methods (Hamilton and Ives, 1982a; Farhoomand and Drury, 1999; Grover et al., 1993; Claver et al., 2000), and research topics (Alavi and Carlson, 1992; Farhoomand and Drury, 1999; Claver et al., 2000). Vessey, Ramesh, and Glass (2002) developed a comprehensive framework to empirically analyze the “diversity” of IS field. In addition to reference disciplines, topics, and research methods, Vessey el al. also examined the unit/level of analysis due to the importance of level at which a study is conducted, or the unit of analysis, in IS research.

3. Research methodology

3.1. Choice of Journals

Since there are no IS-specialized research journals in China, we examined all twenty leading academic journals recommended by the Division of Management Sciences, National Natural Science Foundation of China (NSFC). We found that of the twenty journals, sixteen of them published IS research papers during the period of 1999 to 2003. They are: *System Engineering Theory and Practice*, *System Engineering*, *Journal of System Engineering*, *Journal of Industrial Engineering and Engineering Management*, *Control and Decision*, *Forecasting*, *Chinese Journal of Management Science*, *System Engineering Theory Methodology Application*, *Journal of Management Science in China*, *Accounting Research*, *Studies of Science of Science*, *Science Research Management*, *Research and Development Management*, *Journal of the China Society for Scientific and Technical Information*, *Nan Kai Business Review*, and *Management World.* The study also includes two journals which are not on the list suggested by the NSFC, *China Soft Science* and *Science of Science and Management of Science and Technology*, because of the extensive publications of IS research papers. Because few researchers in China published research papers in Non-Chinese IS leading journals (e.g. MISQ, ISR, JMIS), we did not choose those journals.

3.2. Classification

To develop a solid foundation for our analysis we first decided on a classification system that would allow us to capture the state of IS field in terms of reference discipline, topics, methods, and unit/level of analysis. Specifically, this study adopts a similar classification system used by Vessey, Ramesh, and Glass (2002). In their study, Vessey et al. examined 488 papers in five leading IS journals (MISQ, ISR, JMIS, MS, DS) over a five-year period from

1995 to 1999 to assess the "diversity" of IS field. By using this method it is easier to find out the similarities and differences between North American and Chinese IS research.

3.2.1. Classifying Reference Discipline

In this study we used the reference discipline categories developed by Vessey et al. (2002), which include nine categories of reference disciplines. They are: 1-Cognitive Psychology; 2-Social and Behavioral Science; 3-Computer Science; 4-Economics; 5-Information Systems; 6-Management; 7-Management Science; 8-Other; and 9-Not Applicable. In this classification system, the Management category subsumes Organizational Theory and Management Theory. Similarly, artificial intelligence and software engineering are subsumed within Computer Science. Finally, Social and Behavioral Science subsumes the communication (e.g., media richness theory) and social psychology (e.g., theory of reasoned action) literature. Information Systems itself is included as one of reference disciplines because many IS researchers increasingly cited previous IS studies as the source of their theories.

We identified the reference discipline on which the paper is based by looking at the theories/papers the authors used to formulate their model or hypotheses; that is, we classified a paper as belonging to a particular reference discipline when it predominantly cited other papers from that discipline as the source of its theories. The above mechanism for characterizing reference disciplines necessitated the addition of the two categories, "Other" and "Not Applicable," to the list of reference disciplines. "Other" indicates that a paper relied on a reference discipline other than one of those defined, such as marketing. "Not Applicable" indicates either that a paper relied on a number of reference disciplines, none of which was dominant, or that it did not rely on a reference discipline at all.

3.2.2. Classifying Topic

To deal with the classification of topics, we also followed the sets developed by Vessey et al. (2002), which use eight top-level categories, each of which is divided into several subcategories (Appendix, Table 1). The eight top-level categories are: 1-Computer concepts; 2-Systems/Software concepts; 3-Data/information concepts; 4-Problem domain specific concepts; 5-Systems/software management concepts; 6-Organizational concepts; 7-Societal concepts; and 8-Disciplinary issues. To ensure the list of topics was sufficiently broad to include all areas of IS research (for example, behavioral and technical, as well as organizational), Vessey et al. used several sources of topics from the general discipline of computing, e.g., the ISRL categories (Barki et al., 1988, 1993). Meanwhile, they especially expanded the organizational concepts category. As Vessey et al. self-assessed, this is a well-balanced, non-overlapping, and non-redundant classification system.

Most previous studies that classified IS research (for example, Swanson and Ramiller, 1993; Farhoomand and Drury, 1999; Alavi and Carlson, 1992) determined the primary topic of the paper by examining the abstract, title, and keywords. This approach is error prone because authors frequently refer to several topics in their keyword list/abstracts. We adopted the method used by Vessey et al. (2002), which determine the topic addressed by the paper by examining the contents of the entire paper. This approach enabled us to reliably identify a single topic that was the key focus of the paper.

3.2.3. Classifying Research Method

The framework used for classifying research method was originally developed by Alavi and Carlson (1992), and was used in several other studies (e.g., Claver et al., 2000). At the highest level, the framework distinguishes between empirical and non-empirical methods. The empirical methods capture the essence of research by relying on the systematic observation. The empirical methods are further divided into: 1-Lab experiment; 2-Field experiment;

3-Field study; 4-Case study; 5-Survey; 6-Development of IS instrument; 7-Ex post descriptions; 8-Secondary data; and 9-Description of objectives. Non-empirical papers are those primarily based on ideas, frameworks, and speculation rather than on systematic observation. Although some observations or empirical data may be found in non-empirical papers, the role of the former is merely secondary or supporting one. In other words, emphasis is laid on the ideas rather than on data and observation. Non-empirical studies can be: 1-Conceptual; 2-Illustrative; and 3-Applied Concepts. Detailed description of each method is provided in Table 2. Similar to research topic, we identified the research method by reviewing the entire paper.

Table 2 Research Methods

	Detailed description
Empirical	
Lab experiment	Manipulates independent variable; controls for intervening variables; conducted in controlled settings.
Field experiment	As for laboratory experiment, but in a natural setting of the phenomenon under study.
Field study	No manipulation of independent variables, involves experimental design but no experimental controls, is carried out in the natural settings of the phenomenon of interest.
Case study	a. Single Case: examines a single organization, group, or system in detail; involves no variable manipulation, experimental design or controls; is exploratory in nature. b. Multiple Case Studies: as for single case studies, but carried out in a small number of organizations or context.
Survey	Involves large numbers of observations; the research uses an experimental design but no controls.
Development of IS instrument	Description of the development of instrument/measurements or classification scheme.
Ex post descriptions	Interest in reporting the results of the project develops after the project is complete (or is partially complete).
Secondary Data	Research using data from secondary sources, that is, data collected by sources other than the researcher.
Description of objectives	Description of a type or class of products, technologies, systems, projects, or description of a specific application system, product, installation, software model, program, company, IS function, etc.
Non-Empirical	
Conceptual orientation	Describes frameworks, models, or theories and offer explanations and reasons.
Illustrative	Intends to guide practice, often containing recommendations for action or steps to be followed in given circumstance.
Applied concepts	Have an approximately equal emphasis on conceptual and illustrative elements.

3.2.4. Classifying Unit/Level of Analysis

Previous studies that classify IS research did not include Unit/Level of Analysis. It should be addressed because it is a key decision that IS researchers must make when conducting an IS study. We used the ten levels that were outlined by Vessey et al. (2002): 1-Society; 2-Profession; 3-Inter-organizational Context; 4-Organizational Context; 5-Project;

6-Group/Team; 7-Individual; 8-Abstract Concept; 9-System; and 10-Computing Element. This classification scheme used Individual, Group, and Organizational as a starting point and Societal level was added to categorize papers that examined IS issues at regional, national, international, or societal levels that have no organizational context. To accommodate the needs of "technically-oriented" IS research; Vessey et al. added the categories of Computing Element (e.g., a procedure or algorithm), Computing System, and Abstract Concept (e.g., data or mathematical model). The Project level was added to reflect research that examines software project(s), such as software engineering issues. Adding inter-organizational level allows us to differentiate studies that focus on inter-organizational issues, e.g., EDI-focused studies, from those that have an intra-organizational focus. Finally, the Profession level allows us to capture explicitly papers whose primary contribution is to the academic IS community itself in the form of contributions to teaching or research. This study and the majority of papers cited in this study would fall into this category.

3.3. The Coding Procedure

Two of the three researchers were involved in coding the papers and worked according to the following procedures. At first we used the information provided by China Journals Full Text Database (CJFD). CJFD is the most prestigious and comprehensive database for academics in China. It includes all eighteen journals we selected. We used "information system" as a key word to search the full text in the eighteen journals. Not every paper with "Information systems" in its text falls into IS field. The two researchers together reviewed every papers' abstract to determine if it was an IS paper. In cases where the coders felt the abstract could not provide enough information; the entire paper would be reviewed. Every paper we judged which fell into IS field was downloaded and then double-reviewed. The journals for the last six months were not available in CJFD. We searched and reviewed them directly in the library of Dalian University of Technology in China. SPSS 11.5 for Windows was used to record and analyze data extracted from the papers.

4. Results

A total of 604 papers in eighteen journals from 1999 to 2003 were identified and coded according to the above procedures. As shown in Table 3, the number of papers varies considerably according to the journals. For example, 123 papers were published in *Journal of the China Society for Scientific and Technical Information*, accounting for 20.4%. More than 60% of papers were published in the top five journals, while only 7.3% papers were published in the last five journals. An increasing number of IS research papers were published in the past five years (Table 4).

Tables 3 Number of IS papers in the leading journals in China

Journals	No. of Papers	Percent	Cumulative percent
Journal of the China Society for Scientific and Technical Information	123	20.4%	20.4
System Engineering Theory and Practice	75	12.4%	32.8%
Chinese Journal of Management Science	57	9.4%	42.2%
China Soft Science	56	9.3%	51.5%
Science of Science and Management of S and T	53	8.8%	60.3%
Journal of Industrial Engineering and Engineering Management	43	7.1%	67.4%
Journal of Management Science in China	39	6.5%	73.8%
System Engineering	30	5.0%	78.8%

Science Research Management	21	3.5%	82.3%
Journal of System Engineering	19	3.1%	85.4%
Control and Decision	16	2.6%	88.1%
System Engineering Theory Methodology Application	14	2.3%	90.4%
NanKai Business Review	14	2.3%	92.7%
Management World	14	2.3%	95.0%
Research and Development Management	10	1.7%	96.7%
Forecasting	7	1.2%	97.8%
Accounting Research	7	1.2%	99.0%
Studies of Science of Science	6	1.0%	100%
Total	604	100%	

Tables 4 Number of IS papers by years from 1999 to 2003

	1999	**2000**	**2001**	**2002**	**2003**	**Total**
Number of Papers	92	107	112	143	150	604
Percent	15.2%	17.7%	18.5%	23.7%	24.8%	100%

4.1. Reference Discipline

Table 5 shows the reference disciplines which the IS field relies on in China. The fourth column shows the proportion of papers based on this reference discipline in Vessey's Study (Vessey et al., 2002). As shown, more than 41.1% of the papers examined used Information Systems as their principal reference discipline, with Computer Science the next at 18.0%, followed by Management at 13.4% and Management Science at 12.6%. Four reference disciplines examined were present at less than 5%; they are Economics (4.8%), Not Applicable (4.5%), Social and Behavioral Science (0.2%), and Cognitive Psychology (0.2%).

Table 5 Papers by Reference Discipline

Reference Disciplines	**Frequency**	**Percent**	**Vessey's Study**
Information Systems	248	41.1%	27.2%
Computer Science	109	18.0%	8.8%
Management	81	13.4%	18.0%
Management Science	76	12.6%	6.6%
Other	32	5.3%	3.7%
Economics	29	4.8%	11.1%
Not Applicable	27	4.5%	4.9%
Cognitive Psychology	1	0.2%	10.7%
Social and Behavioral Science	1	0.2%	9.0%
Total	604	100%	100%

This result shows that there is no single reference discipline. Many IS researchers in China were trained originally in other disciplines. They always borrow from and learn from the theoretical foundations, formal methods, and examples of good research in multiple reference disciplines. This is similar to the situation in North America. On the other hand, IS field is a fusion of behavioral, technical and managerial issues. Multiple reference disciplines will contribute heavily to the intellectual development of IS (Robey, 1996).

Compared with Vessey's findings, Information Systems, Computer Science and Management

Science underlay proportionally more research in China than in North America. But Cognitive Psychology and Social and Behavioral Science, which were frequently used in North America, were rarely used in China.

4.2. Research Topics

The research topics are presented in Table 6. The table shows the number of papers dedicated to each topic and the total percentage of the papers they represent. The fourth column is the proportion of the topic in Vessey's study (Vessey et al., 2002). As shown, more than 80% of the papers belong to the following three topics: Organizational concepts (46.4%), Systems/software concepts (24.8%), and Problem domain specific concepts (10.3%). In Vessey's study, these three topics are also the top three. But Organizational topics have the higher proportion (65.6%) in North America, while Systems/software topics only account for 7.4%, much less than that in China. Both in our study and in Vessey's study, none of the journals published papers focusing on "computer" topics in the time frame examined. As Vessey et al. (2002) indicated, computer topics are central to the Computer Science discipline rather than Information Systems.

Table 6 Papers by General Topics

Reference Disciplines	Frequency	Percent	Vessey's Study
Organizational concepts	280	46.4%	65.6%
Systems/software concepts	150	24.8%	7.4%
Problem domain specific concepts	62	10.3%	11.1%
Systems/software management concepts	42	7.0%	7.0%
Data/information concepts	39	6.5%	3.1%
Societal concepts	18	3.0%	1.6%
Disciplinary issues	13	2.2%	4.2%
Computer concepts	0	0%	0%
Total	604	100.0%	100.0%

Organizational topics far outweighed other topics both in China and in North America. The reason is that, as many leading IS researchers have argued, there has been a general shift in IS research away from technological to managerial and organizational issues (Benbasat et al., 1987). Because of the high concentration of topics in the Organizational topic category, we examined Organizational topics in more detail (see Table 7). Among 11 sub-categories of Organizational topic, the most popular topic is IT usage/operation (27.9%), followed by Organizational alignment (21.8%), and Organizational learning/knowledge management (11.1%). In all, they represent 60.8% of the papers under Organizational topic category. The lesser-researched areas were Organizational structure (1.4%), Legal/ethical/cultural/political (organizational) implications (1.4%), Technology transfer (1.1%), and Change management (0.8%). Compared with Vessey's study, IS researchers in China did proportionally more research on Organizational alignment. But some topics such as Technology transfer, IT impact and Management of "computing" function were relatively seldom considered.

Table 7 Papers by Organizational Topics

Organizational Topics	Frequency	Percent	Vessey's Study
IT usage/operation	78	27.9%	24.4%
Organizational alignment (incl. BPR)	61	21.8%	6.9%

Organizational learning /knowledge management	31	11.1%	4.4%
Strategy	29	10.4%	6.6%
IT Impact	22	7.9%	15.3%
Management of "computing" function	20	7.1%	11.6%
IT implementation	15	5.4%	1.6%
Computing/information as a business	12	4.3%	0%
Organizational structure	4	1.4%	5.0%
Technology transfer (incl. innovation, acceptance, adoption, diffusion)	4	1.4%	19.4%
Legal/ethical/cultural/political (organizational) implications	3	1.1%	3.4%
Change management	1	0.4%	1.6%
Total	280	100%	100.0%

4.3. Research Methods

Table 8 lists the numbers and proportion of the papers examined according to the research methodology at the highest level. The last three columns are the proportion of every research method in previous studies. As shown, 84.9% of IS researches in China from 1999 to 2003 were non-empirical, only 15.1% are empirical. In contrast as the analysis of the last three columns show, there is a time-related shift from Non-Empirical to Empirical studies. This finding is consistent with Alavi and Carlson's conclusion: in the mid-80s, research efforts went through a change from theoretical to empirical ones (Alavi and Carlson, 1992).

Table 8 Papers by Research Methods - Empirical vs. Non-Empirical

	Frequency	Percent	Alavi' Study 1968-1988	Claver's Study 1981-1997	Vessey's Study 1995-1999
Empirical	91	15.1%	48.1%	68.7%	72.9%
Non-Empirical	513	84.9%	51.9%	31.3%	27.1%
Total	604	100%	100%	100%	100%

Next we examined the method in detail. (see Table 9). The most popular method was Illustrative (45.5%), followed by Conceptual (24.2%), and Applied concepts (15.2%). The top three were all Non-Empirical methods. For empirical studies, the most popular was the description of objectives (9.3%) followed by case study (2.3%) and secondary data (1.8%). We found that some empirical methods, such as Survey and Ex post descriptions were rarely used. The rest of the empirical methods: lab experiment, field experiment, field study, and development of IS instrument were never used in China. Compared with Alavi's study, a major difference exists between Chinese and North America researchers in research methods. Chinese IS researchers did not use empirical based methods. Especially in field study, no papers we examined belonged to this category. In comparison, Alavi et al. (1992) found that field study accounted for 16.1% of the publication from 1968 to 1988 in North America. And in Vessey's study, field study is the most popular research method (26.8%) from 1995 to1999.

Table 9 Papers by Research Methods - Detailed Methods

Research Methods	Frequency	Percent	Alavi's Study
Illustrative	275	45.5%	31.8%
Conceptual orientation	146	24.2%	17.6%

Applied concepts	92	15.2%	2.4%
Description of objectives	56	9.3%	10.8%
Case Study	14	2.3%	4.4%
Secondary data	11	1.8%	0.8%
Survey	7	1.2%	3.5%
Ex post descriptions	3	0.5%	2.0%
Lab Experiment	0	0%	7.3%
Field experiment	0	0%	2.0%
Field study	0	0%	16.1%
Development of IS instrument	0	0%	1.3%
Total	604	100%	100%

4.4. Unit/Level of Analysis

Table 10 presents the findings of unit/level of analysis. The fourth column is the proportion of every unit/level of analysis in Vessey's study (Vessey et al., 2002). As shown, the most frequently analyzed unit/level in China is Organizational Context (33.9%) followed by System (32.9 %), and Society (12.3 %). Group/Team and Individual were two levels that were rarely used. Compared with Vessey's findings, Chinese IS researchers did proportionally much more studies at System level. These findings strongly support the findings of reference discipline. Since Chinese IS researchers did not like to conduct research at Group/Team and Individual level, they didn't need Cognitive Psychology as a reference discipline. Similarly, because they focused more on Systems/Software than North American researchers, they therefore did proportionally more research at system level.

Table 10 Papers by Unit/Level of Analysis

Unit/Level of Analysis	Frequency	Percent	Vessey's Study
Organizational Context	205	33.9%	25.6%
System	199	32.9%	7.2%
Society	74	12.3%	3.1%
Computing Element	46	7.6%	4.9%
Project	30	5.0%	8.8%
Profession	17	2.8%	1.8%
Abstract Concept	16	2.6%	8.8%
Inter-organizational Context	12	2.0%	5.1%
Group/Team	3	0.5%	10.9%
Individual	2	0.3%	23.8%
Total	604	100%	100%

5. Discussion and Conclusion

From the viewpoint of reference disciplines, our data lead us to the conclusion that IS research in China does not demonstrate reliance on a single theory. This is also true of North America. Most young disciplines need to initially rely on their reference disciplines before developing theories of their own. Although reliance on reference disciplines helps shape the foundation of a new field of studies, by itself it is not a sign of maturity of the discipline. Indeed, mature disciplines rely on specialized research publications rather than borrowing from other disciplines (Culnan, 1986; Farhoomand and Drury, 1999). But, as Vessey et al. (2002) argued, the initial use of existing theories from reference disciplines was inevitable. Not only because of the training of those Information Systems researchers in those reference disciplines, but also because Information Systems is an applied discipline much like engineering. What is crucial is that Information Sysstems researchers use theories from reference disciplines to develop their own theories that provide the field with new understanding. Similar to Vessey's findings, our study also shows that a substantial volume of Information Systems research used Information Systems itself as the reference discipline (41.1%). This shows that a moratorium on theoretical diversity is necessary for IS to progress as a discipline (Benbasat and Weber, 1996; Farhoomand and Drury, 2001). Interestingly, we found Information Systems itself underlay proportionally more research in China than in North America. We do not believe it indicates Chinese IS research is more mature. It is only because many IS studies simply did mere descriptions of IS related phenomena that these studies did not use existing disciplines as reference discipline.

From the viewpoint of topics, IS research in China is clearly focused on organizational issues (46.4%) and system/software issues (24.8%). The greater emphasis (compared with Vessey's study) on system/software topics may be the result of journal selection bias. Several system engineering dedicated journals were selected, such as *System Engineering Theory and Practice*, *System Engineering*, and *Journal of Industrial Engineering and Engineering Management*. Most systems/software papers were published in these journals. On the other hand, this shows that IS field in China is still being developed. The "general shift" from technical to organizational and managerial issues has not finished yet.

Perhaps a more telling story can be gleaned from the examination of research methods. The proportion of non-empirical studies within all papers we examined is extremely high compared with previous western studies (Table 8). On the one hand, this phenomenon may be the result of interpretive research tradition in China. On the other hand, it strongly indicates that IS field in China is still a very young discipline. Alavi and Carlson (1992) believed that non-empirical studies are appropriate in the early years of IS. With the maturity of the field, empirical studies are more suitable for providing theories that already exist in practice, or building theories based on empirical facts. But, as Farhoomand and Drury (1999) argued, without closer examination of non-empirical studies, it is difficult to determine whether these studies facilitated or hindered scientific progress of the IS field. If the majority of non-empirical studies are anecdotal, descriptive, and without substantive theoretical underpinning, then the progress of IS as a scientific discipline is being seriously hampered by such studies. On the other hand, if these studies relate to theoretical development of the field, then non-empirical studies serve a valuable role in demarcating the boundaries of the field. Further work is needed to examine the impact of these studies. With regards to the detailed research method, we surprisingly found that field study, one of the most popular research methods in North American (Claver et al., 2000; Vessey et al., 2002) was never used in China. Besides the different sociological paradigm and research tradition, we believe that this is due to the fact that Chinese IS researchers are not familiar with this method.

Similar to research topics and methods, the unit/level of analysis is also a sign of immaturity of IS research in China. Chinese IS researchers almost never did research at Group/Team and Individual level. But in North America, studies at the two levels account for 34.7% within the total IS research (Vessey et al., 2002). On the one hand, this phenomenon may reflect the culture in China. On the other hand, this may indicate that IS research in China is still at the "high" level and not in-depth enough to explore the Group/Team and Individual issues.

The type of characterization of the field in this paper could be of considerable help to Chinese IS researchers in positioning their research, not only from the viewpoint of topic, but also with regard to sources of appropriate theories, choice of research method, as well as the unit of analysis at which a study might be most appropriately conducted. They might wish to identify major areas where little research has been published, which might therefore represent an opportunity for their own research. For example, organizational alignment has been well studied, while technology transfer and management of “computing” function need more attention. Similarly, they might try to conduct study at individual level and find theory foundation from Cognitive Psychology.

The IS field that we are dealing with is perhaps the century’s most significant accomplishment, with far-reaching and complex impacts. It has transformed every aspect of government, industry, and education worldwide. For IS researchers, whether in China or in other countries, the major challenge is to satisfy the need for the knowledge of how the use of information technology can lead to improved organizational performance and individual quality of work life. This is certainly a complex and ambitious task. The discourse to find ways that could further improve the development of the discipline is very useful to accomplish such a challenging task.

References

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

Alavi, M., Carlson, P., and Brooke, G.. “The Ecology of MIS Research: A Twenty Year Status Review,” *Proceedings of the Tenth International Conference on Information Systems*, 1989, pp 363-375.

Barki, H., Rivard, S., and Talbot, J. “An Information Systems Keyword Classification Scheme,” *MIS Quarterly* (12:2), 1988, pp. 299-322.

Barki, H., Rivard, S., and Talbot, J. “A Keyword Classification Scheme for IS Research Literature: An Update,” *MIS Quarterly* (17:2), 1993, pp. 209-226.

Benbasat, I., Goldstein, D.K., and Mead M. “The Case Research Strategy in Studies of Information Systems,” *MIS Quarterly* (11:3), 1987, pp. 369-386.

Benbasat, I., and Weber, R. “Rethinking “Diversity” in Information Systems Research,” *Information Systems Research* (7:4), 1996, pp. 389-199.

Claver, E., Gonzalez, R, and Llopis, J, “An analysis of research in information systems (1981-1997),” *Information and Management* (37:4), 2000, pp. 107-119.

Culnan, M “The intellectual development of management information systems, 1972-1982: a co-citation analysis,” *Management Science* (32:2), 1986, pp.156-172.

Culnan, M., and Swanson, E.B. “Research in Management Information Systems 1980-1984: Points of Work and Reference,” *MIS Quarterly* (10:3), 1986, pp. 289-301.

Farhoomand, A.F., and Drury, D.H. “A Historiographical Examination of Information Systems,” *Communication of the AIS*, Volume 1, paper 19, 1999, pp. 1-27.

Farhoomand, A.F. and Drury, D.H. “Diversity and Scientific Progress in the Information Systems Discipline,” *Communications of the AIS*, Volume 5, Paper 12, 2001, pp. 1-21.

Grover, V., Lee, C.C., and Durand, D. “Analyzing Methodological Rigor of MIS Survey Research from 1980-1989,” *Information and Management* (24:6), 1993, pp. 305-317.

Hamilton, S. and Ives, B. “MIS Research Strategies,” *Information and Management* (5:6), 1982a, pp. 339-347.

Hamilton, S. and Ives, B. “Knowledge Utilization among MIS Researchers,” *MIS Quarterly*

(6:4), 1982b, pp. 61-77.

Hu, Changping "Education of Information Management towards the 21st Century in China," *Journal of the China Society for Scientific and Technical Information* (18:1), February 1999, pp. 3-9.

Ives, B., Hamilton, S., and Davis, G. "A framework for research in computer-based management information systems," *Management Science* (26:9), 1980, pp. 910-934.

Nolan, R.L.; and Wetherbe, J.C. "Toward a comprehensive framework for MIS research," *MIS Quarterly* (4:2), 1980, pp.1-19.

Robey, D. "Diversity in Information Systems Research: Threat, Promise, and Responsibility," *Information Systems Research,* (7:4), 1996, pp. 400-408.

Swanson, E.B., and Ramiller, N.C. "Information systems Research Thematics: submissions to a New Journal, 1987-1992," *Information Systems Research* (4:4), December 1993, pp. 299-330.

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

Zha, Xianjin "Probe into Talent Cultivating Direction and Course System in the Speciality of Information Management and Information System," *Journal of the China Society for Scientific and Technical Information* (22:4), August, 2003, pp. 507-512.

Table 1 IS Research Topics (Adapted from Vessey et al., 2002)

1.0 Computer concepts

1.1 Computer/hardware principles/architecture
1.2 Inter-computer communication (networks, distributed systems)
1.3 Operating systems (as an augmentation of hardware)
1.3 Machine/assembler-level data/instructions

2.0 Systems/software concepts

2.1 System architecture/engineering
2.2 Software life-cycle/engineering (incl. requirements, design, coding, testing, maintenance)
2.3 Programming languages
2.4 Methods/techniques (incl. reuse, patterns, parallel processing, process models, data models...)
2.5 Tools (incl. compilers, debuggers)
2.6 Product quality (incl. performance, fault tolerance)
2.7 Human-computer interaction
2.8 System security

3.0 Data/information concepts

3.1 Data/file structures
3.2 Data base/warehouse/mart organization
3.3 Information retrieval
3.4 Data analysis
3.5 Data security

4.0 Problem domain specific concepts (use as a secondary subject, if applicable, or as a primary subject if there is no other choice

4.1 Scientific/engineering (incl. bio-informatics)
4.2 Information systems (incl. decision support, group support systems, expert systems)
4.3 Systems programming
4.4 Real-time (incl. robotics)
4.5 Edutainment (incl. graphics)

5.0 Systems/software management concepts

5.1 Project/product management (incl. risk management)
5.2 Process management
5.3 Measurement/metrics (development and use)
5.4 Personnel issues

6.0 Organizational concepts

6.1 Organizational structure
6.2 Strategy
6.3 Organizational alignment (incl. business process reengineering)
6.4 Organizational learning /knowledge management
6.5 Technology transfer (incl. innovation, acceptance, adoption, diffusion)
6.6 Change management
6.7 IT implementation
6.8 IT usage/operation
6.9 Management of “computing” function
6.10 IT Impact
6.11 Computing/information as a business
6.12 Legal/ethical/cultural/political (organizational) implications

7.0 Societal concepts

7.1 Cultural implications
7.2 Legal implications
7.3 Ethical implications
7.4 Political implications

8.0 Disciplinary issues

8.1 “Computing” research
8.2 “Computing” curriculum/teaching