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INFORMATION SYSTEMS RESEARCH IN CHINESE UNIVERSITIES: AN EXAMINATION OF THE INPUT SIDE

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Abstract

Along with the rapid growth of the Chinese economy over the past decades, information systems (IS) research in China has undergone a profound transformation. This exploratory study reports on a survey involving 107 university researchers, focusing on the input aspects of IS research and how institutional factors affect the input. In this paper, input mainly refers to research activities, effort, methods and reference disciplines. Data show researchers are withdrawing from IS development projects, while increasing their effort in academic research. Compared to the past, IS research topics are now more aligned to the international mainstream. A major hurdle for empirical research is the lack of familiarities with empirical research methodology, as indicated by nearly half of the respondents. Effort in academic research tends to correlate with the researchers' income scheme, i.e., sources and proportion of base salary and benefits in their overall income. However, surprisingly, emphasis on quality of publication has not significantly influenced researchers' effort yet, nor has the increased degree of internationalization affected the selection of research methods and the shift to empirical research. The underlying reasons are explored, and implications are also discussed.

Keywords: Information Systems Discipline, Information Systems Research in China, Research Activities in China.

INTRODUCTION

Although Information Systems (IS) research as an academic discipline has a history of almost four-decades, its development in Mainland China is far from maturity. In fact, only in the early 1980s was the concept of MIS introduced to the curricula of higher education in China. In 1998, several IS-related subfields were officially integrated into a single one, information management and information systems, by the Ministry of Education of China in recognition of the multidisciplinary nature of the discipline and its high growth (Zha 2003). Meanwhile, a national strategic vision of “industrialization driven by informatization” proposed by the government in 2000 has given a major boost to IS-related teaching and applications. By 2005, 539 universities had established IS programs, which made IS program the most popular one in undergraduate education in China (Zhang et al. 2006). IS researchers in China long to draw from the experiences of their international colleagues in order to develop Chinese IS discipline by leaps and bounds (Huang et al. 2003), and to become a full partner in the international IS community. Therefore, it would be of interest to know what kind of research the IS research community does and what the international IS community can expect from its counterpart in China.

IS research in China has been partly shaped by some unique social, industrial, and economic factors. In the early stage of IS proliferation in China in the 1980s and 1990s, due to a lack of commercial service providers and multinational IT firms’ presence, university researchers have filled the void by becoming a key source of service delivery, in addition to being educators. Therefore, for quite some time, a major portion of university researchers’ work was to develop application systems and acquire contracts, which led to publications on systems development mostly from a technical perspective. As a form of outside practice, such effort had provided substantial supplementary income for the researchers. However, over the past decade packaged software and commercial vendors have gradually taken over as the primary source for IS solutions.

Meanwhile, the rapid growth of the Chinese economy has created both challenges and opportunities for IS researchers. Leading universities in China have experienced a record level of international academic exchange, and raised their publication standard in alignment with that of the international community. It is high time for IS researchers to take stock of past research activities in China and contemplate new directions for the future. As such, this effort can promote informed debates and help IS researchers in Mainland China to devote their efforts in the most productive manner (Alavi & Carlson 1992).

This study is of interest to the IS community at large for two reasons. First, the findings may share common characteristics of IS research in other emerging economies. An understanding of the status and trends of IS research in China could also be important for the international research community for exchange with its Chinese counterpart, and for facilitating collaboration. As we know, IS research conducted in different contexts tends to have varying focuses, which reflect the diverse cultures, economic infrastructures, political systems, legal environments and technological paths (Watson et al. 1997).

Second, it is also of interest for the international IS community to know what institutional factors, e.g., compensation scheme and evaluation policy, have influenced the research directions and methods in scientific inquiries by Chinese IS researchers? What contributions can be expected from IS research in China to the mainstream literature? What opportunities are there for overseas researchers to contribute and leverage? In fact, answers to these questions are not only important for individual researchers in China and their potential international research collaborators, but also useful for strategic planning by Chinese university administrators and funding agencies.

The rest of this paper is organized as follows. Section 2 reviews relevant literature and key glossaries used in this paper. Then, Section 3 describes the research method used in this study. Next, Section 4

reports on the main findings of our data analysis, which is followed by Section 5 consisting of a brief summary of the key findings and discussion on the contributions and implications of this paper.

1 BACKGROUND

1.1 Relevant literature

The IS discipline has engaged in continuous self-examination since the first IS program established at the University of Minnesota nearly 40 years ago (Vessey et al. 2002). A great deal of studies on the IS discipline have been conducted examining the reference disciplines (e.g., Hamilton & Ives 1982a, Culnan & Swanson 1986), research methods (Hamilton & Ives 1982b, Farhoomand & Drury 1999, Grover et al. 1993, Claver et al. 2000), and research topics (Alavi & Carlson 1992, Farhoomand & Drury 1999, Claver et al. 2000). These studies primarily addressed two issues: (1) what constitutes or should constitute IS, and (2) what has been achieved and what needs to be accomplished in the future (Zhang et al. 2006).

However, except for numerous papers discussing IS curricula and teaching guidelines, there has not been similar self-examination on IS discipline by Chinese IS researchers. For example, Hu (1999) studied the content and structure of the education of information management in China, and discussed the courses and teaching. In another study, Zha (2003) discussed the diverse approaches to IS teaching in different universities, and suggested tolerance for the diversities and gradual convergence. An overview was also presented of the MIS discipline in China with regard to the core courses, main research streams, and major conferences and journals (Huang et al. 2003). Whereas IS research in the West is heavily influenced by practical concerns and the desire to stay current (Larsen & Levine 2005), the same pattern is observed in China.

Other researchers have attempted to understand the IS discipline in China by looking into the academic publications. For example, Zhang et al. (2006) examined 410 research papers published in IS management and technical IS research in ten leading Chinese academic journals from 1999 to 2004, and assessed the state of IS research. They found that three quarters of the research focused on technologies, systems development, and applications. Furthermore, human-related and research methodologies issues are scarce, and empirical studies are few and far between. These led to their conclusion that research in China leaned toward IS development and IS technological research, whereas the international IS community tended to focus managerial aspects, i.e., the management of IS. More recently, Ji et al. (2007) reviewed a total of 604 research papers published in 18 leading Chinese academic journals from 1999 to 2003, identified the similarities and differences between North American and Chinese IS research from four perspectives: reference disciplines, research topics, research methods, and unit/level of analysis. Their results show that IS itself has been the primary reference discipline in the studies, and non-empirical study was the dominant form of IS research in China.

1.2 Classification of research

The research subject of this paper needs to be clearly defined first to bridge the terminologies used in China and the West. Although IS management is an important branch of management studies, there has always been a lack of consensus with regard to its core research issues and methodologies (e.g., Robey 1996, Benbasat & Zmud 1999).

Based on the general practice and common belief of the Chinese research community, in this paper, input mainly refers to research activities, effort, methods and reference disciplines. IS research activities in China are classified into two broad categories: academic research versus applications and practice. To avoid confusion, these two categories are operationalized as follows: academic research

mainly refers to activities with the purpose of knowledge discovery via publishing academic papers without clearly identified areas of application. In contrast, IS applications and practice refer to practice-oriented activities, such as engagement in the IS development, systems integration, implementation, operation and maintenance, consulting, project management and supervision. They are usually known as “horizontal” projects¹, with a specific target of application domain, typically funded by a government agency or an enterprise. Their final output may or may not be include academic research papers. Furthermore, IS academic research is further broken down into two types, empirical versus non-empirical.

2 RESEARCH METHOD

An interesting observation of the few studies on IS discipline in Mainland China is that the focus was invariably on the output of research, i.e., published papers. This paper departs from the tradition by looking into the input side of IS research. We conducted a survey of leading IS researchers in China, focusing on the input aspects of IS research and how institutional factors affect the input.

The survey questionnaire went through three rounds of development and verification. The initial version was created out of brainstorming by the research team based on the research objectives, followed by a small-scale Delphi-alike validation process involving three expert panel members in two rounds of evaluation, and lastly a pilot test with three IS colleagues. Based on the results and feedback, the research team further revised the questionnaire. Since the questionnaire involved objective measures only without any latent variable, we did not perform any construct reliability and validity test.

Our survey used a convenience sample. We compiled a mailing list of 280 active researchers obtained from the organizers of several high-profile IS conferences and workshops in Mainland China. The questionnaire was emailed to 190 individuals with a valid email address in the end of 2006. Two high-profile publishers in China provided IS-related textbooks to respondents as incentives. Compared to the usual response rate between 20% and 40% in the IS field (Walstrom et al. 1995), our 107 valid responses resulted in a 56.3% response rate to our satisfaction. A comparison was made between the responses received within a week and those received after our reminder, and no significant differences was found. The test suggests that our data can be considered reasonably representative of the target community in general.

Gender:	Male (67.3%)	Female (32.7%)	
Highest Degree:	Ph. D (48.6%)	Master (40.2%)	Bachelor (9.3%)
Affiliation in University:	Business Administration (67.3%)	Library and Information Science (29.9%)	Others (2.8%)
Overseas Experience:	At least three months of work or study overseas (34.6%)	At least one colleague trained in the IS area from overseas (50%)	

Table 1. The Profile Information of the Sample (n=107).

With respect to the respondents’ affiliation within their respective university, Table 1 shows that IS researchers in China tend to be affiliated with two academic units of the universities, with one leaning to management studies and the other in information science with a technical orientation. Furthermore, the degree of faculty international experience is relative low.

¹ “Horizontal funding” is often arranged via a contract for specific deliverables. In contrast, “vertical funding” is from national or provincial funding agencies in the form of research grants.

3 OBSERVATIONS AND DATA ANALYSIS

In this section survey results are reported in two parts. The first part describes the current research status in China in terms of projects, methods, and reference disciplines. The second part reports institutional factors such as compensation scheme, performance evaluation criteria, and internationalization that might influence IS researchers' effort and activities.

3.1 Academic IS research in China

Types and trends of IS projects. One of the best indicators of research activities is the projects that are undertaken and will be conducted by researchers. Table 2 shows that the IS projects that the respondents were involved in as either the project principal or a participant over the past five years (2001-2005), and planned for the ongoing five years (2006-2010, the 11th five-year plan of China). The top two most common projects that have been completed over the past five years were academic research and IS development. It can also be seen that over the ongoing five years the number of academic research projects would increase by 12.2%, whereas IS development would decline by over 10.3% and its ranking declined from the second to the fourth place. The most conspicuous increase is with IS consulting and implementation, by 37.4% and 23.4%, respectively, and their ranking moved up by one berth. It implies there would be more academic research projects, and the areas of IS application and practice would shift from systems development to consulting and implementation of packaged software, e.g., Enterprise Resources Planning (ERP).

	2006-2010		2001-2005		Net Change (%)
	Ranking	Frequency	Ranking	Frequency	
Academic Research	1	87.9%	75.7%	1	12.2%
Consulting	2	72.0%	34.6%	3	37.4%
Implementation	3	47.7%	24.3%	4	23.4%
Development	4	43.0%	53.3%	2	-10.3%
Integration	5	33.6%	19.6%	5	14.0%
Supervision	6	18.7%	3.7%	7	15.0%
Operation and Maintenance	7	8.4%	9.3%	6	-0.9%

Table 2. Areas of Funded Research Projects and Ranking (n=107).

Areas of focus in academic research. Following the classification of IS research topics by Claver et al. (2000) and that used in Yu & Huang (2004) in their research of themes and topics of IS, we adopted six categories to classify research topics, namely IS management, development of the IS discipline (e.g., knowledge structures, systems, and domains), IS applications, development, technologies and others.

Respondents were asked to answer a multiple-choice question on "research areas that you have invested in a significant amount of effort." Table 3 shows their self-reported most heavily researched areas in terms of effort over the past three years (2003-2005), and a comparison with the results of Yu & Huang's classification of research output in China and overseas (2004). Some interesting trends can be seen. For example, the most frequently mentioned intensively-researched area was IS management (35.2%), followed by the development of the MIS discipline (26.7%). Whereas in Yu & Huang's findings (2004), IS development ranked on top but slipped to the fourth place in our study. This discrepancy perhaps is an indication of a shift in research directions.

Due to the lack of research papers published overseas recently with the similar classification, we used Yu & Huang's findings based on 1981-1997 data as a proxy for comparison. It is clear in Table 3 that university researchers in China placed more effort on managerial issues of IS, which ranked first in

terms of research effort during 2003 to 2005. These reflect an important shift in research topics, and increasing alignment to the mainstream IS research.

IS Areas	Research effort in 2003-2005 (n=107)		Papers published in 1999-2002 (Yu & Huang, 2004)		Papers published overseas (1981-1997) (Yu & Huang, 2004)	
	Frequency	Ranking	Frequency	Ranking	Frequency	Ranking
IS Management	35.2%	1	11.4%	4	31.7%	1
Development of the IS Discipline	26.7%	2	N/A		N/A	
IS Applications	24.8%	3	26.4%	3	13.4%	4
IS Development	21.0%	4	30.7%	1	24.2%	3
IT Technologies	12.4%	5	28.7%	2	25.7%	2
Others	5.7%	6	2.8%	5	5%	5

Table 3. *Juxtaposition of Research Input and Output.*

Each of the areas listed in Table 3 can be broken down to several more specific research directions based on convention and common practice in China. When asked about the question on “research directions that you have invested in the most amount of effort,” the top three widely researched directions were electronic commerce, knowledge management, along with business processes modeling, improvement and reengineering.

Research methods and reference disciplines. Among those who conducted academic research in our sample, 51.4% of them reported using empirical research methods, and 43.9% of them reported non-empirical work, and the rest 3.7% claimed using both. However, this result from the research input side contradicts findings from the research output side, e.g., an overwhelming majority of the papers are non-empirical (97.2%), compared with only 1.6 % empirical studies (Zhang et al. 2006). The source of the contradiction seems to be the lag time between researchers’ intent and outcome. Whereas we found nearly half of the respondents considered using empirical research, which is likely driven by the desire to align with the high proportion of empirical papers in international IS journals (Mingers 2003), the intent has largely not materialized yet.

Our questionnaire also inquired about hurdles that prevented the use of empirical research methods. About half of the responses (45.6%) cited lack of familiarity with empirical research methods, 43.7% of the answers expressed reluctance to move away from IS development and worries about losing technical depth in research, whereas 25.2% expressed similar reluctance but due to worries about losing insights about IS practice in teaching. Furthermore, the top two commonly used empirical research methods were case studies (79.7%) and survey based on questionnaire (64.4%). No other methods received wide use, as lab experiments, field experiments, and other field research methods were mentioned by only 28.8%, 20.3, and 13.6% of the respondents respectively.

The reference disciplines adopted by IS research in China have been studied by prior research (e.g., Ji et al. 2007). One of the key findings is that cognitive psychology, and social and behavioral science, which are frequently used in North America, are rarely used in China (Ji et al. 2007). This is consistent with our finding of hurdles for adopting empirical methods. Moreover, there are strong indications that a large portion of research in the IS field in China is still not well-grounded in behavioral and organizational theories, which hinders a cumulative research tradition (Zhang et al. 2006). In sum, the IS field in Mainland China is still a young discipline.

3.2 Institutional factors that facilitate/inhibit IS research

Compensation scheme versus research project types and effort. Until 2003, income from universities was extremely low, thus IS development projects provided an extra source of funding and

income, which could be used to support academic research and improving researchers' standard of living. However, with the substantial increase of salaries and benefits from the university, the income-supplementary role of IS projects has become less important. Therefore, it is of interest to examine the relationship between IS research effort and researcher' compensation scheme.

In our investigation, respondents were asked to assess the direction of change in the number of IS projects undertaken by university researchers between 2006 and 2010. 62% of them expected a rapid decline or decline, only less than 17% expected an increase or rapid increase. There is a clear pattern of decline in the expected number of IS development projects undertaken by university researchers. The top five reported reasons for the decline were the presence of more specialized IT firms, systems getting bigger and more complicated, increased need for certified qualifications for systems integration, increasing client adoption of purchased packaged software, and a declining level of trust in university projects. Each of them was reported by more than one-third of the respondents, indicating a high level of consensus. There was also a general impression among the respondents that it was increasingly more difficult for them to acquire IS development projects.

A regression analysis was conducted to examine the relationship between research effort and compensation scheme. Research effort, which is part of all effort including academic activities and project execution activities, was measured by self-reported percentage of time on academic research, whereas compensation scheme was defined as the percentage of salary and benefits from the university in one's overall income in 2005. The standardized β coefficient is 0.229 with a t-value of 2.285, indicating a significant positive relationship. This implies that those researchers who had a higher proportion of base income from their universities tended to spend more time in academic research.

Evaluation criteria versus research effort. In one of the multiple-choice questions (not mutually exclusive), respondents selected the three most important research evaluation criteria used in their respective institution. As shown in Table 4, the most widely used evaluation criteria for research were, papers in the four major citation index databases such as SCI, SSCI, EI and ISTP and papers in internally designated core journals, mentioned by about half of the respondents. Since the indexed articles are mostly in English, this finding is an indicator of increased emphasis on internationalization in research. "Vertical" research grant from funding agencies was the third most widely adopted criterion, accounting for close to a quarter of the responses. Textbooks, which used to be considered research, are virtually no longer a factor in research evaluation.

Most Important Criteria	Frequency
Papers indexed in SCI/SSCI/EI/ISTP	50%
Papers in core journals designated by university	49.1%
"Vertical" research grants	23.6%
Monographs	10.4%
"Horizontal" projects funds	8.5%
Textbooks	4.7%

Table 4. The Most Important Criteria of Research Evaluation (n=107).

Apparently, universities in China have placed the greatest weight on papers in the four major citation index databases depending on the journal's reputation and impact factor (IF). The main reason is that they represent international standard of quality and directions for domestic research.

A regression analysis was also conducted to examine the effect of evaluation criteria on research effort, and the former is measured by whether having papers appear in the four citation index databases or in internally designated core journals. Results show that evaluation criteria were not a significant predictor (Pearson's Chi-square tests with p-values of 0.991 and 0.208, respectively), which suggests that researchers' time spent on academic research was not related to emphasis on

quality publications. This finding was quite surprising. Further discussion will be provided in the final section of this paper.

Effects of internationalization on research methods. There is a clear pattern of increased internationalization in the Chinese IS research community, such as easier to access the latest mainstream research via the Internet, raised levels of international academic exchange, and a conspicuous trend in the return of expatriate Chinese researchers. This has helped domestic researchers to learn about the current mainstream research topics, methodologies, quality standard, and increased their intent to conduct empirical research.

We examined the relationships between research methods and if the respondents had overseas experience, and the presence of expatriate Chinese scholars. However, no significant result was found (Pearson chi-square tests with a p-value of 0.107 and 0.741, respectively). This finding means the respondents' overseas experience had little influence on their research methods yet for various reasons, e.g., a short visiting experience might not be enough to have a major impact. Alternatively, their impact is not shown yet and lagged. The apparent lack of impact of expatriate Chinese scholars could be because they were not senior enough to have a strong influence, and it might take more time for them to have strong influence on research methods adopted by their colleagues.

IS research community and publication outlets. Normally, the development of an academic discipline is associated with a research community and publication outlets. However, China Association for Information Systems (CNAIS) was only founded in 2005 in an effort to form such a community. Besides CNAIS, there are several related communities such as a chapter named Information Management and Information System under the China Information Economics Society (CIES), and another special interest group named Information System Engineering under the Systems Engineering Society of China (SESC).

As to IS research publication outlets, to date there is only one academic journal, China Journal of Information System (CJIS) founded in 2007, exclusively dedicated to IS research in China. Therefore, IS researchers mainly publish their work either in the management field or in the computer science and engineering field, as shown in Table 5, which was identified by Ji et al. (2007) and Zhang et al. (2006) and verified by the authors via informal conversation and discussion with their colleagues. Besides, a small number of IS researchers publish their papers in the library filed, such as Journal of the China Society for Scientific and Technical Information, and Library and Information Service.

Journals in Computer Science & Engineering	Journals of Management Studies
Computer Integrated Manufacturing Systems	Journal of the China Society for Scientific and Technical Information
Application Research of Computers	Journal of Management Science in China
Computer Engineering	Journal of Management Engineering
Computer Engineering and Applications	System Engineering Theory and Practice
Microcomputer Applications	Chinese Journal of Management Science
	System Engineering Theory Methodology Application
	China Soft Science
	Science Research Management
	Science of Science and Management of Science and Technology
	Management World

Table 5. Fifteen Reputed Journals for IS Publications in China.

4 CONCLUSIONS AND DISCUSSION

4.1 Summary of key findings

This paper describes the IS research landscape in Mainland China, focusing on research activities, effort, methods, and institutional factors. Data analyses revealed some interesting findings, highlighting the transition of IS research in China and the adjustment in research focus. Over the past five years (2001-2005) university IS researchers have worked on academic research, development, consulting, implementation, operation and maintenance, in a decreasing order of frequency. They expect a significant increase in academic research and substantially reduction in IS development work in the ongoing five years (2006-2010).

However, the transition may not be easy or happen soon. There is roughly an equal split between researchers who claimed to use empirical and non-empirical methods, although this finding contradicts studies based on research output (e.g., Zhang et al. 2006). A major hurdle preventing more empirical research is the lack of familiarities with empirical research methodology, as indicated by nearly half of the respondents. There seems to be a huge mismatch between skill requirements and the intended shift to academic research.

Moreover, the transition may be facilitated by institutional factors. For example, data show that universities place more emphasis on papers in the four citation index databases and the quality of research, which is also a clear indication of increased internationalization of research. Furthermore, the effort in academic research seems to be closely associated with the researchers' compensation scheme. Naturally, if a high proportion is from the base salary and benefits (likely in better and research-intensive universities), the need for undertaking IS development for income is smaller.

Surprisingly, the emphasis on quality and internationalization in evaluation criteria has not led to more research effort to academic research. Our interpretation based on our observation is that university researchers nowadays are burdened with heavy workload, as they have to deal with heavy teaching due to massively increased student enrolment without duly increased manpower. This is worsened by inefficient university governance and administrative bureaucracy. Moreover, productive researchers are often given a heavier administrative load, as reward for research excellence in a culture where resource allocation is heavily influenced by administrative power. To many researchers, funding has increased, so have research opportunities, but the available time for research has decreased. There are simply too many distractions. Lastly, whereas top tier international journals are perceived to be too difficult to get in, the easier ones are not collected in the major citation index databases, which do not give the researchers sufficient motivation.

4.2 Discussion and implications

In terms of contributions, whereas past studies on IS research tended to be conducted from the output end, this research to our knowledge is the first to investigate the input and the factors affecting the input. We argue that significant contributions are made in this study for the IS research community. Our findings have several important implications as discussed below.

4.2.1 *Implications for overseas researchers*

First, because two-thirds of the researchers are affiliated with business schools and the rest in information science related fields, overseas researchers need to keep this in mind when searching for and selecting collaboration partners because their research focus and methodological orientation are likely reflective of their academic affiliations. Moreover, given the close tie found in this study between research achievements and faculty compensation scheme, university ranking, which usually is a key determinant for faculty compensation and benefits, might be a reasonable guide for

international researchers to find Chinese collaborators. A simple reason is that researchers receiving a higher pay from their university are more likely to have adequate energy devoted to research activities, which would facilitate intensive and in-depth research collaboration.

Second, in light of the heavy emphasis on the four citation index databases as objective indicators of quality in Chinese universities, major international journals and conferences can attract more participation from China if they are collected in the citation index databases, which is an indicator of internationalization to Chinese university administrators.

Third, since most Chinese researchers are not familiar with empirical research methodology, overseas researchers can contribute substantially via transfer of research know-how, including tacit knowledge on dealing with difficult scenarios. Overseas researchers can increase their scope of influence by running training courses on research methodologies, to help Chinese researchers to become international.

Lastly, it is worth noting that there are many unique IS research topics in the emerging Chinese economy. Although few researchers in China published research papers in international leading IS journals, there still exist many foreign scholars studying issues about the unique aspects of China. We can give three examples as follows: (1) Research by overseas researchers has been fruitfully investigated key success factors for ERP implementation in various ownership contexts (e.g., Reimers 2003, Martinsons 2004). (2) Companies operating in mature economies usually are less affected in a fundamental way by the implementation of ERP or e-Commerce applications. In contrast, these applications in China are often seen as a means to modernize the firm (Reimers 2003). Similarly, the prospects for e-Commerce in mainland China are related to the development of the rules and infrastructure that are fundamental to a modern market economy (Martinsons 2002). (3) Knowledge management is influenced more significantly by psychological factors (such as cultural values) among groups and social levels in China than in the West (Burrows et al. 2005).

In addition to the unique research opportunities discussed above, there are other interesting IS research issues in China: (1) The largely successful and thriving software offshore outsourcing business to Japan also offers distinct cultural and cross-cultural aspects to this line of research. (2) Guanxi, which means relationship, plays a particularly important role in the winning and execution of contracts between application services providers and customers in China. (3) In the Chinese society, the pursuit for harmonious society encourages collectivism and mutual benefits for all, which inevitably affects computing and information ethics, privacy and knowledge property.

Naturally, Chinese researchers have a better understanding of the issues mentioned above, being close to the frontline action and in an advantageous position to work with international colleagues. We envision a complementary arrangement, which could be mutual beneficial: Overseas researchers could contribute to research design and other methodological issues and the presentation, whereas domestic researchers could contribute to access to research settings, data collection and analysis, with each party leveraging its own unique strengths to draw synergy. Undoubtedly, Chinese IS researchers are on their way to align themselves to the mainstream. Support and collaboration from international colleagues could speed up this process.

4.2.2 Implications for administrators and researchers

First, our findings are useful for planning and structuring the IS discipline, while in higher education in China government regulation and centralized planning are still very powerful. The diversity in the IS discipline needs to be recognized in the design of educational programs and research funding schemes, as IS researchers tend to be affiliated with two academic disciplines, namely management and information science.

Second, with the changing landscape of IS applications, both IS program leaders and individual researchers need to rethink about their future research directions, skill sets, and research activities, in terms of how to position themselves. Historically, IS research in China has been influenced by

technological developments. The earlier generations of IS researchers tended to have a background in engineering and technological fields, and it was natural for them to do IS development projects. However, there is a shift from technical themes towards non-technical themes globally (Farhoomand & Drury 1999). Therefore, IS research in China needs to reflect the shift in focus in practice from systems development to managerial issues.

Third, more effective measures need to address the mismatch between skill requirements and the shift to academic research. Administrators in universities need to take this into consideration in recruiting, training, and degree program designed to reflect the transition in place. For example, universities may need to recruit candidates who have a firm grasp of internationally accepted research methodologies, strengthen their effort in training in empirical research methodologies, and boost internationalization with aggressive measures.

Lastly, universities should recognize the relationship between compensation scheme and effort in research, and take the necessary measure accordingly in order to keep their researchers concentrating on academic research without undue worry for earning supplementary income.

4.3 Limitations and future directions

This exploratory research has identified some patterns in IS research in Mainland China's universities from the input aspects. Given the significant influence that university researchers have on IS practice in China and their historical role and responsibilities, the shifts identified in this research are worth the attention of institutions, leaders in the IS community, individual researchers and their colleagues in the international IS research community, in order to better leverage the opportunities in China and to advance the IS field.

A major limitation of this paper is that the survey was based on a convenience sample. All respondents were participants to several research conferences, and likely from research-intensive universities and well established. On one hand, this could be a bias. On the other hand, the respondents were likely to be the pacemakers and leading force in the field. A secondary limitation is that our data set was relatively small, with a small pool to begin with, despite our effort to ensure a high response rate. Our challenge for future study of this kind is to enlarge the base. The above implications of this survey should take into consideration of these limitations.

Moreover, although this paper has identified the relationship between institutional factors and research effort, it does not present a clear model to explain why they interact with each other. Furthermore, besides of compensation scheme, performance evaluation criteria, and internationalization, the factors affecting research effort may include financial support, adequate research infrastructure, intellectual pursuit, and pressure for promotion.

Therefore, a future study is planned to develop a model for elaborating how various factors affect researchers' input, and for verifying the relationship between the input and the output of IS research. Cross-cultural comparisons will also be conducted to advance the development of the information systems discipline.

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