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## The Comparison of Information Systems Develop Trends between the Chinese Mainland and International

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### Abstract

*The aims of this research are two fold. First, it compares the research focus of Information Systems in Mainland China with that of the international IS research community. Second, the paper describes the main features and trend of IS research in Mainland China, and makes some suggestions as to some possible interesting research arena. The data are from twenty five academic journals in China and proceedings of international Information Systems conferences.*

**Keywords:** IS research, Mainland China, comparative study

### 1. Introduction

As a young discipline, Information Systems has been around for more than 40 years. It was introduced into China in 1980s and saw a healthy growth since then. With the widespread adoption of IT in both business and government, one university after another has been establishing IS departments where the bulk of IS research in China is done (Zha, 2003, Huang et al 2003). After the initial period of groping around, basic consensus has been reached among the IS scholars in the Mainland. The aims of this paper are to compare the research focus in Mainland China with their counterpart abroad and to introduce Chinese IS research to the international IS community.

### 2. Literature review

In the early stage, IS researchers tend to focus on technology, such as network technology and database technology. Gradually, they come to appreciate the roles of the users, who deserve the same attention as technology. Indeed, in some cases users deserve even more than attention than technology. Information system may thus be perceived as an organizational and management solution, based on information technology, to a challenge posed by the environment (Laudon 2000). IS has become an integrative discipline, which draws on concepts, theories, research methods, and insights from behavioral science, cognitive psychology and social science. As the discipline grows, the

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IS research community has been engaged in extensive self-examination, as reflected in studies published in the last few decades. Culnan and Swanson (1986) examine published research papers from 1980 to 1984 and evaluate the emergence of IS as an independent scholarly field of study. Other studies examined the intellectual structure of IS (Alavi and Carlson, 1992), research methods (Hamilton and Ives 1982a; Hamilton, Ives et al. 1982b; Grover 1993; Farhoomand and Drury 1999; Claver et al. 2000), reference disciplines (Hamilton, Ives et al. 1982b; Culnan and Swanson 1986), research topics (Alavi and Carlson, 1992; Farhoomand and Drury, 1999; Claver et al., 2000) and levels of analysis (Bariff and Ginzberg, 1982; Lai and Mahapatra, 1997).

Vessey et al (2002) propose a research framework of four dimensions to analyze the research trends of IS field. These are (1) research topic, (2) reference discipline, (3) research method, and (4) level of analysis. After analyzing the four dimensions proposed by Vessey et al, we find that the research framework emphasizes computer science, and pays less attention to the role of management and organization science. We find the framework too technology centered and look for one that is more balanced. We therefore adopt the research topic dimension proposed by Claver et al (2000) and divide the research topics into five major clusters (Baskerville and Myers 2002), which are IS management, IS development, IS technology, IS usage and IS subject theory. This classification is used to survey the trends in IS research area where IS has become a cross-discipline, composing of computer science, management science, behavior science and etc.

In recent years, papers on the research trends of IS discipline are also common in the international conference, but few research papers focus on IS research in China. This paper contributes to this growing literature.

### **3. Research method**

#### ***3.1 Data collection***

The latest research trend of a discipline can be detected in journal papers and special issues, conference papers and themes, keynote speeches, and topics of workshop. But in Mainland China, there are no special conferences in IS discipline. We therefore use 20 Chinese academic journals as the source to obtain data on the research trends of the Mainland. These journals are endorsed by the National Natural Science foundation of China. We also include another five journals, which publish more paper of IS than others, and we look at the all papers related to IS in the journals from 2003 to 2004 to obtain the newest research trend of mainland. Please see appendix for the list of the journals.

To analyze the international research trends of IS, we use conference papers as the research data, but not the journal papers. The choice is based on following reasons: the submission-to-publication period is very long for top international journals, so the latest papers in the journal sort of out-dated. It is therefore not the best way to reflect the latest international research trends. In contrast, the submission-to-publication period of international conferences is short, which can reflect the resent trend in IS fields in a more timely manner. Moreover, international conferences have been endorsed by senior scholars and they have become a part of academic system.

The authors collect the papers of the major IS international conferences in 2003 and 2004, which include the International Conference on Information systems (ICIS), American Conference on Information systems, Pacific Asia Conference on Information systems (PACIS) and Hawaii International Conference on System Sciences (HICSS). Because the HICSS focus on the system sciences, there is a little difference between IS and system sciences, so not all papers of HICSS can be seen as IS papers. We discard some HICSS papers which do not include any content of IS field. In the end, we gather 2746 papers in total, 2350 papers in English, and the other in Chinese, which are related to IS field, and touch on 100 research subjects within five major research fields.

We use abstract to classify the papers. Three Ph D candidates, who have been trained in research methods, classify the paper by reading the title, abstract, and key words. If the paper cannot be identified, the full paper would be read. When a paper cannot be suitably categorized even after we have read the full paper, we would list it under the item "others". At last, we get approximately 100 detailed research items, and then combine the small quantity of the items. We identify almost 70 analytical topics, which reflect the main trends of IS research.

### ***3.2 Research topic***

Based on the scheme of Barki (1993), Claver et al (2000) classified the 30 different research topics into four major research areas: IS management, IS development, IS technology, IS usage and others. To categorize the papers we study, we add a new research area, namely, discipline development of IS. So in our research scheme, there are five research areas, which are IS management, IS development, IS technology, IS usage, IS discipline development, and others. The "IS discipline" area is formed from research method and theory, IS education and IS fundamental concepts which includes the meaning of data, knowledge, the scope of IS discipline, and IS evolution. We use the findings of Vessey and Ramesh (2002) to group the research topic.

The IS research topic is distributed broadly in the international conferences. According to the statistical results, in spite of a lot of traditional topics, there are also many emerging research topics, likely media choice, Radio Frequency Identification (RFID), Information Systems Computer-Human Interface Designing (ISCHID), and Open Source. This phenomenon suggests that the IS discipline is a dynamic research discipline.

### ***3.3 Reference discipline***

The position of reference discipline is emphasized by Keen (1980), Benbasat and Weber (1996), Robey (1996), Vessey and Ramesh (2002). In order to for the results fit to make sense for the academic community of Mainland China, the authors adjust the category of the reference discipline. We combine the cognitive psychology and organization behavior into behavioral science, because organization behavior also includes some subfield of psychology; we use management to cover the fields of management and management science. Finally, we set up the reference disciplines as follows: behavioral science, sociology, computer science, economics, management, politics and others.

### 3.4 Research design

The articles studied can be classified as empirical one and theoretical one. Following Alavi and Carlson, we divided theoretical studies into conceptual, illustrative and applied concepts. The empirical ones, according to the classical scheme elaborated by Van Horn (1973), and used by others, are classified as case studies, field studies, field experiments and laboratory experiments. We also add survey and formula-based model to the empirical method. Survey is a well-known empirical research method and is also used broadly in IS academic field.

**Table 1: the Detailed Description of Research Method**

Research Method		Detailed description
Empirical	<i>Lab Experiment</i>	Manipulates independent variable; controls for intervening variables; conducted in controlled settings.
	<i>Field Experiment</i>	As for laboratory of independent variables, involves experimental design but no experimental controls, is carried out in the natural setting of the phenomenon of interest.
	<i>Field Study</i>	No manipulation of independent variables, involves experimental design but no experimental controls, is carried out in the natural settings of the phenomenon of interest.
	<i>Case study</i>	Single case: examines a single organization, group, or system in detail; involves no variable manipulation, experimental design or controls; is exploratory in nature. Multiple case study: as for single case studies, but carried out in a small number of organizations or context.
	<i>Survey</i>	Involves large numbers of observations; the research uses an experimental design but no controls.
	<i>Formula-based Model</i>	Using mathematic model to get the results.
Theoretical	<i>Conceptual orientation</i>	Describes frameworks, models, or theories and offer explanations and reasons.
	<i>Illustrative</i>	Intends to guide practice, often containing recommendations for action or steps to be followed in given circumstance.
	<i>Applied Concepts</i>	Have an approximately equal emphasis on conceptual and illustrative elements.

### 3.5 Level of analysis

The level of analysis at which a study is conducted has not been investigated extensively in the early days of IS research. But by now, it has become an important aspect of papers analysis (Bariff and Ginzberg, 1982, Lai and Mahapatra, 1997). It is a key decision that IS researchers must make when conducting an IS study. We adjust the original category (Vessey and Ramesh 2002) and build the hierarchy as follow: society; profession; inter-organization context; organization context; team; individual; abstract concept; system and computing element. To accommodate the needs of “technically-oriented”, Vessey and Ramesh (2002) add the categories of computing element (e.g., a procedure or algorithm), computing system, and abstract concept (e.g., data or mathematical model).

In Mainland China, we do not classify so many levels, the common research levels are micro-level, macro-level and middle-level, but this classification is pretty rough. For example, we cannot distinguish the differences between inter-organization and organization even though there are differences between them. We also know that the individual level research and organization level research are also inconsistent in research process---organization level research is more complex and difficult than individual level.

#### 4. Results analysis

##### 4.1 Research topic

The variety of the research topic reflects the maturity of a discipline. From the analytical results, we can know that research in Mainland China and overseas research are involved in the five fields, but the foci are not same. From the figure 1, we can see that the percent of the management topics of the international is 31.9%, which is only 15.15% in the case for Mainland China, but the latter pays more attention to the IS usage than international. Obviously, the international research attaches importance to the IS discipline development, and it's about 5.57%, which is far more than the Mainland.

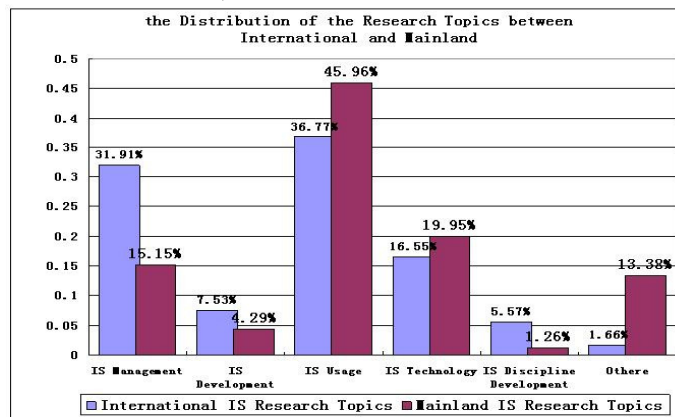


Figure 1: Distribution of the Research Topics between International and Mainland China

Yu and Huang (2004) has followed the IS research trend in mainland from 1999 to 2002. Because the construction of the concept is compatible, we can compare the results of his analysis with ours. Please see Figure 2 below. Form the table, we know that the number of research papers devoted to IS management and IS application increases quickly in recent years. In contrast, the number of papers on IS development and IS technology decreases a lot. While the research topics change pretty quickly, a number of new concepts emerge which have not heard several years ago. The trend of research in the Mainland breaks away from the traditional role of IS development as the chief concern of IS research. The three major topics are IS usage, IS management, and IS technology.

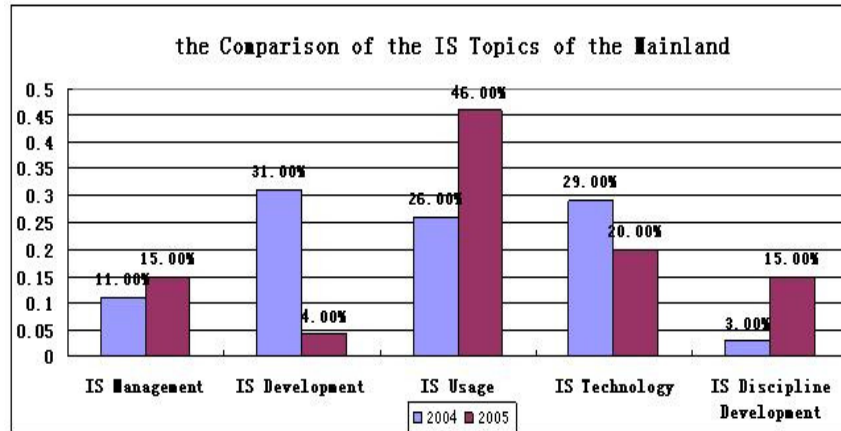


Figure 2 the Comparison of the IS Topics of the Mainland

The variety of research topic partly reflects the research depth of a discipline. We have identified 71 research topics in the international conference, which contain not only the common topics we can often see in domestic journal, such as IS evaluation, IS implementation and IS project management, but also some rarely studied topics, such as IS adoption, copy right, task technology fit, media choice, semantic network, RFID, mobile commerce and recommend system. In contrast, there are only 37 topics which are found in mainland journal. The IS discipline development is also a major issue researched by the international IS research community, and the total number of this kind of paper is 131, about 5.57%. In the Mainland however, there are only five papers which focus on IS discipline development, representing only about 1.26%. We submit that the difference is related to the different stages they are in. About 46% paper are devoted to investigating IS usage.

Analyzing the research topics (see table 2), we can conclude that the Security and Privacy of IS management, Customized IS Development, Knowledge Management, Electronic Commerce and Intelligent Agent technology form the emphasis of the international IS research, while research in the Mainland is centered on IS value and Evaluation, BPR, Electronic Commerce, ERP, DSS/GDSS, Knowledge Management. International research of IS development and Electronic Commerce have been studied for a long time. Mainland IS research and its international counterpart show huge difference in reference discipline, level of analysis, and research method. Many papers on Electronic Commerce are designed from behavioral science and management perspective. Furthermore, almost half of papers describe the problems by survey method and several varied analysis levels. It is also interesting to note that while healthcare information systems have attracted much interest in the international IS research, the topic is not represented in Mainland research. It is likely that this topic is going to enjoy some attention in the near future in Mainland China.

Table 2: The Order of Research Topic

Order	International	Percent	Mainland	Percent
1	Electronic Commerce	7.9%	Electronic Commerce	12.6%
2	Knowledge Management	7.1%	Web Technology	6.6%
3	IS Security and Privacy	4.5%	ERP	6.3%

4	IS Development	4.3%	Data storage, retrieve transfer	5.3%
5	IS Acceptance and Diffusion	3.8%	DSS/GDSS	4.7%
6	Tele Communication Technology	3.3%	Knowledge Management	4.5%
7	IS Value and evaluation	3.1%	IS Value and Evaluation	3.8%
8	Mobile Commerce	3.1%	SCM	3.3%
9	Cooperate management	3.0%	Electronic Government	3.3%
10	IS education	2.9%	IS Development	3%
11	Hospital IS	2.9%	BPR	3%
Summation		45.9%		56.4%

#### 4.2 Reference discipline

Reflecting its multi-discipline character, IS has been studied from many perspectives. Based on the results, we find that the most frequently cited reference disciplines of international IS research are management, computer science, behavioral science. The result (Figure 3) suggests that the disciplines of management, computer science and behavioral science are the three basic foundations of IS. This is not only evident in the definition of the IS, but it is also supported by data revealed in research papers. Now there are also some emerging disciplines underlying the development of IS, for example, politics, bionomics.

On the other hand, the research disciplines of the mainland are computer science and management, and the majority is from computer science, and it is about 47%. Relatively few published papers use behavioral science and social science perspective, but many more paper are using the economic perspective.

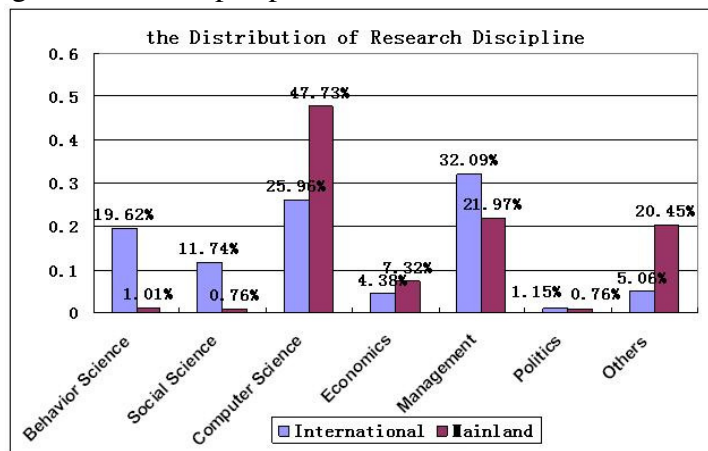


Figure 3 the Distribution of Research Discipline

Another important phenomenon is that the social science and economics have become more important reference disciplines in international IS research. Because more and more sociologists and economists are interested in the information economy and



information society, these social scientists have introduced insights and methods of their fields to the IS discipline.

### 4.3 IS research method

There is a huge difference in research methods adopted by the Mainland researchers and international researchers. Mainland researchers tend to use conceptual framework, illustration and practical concepts (as opposed to abstract and theoretical concepts), while more and more researchers are using the quantitative analysis, such as survey method. We believe that this is due to their educational background. Mainland students tend to follow their supervisors and pick up their style and methods. With more and more exposure to the international research works, Mainland researchers are communicating with their foreign counterpart. They have learned to use more research methods adopted by international research community and this is reflected in their published papers.

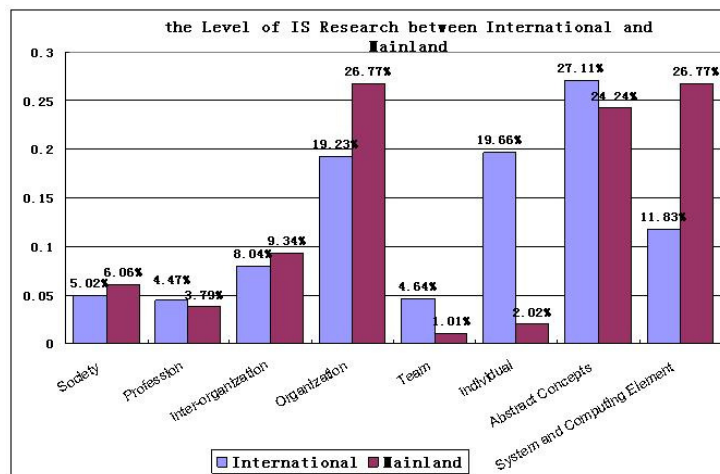


Figure 4 the Level of IS Research between International and Mainland

IS discipline is a sub-discipline of the management, and one of its key characteristics is practice, so field study and case study are good tools to develop theory. These two methods are common in international IS research, but they are relatively new for mainland researchers. Through training in these research methods, Mainland Chinese IS scholars would be able to conduct research more in line with their overseas counterpart and present their findings to them.

Each research method has its own strength and advantages. In the early stage of developing a theory, case study is preferred. This has to be followed by more rigorous validation and verification e.g. by survey, additional case studies by colleagues from other universities. Generally speaking, research methods used by the international community tend to be more various and varied than those used in the Mainland.

#### 4.4 Level of analysis

Level of analysis is a key issue of a research project. From the data collected in this research, we know that the international research focuses on the individual, organizational level, and other levels. For example, 5% of these papers are on the level of society. As far as levels are concerned, most of the researches conducted in Mainland are at the level of organization but few are at the level of individual or team. The results reflect that the research level is influenced by the Chinese culture, which subsumes the interest of individual to that of organizations. The results also suggest that future research efforts need to be directed to fill in the knowledge gap by studying IS activities at the individual and team level.

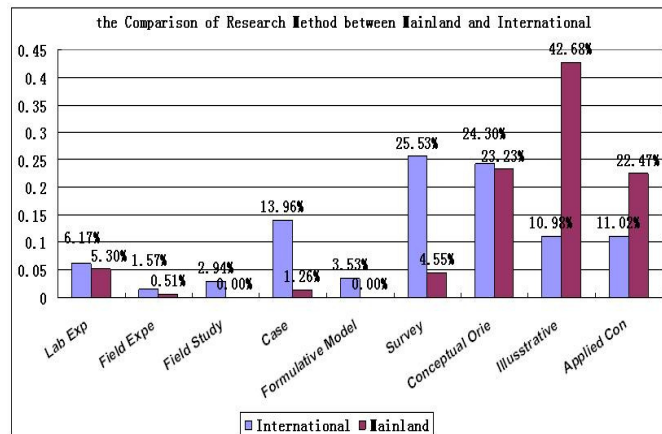


Figure 5 the Comparison of Research Method between Mainland and International

The influence of IS has extended from the individual to the organization and inter-organization, so research on the function of the IS among the organization and inter-organization has a bright future. The more complex the research levels, the more difficult is it for the researchers to guarantee validity and reliability of their research findings. The general problem of the mainland research is not only following the criterion of the international research, but also improving the accuracy of the research results.

#### 5. Discussion and conclusion

From the results, we may conclude that combining IS with management and organization is a significant field. With the involvement of the other disciplines, IS has become an integrated discipline. Knowledge management is a good example. It is a hot area of the IS research, but it is so different in the research details. The research in Mainland China emphasizes the construction of the concept and provides recommendations to the management, while their foreign counterparts look for method to measure capability of knowledge management and the relationship between knowledge and firm capabilities.

We also recognize that Mainland researchers need to pay more attention to the issue of research methods. International academic journals are very strict with the use of

appropriate research methods. The implication is pretty clear. If we want to present our work to international IS research community, we should make sure that we are well trained in research methods and use the appropriate method in conducting a given research.

With development of the IS research, the research objects have changed, and the level of analysis is extended. For example, several years ago, the Business Process Reengineering (BPR) within an organization is popular, but now the research objectives have extended to the inter-organization issues and the research has become more complicated than before. This is a challenge to the mainland researchers.

Because the data is collected during two years, so it is not possible to analyze the papers using the time series. So, one of our future research projects is to continue our study over a longer period.

### **Appendix:**

The list of twenty journals endorsed by the National Natural Science foundation of China:

- 1 Systems Engineering- Theory & Practice
- 2 Quantitative & Technical Economics
- 3 Systems Engineering
- 4 Journal of Systems Engineering
- 5 Journal of Management Engineering
- 6 Control & Decision
- 7 Operation Research Transactions
- 8 Forecasting
- 9 Chinese Journal of Management Science
- 10 Application of Statistics and Management
- 11 Systems Engineering-Theory Methodology Application
- 12 Journal of Management Sciences in China
- 13 Accounting Research
- 14 Studies in Science of Science
- 15 Science Research Management
- 16 R&D Management
- 17 Journal of the China Society for Scientific and Technical Information
- 18 Nankai Business Review
- 19 Management World
- 20 Management Review.

Five journals which publish more paper of IS than others,

1. China Soft Science
2. Computer Integrated Manufacturing Systems (CIMS)
3. Application Research of Computer
4. Computer Engineering
5. Computer Engineering and Applications.

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