



Research article

Research on IT in China: a call for greater contextualization

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Abstract

Research on information technologies (IT) in China has gained increasing attention in the international information systems (IS) community. This study systematically reviews papers on IT in China published in the ‘Senior Scholars’ Basket of Journals’ from 2000 to 2013. We have two specific objectives: to identify key research issues and trends, and to propose future directions for research on IT in China. This paper categorizes the global distribution of authors and their research methods. Five research streams are identified, including human behaviors in IS adoption and use, IS management, e-Business, social media, digital collaborations and group support, and industry and societal issues in IS. While each stream is examined in detail, we specifically pay attention to the effect of the Chinese context in each paper and the approaches to contextualizing the research. On the basis of our findings from the literature review, we propose a focus on the Chinese context as guidance for future research.

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Introduction

Along with rapid economic development in China comes an increasing demand for information technologies (IT). According to a report by Gartner (2013), IT spending by Chinese individual consumers and firms grew by nearly 14% in 2012 over 2011, and it is estimated to reach \$323 billion in 2013. The Chinese market offers substantial opportunities to technology and service providers. Booming IT applications in China have attracted keen interest among researchers and practitioners around the globe. The new millennium has witnessed an increasing amount of publications on IT in China in international conferences and journals including mainstream information systems (IS) journals, as demonstrated by the special issues on this topic in the *Information Systems Journal* and *Journal of Information Technology* in 2008 and 2014, respectively.

The growing interest in IT in China is not surprising. The combination of cultural heritage and a long history with drastic reform over the past three decades has created distinct management phenomena embedded in a special context. As a result, findings from management research based on the Western context are not always appropriate for understanding

phenomena unique to China. Therefore, research that focuses on Chinese management phenomena can not only advance localized management experience, but also make important contributions to knowledge in general (Tsui, 2009). Management researchers have called for the application of general management theories to the Chinese context, which may provide important opportunities to substantiate, extend, or revise the extant theories and make them more generalizable (Tsui *et al.*, 2004; Barney and Zhang, 2009).

IT adoption and use in China are influenced by unique cultural, social, and institutional forces in the local context (Liang *et al.*, 2007). For example, at the society level, the government blocks access to some websites hosted overseas for political reasons (Zhang and Wang, 2012); software piracy widely exists (Chan and Lai, 2011). At the individual level, ‘guanxi’ and ‘face’ are distinct characteristics of personal interaction among Chinese people including IT managers (Goffman, 1967; Farh *et al.*, 1998). At the organizational level, business information is often perceived as a personal asset rather than an organizational resource. IT investment is often directed at monitoring and controlling basic operations in

Table 1 Coding scheme

<i>Coding methods</i>	
Is it research on IT in China?	Yes (Mainland China/Hong Kong/Taiwan/Macao) No
Author(s) information	Country/region
Research methods	Based on the Research Methods section of the paper, including quantitative methods such as survey, experiment, archival data, and qualitative methods such as case study, grounded theory research, ethnography, and action research
Research themes and areas	Based on the title, abstract, and keywords, with reference to the 100 research themes identified by Sidorova <i>et al.</i> (2008, Table A4). Classification of papers is based on research theme and content via a grounded theory research approach (Wolfswinkel <i>et al.</i> , 2013)
Chinese management context	Content analysis to identify a particular Chinese management context

business rather than at decentralizing decision-making, as a result of Chinese high power distances (Martinsons and Westwood, 1997; Li and Mao, 2012). However, until fairly recently, 'IS in China is very poorly represented in the English language literature, despite the increasing global importance of that country and its vast population' (Walsham *et al.*, 2007: 323). It is of interest to the international IS community to have a literature review on research of IT in the Chinese context, which may stimulate and guide future research on this topic.

This paper reviews research on IT in China published in mainstream IS journals. It has two objectives: to identify key issues about and describe research trends on IT in China, and to propose future research directions. The term China in this paper refers to greater China including mainly mainland China but also Hong Kong, Macao, and Taiwan. The key research questions are: what research issues concerning IT in China have been investigated? Who in research follows IT practices in China? How is research on IT in China conducted? And what unique Chinese contextual factors have been investigated?

In the next section, the research method will be described, including criteria for the selection of sampled journals and papers. A comprehensive overview of research on IT in China, in terms of the sources of the papers, global distribution of authors, and their research methods is offered after that. Whereas the section after that presents key findings from the review, the subsequent section examines the literature from the perspective of contextualized research on IT in China. Lastly, a research framework is proposed, and suggestions for future research are given.

Research methods

Following Webster and Watson (2002) and Wolfswinkel *et al.* (2013), we undertook a literature review through the following steps: (1) defining the criteria for inclusion and/or exclusion of a paper, identifying the research fields, determining the appropriate outlets, and deciding the specific search terms; (2) searching through all the identified sources and refining the sample; (3) analyzing the texts of the chosen set of studies; and (4) representing and categorizing the content, and structuring the review. Here we describe our methods for selecting an appropriate set of target journals, identifying a sample of papers, and analyzing the papers.

Target journals

In selecting journals, a conscious decision was made to target research papers on IT in China in mainstream journals with consideration for quality, representativeness, and impact, rather than quantity of papers. The eight in the 'Senior IS Scholars' Basket of Journals' were deemed appropriate. They are generally considered high quality IS journals, with a high impact on Chinese IS researchers. They are:

European Journal of Information Systems (EJIS);

Information Systems Journal (ISJ);

Information Systems Research (ISR);

Journal of the Association for Information Systems (JAIS);

Journal of Information Technology (JIT);

Journal of Management Information Systems (JMIS);

Journal of Strategic Information Systems (JSIS);

Management Information Systems Quarterly (MISQ).

Paper selection

We downloaded all of the papers published from 2000 to 2013 in the eight journals, which resulted in over 3600 PDF files. Then we used Adobe Reader's 'search' function, using keywords such as 'China,' 'Chinese,' 'Hong Kong,' 'Taiwan,' and 'Macao.' Papers were deemed to be relevant to IT in China if they met one of the following two criteria: (1) the research data collection took place in China, or (2) in the case of cross-cultural research, China was one of the nations in the comparison. Papers were screened out if they collected data in multiple countries but data analysis and findings did not treat China individually and involved no national differences. In the end, 115 papers were retained for review (see the Appendix), 64 papers on IT in mainland China, 28 papers on Hong Kong, and 23 on Taiwan.

Coding method

Each of the papers in the sample was coded to address our research questions concerning author information, research methods, research questions and fields, as well as the Chinese context. The coding scheme is shown in Table 1.

Table 2 Distribution of papers by journal, period, and region

Journal name	2000–2004				2005–2009				2010–2013				Total
	ML	HK	TW	ST	ML	HK	TW	ST	ML	HK	TW	ST	
<i>EJIS</i>	0	3	0	3	2	0	3	5	8	0	3	11	19
<i>ISJ</i>	1	1	1	3	6	1	4	11	9	1	5	15	29
<i>ISR</i>	0	1	0	1	0	2	0	2	7	0	0	7	10
<i>JAIS</i>	0	2	0	2	3	0	0	3	3	1	1	5	10
<i>JIT</i>	1	0	0	1	2	1	0	3	1	0	0	1	5
<i>JMIS</i>	0	3	1	4	2	2	3	7	7	1	0	8	19
<i>JSIS</i>	2	0	0	2	2	0	1	3	4	1	0	5	10
<i>MISQ</i>	0	0	0	0	2	5	0	7	2	3	1	6	13
Total	4	10	2	16	19	11	11	41	41	7	10	58	115

Note: ML – Mainland China; HK – Hong Kong; TW – Taiwan; ST – Subtotal.

Table 3 Distribution of authorship by region and period

Authors' geographic location	2000–2004		2005–2009		2010–2013		Total	
	NC	SC	NC	SC	NC	SC	NC	SC
Mainland China	0	0	3	0	36	11	39	11
Hong Kong	15	5	25	11	41	10	81	26
Taiwan	3	1	23	11	17	8	43	20
Other countries/regions	22	10	51	19	86	29	159	58
Total	40	16	102	41	180	58	322	115

Note: NC– Normal-count; SC–Straight-count.

With regard to author information, we coded the region where each author is located based on bibliometrics (Chua *et al.*, 2002; Lowry *et al.*, 2007): (1) normal-count, which gives each co-author one point, and (2) straight-count, which gives only the first author credit for a paper.

After coding each paper individually, all papers were put into clusters, in a manner similar to the grounded theory research for literature review as described by Wolfswinkel *et al.* (2013). The clustering was conducted with reference to the research themes identified by Sidorova *et al.* (2008), especially the lists of research themes in their Table A3, which resulted in five major research streams. In particular, we examined the Chinese context for each paper, and coded the contextual factors at three levels: national and social level, organizational level, and individual level. Moreover, we analyzed how each paper contextualized its study, based on the framework set out by Rousseau and Fried (2001), in terms of a three-tiered approach for examining contextual effects, including rich description, direct observation and analysis of contextual effects, and comparative studies.

Overview of research on IT in China

Distributions by journal, period, and region

Papers were classified into three 4–5-year periods to show trends over time, that is, 2000–2004 (5 years), 2005–2009 (5 years), and 2010–2013 (4 years), as shown in Table 2. The number of publications since the new millennium shows a clear increasing trend, and in the most recent four years most

journals have published more papers than in the previous 5-year period (2005–2009), reflecting growing attention to IT in China.

In terms of the quantity of publications on IT in China, among the eight journals, *ISJ*, *EJIS*, and *JMIS* published the most at 29 papers (25.2% of the papers in the sample), 19 (16.5%), and 19 (16.5%), respectively. In contrast, *JIT* published the least amount, five papers (4.3%) only. It is worth noting that *MISQ* did not publish any papers at all on IT in China in 2000–2004, but since 2006 has steadily published at least one paper per year.

With regard to regional distribution, the publications on IT in the three regions present dissimilar increasing trends. The number of publications on IT in Hong Kong has been stable for the time period examined. Research outputs on IT in Taiwan have increased significantly since 2005, from two papers in 2000–2004 to 10 in 2005–2009 and 10 in 2010–2013. However, the most impressive increase is from mainland China, registering an over tenfold growth, from four papers in 2000–2004 to 41 in 2010–2013. This phenomenal increase reflects both increasing interest from the international IS community on this topic, and significant contributions to international publications by a growing number of mainland Chinese scholars.

Author distribution

As presented in Table 3, there is a strong growing trend of publications in international journals between 2000 and 2013 from researchers based in China on IT in China. Judging from

Table 4 Distribution of authorship by co-authors

<i>Mode of Collaboration</i>	<i>Mainland</i>	<i>HK</i>	<i>Taiwan</i>	<i>Other regions</i>
Single author	0 (0%)	1 (2.4%)	5 (21.7%)	8 (9.5%)
Co-authors in the same region	0 (0%)	11 (26.2%)	10 (43.5%)	27 (32.1%)
Co-authors cross-regions	25 (100%)	30 (71.4)	8 (34.8%)	49 (58.3%)
Total no. of papers with authorship from the region	25	42	23	84

Table 5 Distribution of research method by period

<i>Research method</i>	<i>Number papers (%)</i>			<i>Total</i>
	<i>2000–2004</i>	<i>2005–2009</i>	<i>2010–2013</i>	
Survey	7(43.8%)	19(46.3%)	38(65.5%)	64 (55.7%)
Case study	2(12.5%)	15(36.6%)	13(22.4%)	30 (26.1%)
Experiment	3(18.8%)	5(12.2%)	2(3.4%)	10 (8.7%)
Secondary data	0	0	3 (5.2%)	3 (2.6%)
Mixed-method	0	2 (4.9%)	1 (1.7%)	3 (2.6%)
Conceptual research	2 (12.5%)	0	0	2 (1.7%)
Delphi study	1 (6.3%)	0	1 (1.7%)	2 (1.7%)
Action research	1 (6.3%)	0	0	1 (0.9%)
Total	16	41	58	115

the normal-count, we found that during 2000–2004 there were no authors based in mainland China published in the eight selected journals. During 2005–2009, three Chinese scholars based in mainland China appeared in three co-authored papers, but none was the first author (0 straight-count). However, during 2010–2013, 36 authors based in mainland China contributed to 22 papers, with 11 of them as the first author. The normal-count and straight-count for mainland authors in this period are about the same as for Hong Kong-based IS scholars.

Among the three regions in greater China, IS scholars based in Hong Kong had the most stellar performance thanks to their high degree of internationalization, generous funding, convenience of collaboration with their mainland China colleagues, and relative ease of data access in mainland China facilitated by Hong Kong's culture and advantageous location. Moreover, scholars located outside of greater China consistently accounted for around 50% of publications on IT in China over the past 14 years, the majority of them of Chinese origin. Their familiarity with both Chinese history, culture, and management systems, and Western theories and methods helped them to productively publish in the leading IS journals.

Table 4 summarizes the distribution of authorship by co-authors. Interestingly, the 25 papers with mainland China authorship in the sample were all co-authored with overseas colleagues. In sharp contrast, among the 23 papers with Taiwanese authorship, five (21.7%) were single authored, and 10 (43.5%) were co-authored with colleagues based in the same region. This comparison shows mainland Chinese researchers tend to collaborate with overseas colleagues, and such international collaboration has indeed quickly raised the quality and visibility of their work. The IS community in Taiwan, by contrast, seems to be more closely knit and active in internal collaboration.

Differences in research methods

As shown in Table 5, survey, case study, and lab experiment were the top three choices for research methods, totaling 104 papers or 90.4% of the sample. As a recent trend, since 2010, three papers used secondary data, that is, data from online reviews (Lu *et al.*, 2013), online check-in (Shi and Whinston, 2013), and Chinese Wikipedia (Zhang and Wang, 2012), due to the rise of big data and user-generated content.

IT themes in China research

The 115 papers are classified into 22 research themes in five broad streams: human behaviors in IS adoption and use; IS management; e-Business; social media, digital collaborations, and group support; and, industrial and societal issues in IS. Table 6 shows the distribution of the research themes over the period of the study.

Human behaviors in IS adoption and use

This is the second most popular research stream for IT in China, with 36 papers accounting for 31.3% of the total. These papers are further classified into three research themes. First, the majority of them, 20 papers (64%), are on IT acceptance, adoption, and use in China. They primarily tested and extended the technology acceptance model (TAM) and related theories in a variety of IT contexts such as short message service (Lu *et al.*, 2010), interactive hedonic technologies (Lin and Bhattacharjee, 2010), digital libraries (Hong *et al.*, 2001–2002), e-procurement systems (Chang *et al.*, 2008), multipurpose information appliances (Hong and Tam, 2006), web-based training (Chan and Ngai, 2007), consumer intention to use mobile services (Wang *et al.*, 2006), adoption of online training courses by senior citizens (Lam and Lee, 2006), individual professionals' adoption of IT (Chau and Hu, 2002), and compulsory IT adoption and

Table 6 Distribution of research themes

Research themes	2000–04	2005–09	2010–13	Total
<i>Human behaviors in IS adoption and use</i>	6	14	16	36 (31.3%)
1.IT acceptance, adoption and use	4	7	12	23 (20.0%)
2.IS implementation and assimilation	2	5	2	9 (7.8%)
3.e-Learning	0	2	2	4 (3.5%)
<i>IS management</i>	5	7	27	39 (33.9%)
4.IS development and project management	1	0	7	8 (7.0%)
5.Supply chain management	0	1	7	8 (7.0%)
6.Knowledge management	0	1	4	5 (4.3%)
7.IT outsourcing	2	1	2	5 (4.3%)
8.Economics and value of IS	1	2	2	5 (4.3%)
9.IS in public sectors	0	0	3	3 (2.6%)
10.Global IT	0	1	1	2 (1.7%)
11.IS success	0	1	1	2 (1.7%)
12.Role of top management	1	0	0	1 (0.9%)
<i>e-Business</i>	2	6	3	11 (10.0%)
13.Personalization and web site design	1	5	0	6 (5.2%)
14.Electronic commerce	1	1	3	5 (4.3%)
<i>Social media, digital collaborations, and group support</i>	2	4	7	13 (11.3%)
15.Collaboration and communication	0	2	5	7 (6.1%)
16.Social networks and virtual communities	0	1	1	2 (1.7%)
17.Group support systems	2	0	0	2 (1.7%)
18.Group decision making	0	1	1	2 (1.7%)
<i>Industrial and societal issues in IS</i>	1	10	5	16 (13.9%)
19.Ethics	0	4	2	6 (5.2%)
20.Industry and standards	1	4	0	5 (4.3%)
21.Privacy and security	0	1	2	3 (2.6%)
22.IT and culture	0	1	1	2 (1.7%)
Total	16	41	58	115 (100%)

use (Chan *et al.*, 2010; Xue *et al.*, 2011; Hsieh *et al.*, 2012; Liang *et al.*, 2013). This is a mature research theme with a well-established theoretical foundation, which facilitates incremental contributions and cross-validation in different IT contexts. Studies focus on identifying and testing new antecedents of IT use, or expanding the concept of IT use, to better explain IT adoption behaviors (Venkatesh *et al.*, 2011, 2012). Post-adoption usage of IS has also been a research interest (Limayem and Hirt, 2003; Hsieh and Wang, 2007; Limayem *et al.*, 2007; Liang *et al.*, 2010; Sun *et al.*, 2012; Ke *et al.*, 2012–2013; Li *et al.*, 2013).

Next, post-implementation assimilation of IS forms a distant second commonly studied theme, with nine papers. IS implementation remains a primary task in the IS function of organizations in mainland China, which has raised a great deal of IS management issues and strong research interests for scholars. Enterprise resource planning (ERP) implementation is believed to be particularly challenging to Chinese firms because of high implementation costs, technical complexity, lack of well-trained employees, absence of incentives to employees in state-owned enterprises, and a different corporate culture from that of Western firms (He, 2004; Newman and Zhao, 2008). Embedded in a different culture and institutional environment, Chinese

firms face big hurdles in implementing ERP systems originating from the West. Therefore, the mutual adaptation between ERP packages and Chinese organizations became a research focus. The literature indicates that fit and localization are issues in the adoption of ERP systems by Chinese firms (Liang and Xue, 2004; Wei *et al.*, 2005; Wang *et al.*, 2006). Moreover, for many Chinese firms, successful implementation of ERP does not offer much assurance for assimilation. Therefore, theoretical models were developed to explain how internal management issues, for example top management support, learning capability, and external forces such as institutional pressures, influence the degree of ERP system usage (Liang *et al.*, 2007; Liu *et al.*, 2011; Saraf *et al.*, 2013). The models call for efforts to focus on both vendors and adopting organizations, and to conduct cross-culture studies to examine the effects of the local context.

Lastly, e-Learning as a special form of IT use is under-represented in our sample, with only four papers (Chiu *et al.*, 2007; Chu and Robey, 2008; Cheng, 2011; Wan *et al.*, 2012). This theme could be one of potential growth, given the increasing maturity of e-Learning technologies on the one hand and the reputation for poor quality associated with online learning in practice in China on the other.

IS management

IS management in China is the most researched stream and includes 39 papers (33.9%) in our sample. We have identified nine research themes in this stream. Of them, IS development and project management, and supply chain management were the two most popular themes, each with nine papers. The fast changing and highly dynamic operating environment for Chinese organizations present opportunities for studying the development of agile IS (Goh *et al.*, 2013). Not surprisingly, risk management also received a significant amount of attention (Schmidt *et al.*, 2001; Liu *et al.*, 2010; Keil *et al.*, 2013). However, most studies in this theme did not consider the role of local context in management. For example, Lin *et al.* (2012) proposed a comprehensive behavioral component of the transactive memory system, and found that IS development team members needed to integrate the expertise possessed by each individual, make decisions jointly, and interlink all individual actions, to achieve better teamwork outcomes. However, their research was based on existing concepts and arguments without any effort to contextualize the study, though the Chinese context may impact the collaboration of different members in the IS development team.

Papers in the second theme, supply chain management, have primarily examined generic aspects of supply chain such as information integration (Wang *et al.*, 2006; Wong *et al.*, 2011–2012), bilateral relationships (Wang *et al.*, 2013; Xiao *et al.*, 2013), visibility (Wei and Wang, 2010), agility (Ngai *et al.*, 2011), and system modularity (Xue *et al.*, 2013). Unfortunately, these studies have not paid close attention to the Chinese context. For example, when examining manufacturing firms in Taiwan, Wang *et al.* (2006) showed that environmental uncertainty tends to motivate manufacturers to increase their manufacturing flexibility, in which both virtual integration and supplier responsiveness play a vital enabling role. It was a limitation of this study that the impact of Taiwanese management contexts on the findings was not discussed.

There are five papers each in the three themes of knowledge management, IT outsourcing, and the economics and value of IS. First, in knowledge management, two studies aimed to develop generalizable theories (Teo and Men, 2008; Wu and Hu, 2012), whereas the other three papers examined the influence of unique Chinese socio-cultural factors on knowledge management in using IS. Specifically, Huang *et al.* (2011) focused on the impact of trust, guanxi orientation and face, on employees' intentions to share knowledge in Chinese firms. Davison *et al.* (2013) found that interactive IT tools support informal knowledge sharing by enhancing the guanxi of knowledge workers and by sustaining a robust transactive memory network. Young *et al.* (2012) revealed that the capabilities for surveillance inherent in a web-based knowledge management system severely limited knowledge sharing. Second, since China is a destination for IT outsourcing, research on the theme of IT outsourcing in China has mostly focused on vendors (Jarvenpaa and Mao, 2008; Abbott *et al.*, 2013; Su, 2013), unlike studies based on Western contexts. Third, with regard to the value of IS, researchers often focused on IT governance (Xue *et al.*, 2008), or on the impact of IS on organizational resources and capabilities (Zhang *et al.*, 2008, 2013; Wang *et al.*, 2012) in Chinese firms. Some studies tested the value realization of IS in different cultural contexts, but found no significant difference. For example, Zhang *et al.* (2013) reported a strong positive role of IT capability on the

performance of born-global firms. They found the cultural difference between Chinese and US born-global firms was not a factor for developing IT capability.

IS in the Chinese public sector was an emerging theme, with only three papers, all published in 2010–2013. They were heavily related to the Chinese context, concerning the Beijing Olympic Games (Yang *et al.*, 2012), the outbreak of severe acute respiratory syndrome in 2003 (Chen *et al.*, 2011), and the highly hierarchical structure of the Chinese government (Zheng *et al.*, 2013). Moreover, given the large number of multinational firms operating in China, research efforts on their localization of IS management in China are surprisingly low. A few exceptions are reflected in the theme of global IT (Westrup and Liu, 2008; Heikkilä, 2013). In addition, the themes of IS success (Wang, 2008) and the role of top management (Tai and Phelps, 2000) in Chinese firms are understudied, as in Western contexts.

e-Business

The 11 papers on e-Business in our sample fall into two themes. First, given the importance of user experience for e-Business, a great deal of effort has been directed to the themes of personalization (Tam and Ho, 2005, 2006; Liang *et al.*, 2007) and website design (Hong *et al.*, 2004; Cyr, 2008; Sia *et al.*, 2009) in China. Second, in recent years, research interests seem to have shifted to generic online consumer behaviors (Lee *et al.*, 2003; Lim *et al.*, 2006; Dou *et al.*, 2010; Avgerou and Li, 2013; Lu *et al.*, 2013). However, research to date has for the most part neglected unique phenomena in China, for example, the dominance of TaoBao with over 90% of the C2C market and the lack of quality online book reviews in online bookstores.

Social media, digital collaborations, and group support

There are 13 papers in this stream, of which IT-based collaboration and communication in China have presented as a popular theme of research (Bajwa *et al.*, 2005; Shih, 2006; Lee and Panteli, 2010; Shen *et al.*, 2010; Zhang *et al.*, 2011; Bell *et al.*, 2012; Zhang and Wang, 2012). With about one-fifth of the world's population and six of the world's largest online social networks in mainland China, research on social networks and virtual communities in this region has resulted in only few publications in mainstream IS journals (Zhang and Watts, 2008; Shi and Whinston, 2013). In addition, there were only two publications on group support systems (Davison and Vogel, 2000; Kwok *et al.*, 2002) and on group decision-making in China (Zhang *et al.*, 2007; Lowry *et al.*, 2010), respectively.

Industrial and societal issues in IS

The 16 papers in this research stream fall into four categories, as shown in Table 6. One of the themes is ethics. Software piracy is of global concern, especially in China. Therefore, it has received a great deal of research attention (Moores and Chang, 2006; Davison *et al.*, 2009; Pykäläinen *et al.*, 2009; Chan and Lai, 2011; Xu *et al.*, 2012). Moreover, Martinsons and Ma (2009) examined information ethics issues and the stages of moral development. Their research revealed significant differences in information ethics between three generations of Chinese people. The generation gaps suggest that events such as the Cultural Revolution, the Open Door Policy,

and the One-child Policy have shaped the information ethics of Chinese managers.

Several studies examined various aspects of the Chinese IT industry (Damsgaard and Truex, 2000; Lee and Oh, 2006). For example, drawing upon actor-network theory, Gao (2005) analyzed the socio-technological development of China's strategy for telecommunications market transformation. Gao (2007) investigated China's experience of developing and deploying wireless local-area network standards. On the basis of China's telecommunications market transformation over the past two decades, Gao and Lyytinen (2005) outlined the features of information infrastructure development strategy, the social determinants for a country to choose a strategy and the principles of its design.

Information privacy and security is an issue all over the world, especially in China. Therefore, it is not surprising that it has received a fair amount of research attention (Hsu, 2009; Lowry *et al.*, 2011; Hong and Thong, 2013). Remarkably, although national culture is a key aspect of the Chinese context, there exist few empirical studies on this theme. We found only the following two exceptions. Martinsons (2008) examined the distinctive challenges to e-Commerce in China, and explained how the lack of dependable rules encouraged *guanxi* and relationship-based commerce. He concluded that personal trust, contextual and informal information, and blurred boundaries between business and government have shaped e-Commerce in mainland China. Fang *et al.* (2011) compared the effect of national culture on the rapid IT advances between IT organizations in China and the US, and found that Chinese IT organizations employed coping mechanisms more extensively than their US counterparts, such as vendor support, education and training, and internal procedures.

General observations on the five streams of IT research in China

Some general observations can be drawn from the review of the 115 papers on IT in China. First, among the 36 papers in the human behaviors in IS adoption and use stream, the 23 papers grouped under the theme of IT acceptance, adoption, and use accounted for 20% of the entire sample. The publication quantities grew from four papers in 2000–2004, to seven in 2005–2009, and 12 in 2010–2013. This increasing trend is inconsistent with Sidorova *et al.* (2008), who reported the drastic decline in publications in this theme since 2000 as compared to that during 1997–2001. This sharp contrast in findings can be interpreted in two ways. On the one hand, it appears that Chinese IS research has followed the mainstream, but lags at least 5 years behind. In particular, the critique on TAM-related research by Benbasat and Barki (2007) has not had a significant impact on Chinese researchers. On the other hand, it could also be seen as an effort to compensate for the lack of research in this area in the previous decade, which has left room for scholars to make contributions in this area.

Second, themes in the IS management stream are thinly scattered. Although few papers were published in themes such as the role of top management, IS success, and global IT, research in these areas is closely associated with distinctive Chinese features. For example, Zuo *et al.* found that 74% of CIOs were positioned at the functional head level beyond the executive circle, and they were usually more than one level lower than top management, which severely limited their

impact in a high power distance society such as China (Zuo *et al.*, 2008). Similarly, what determines the success or failure of IS implementation and use in China may differ substantially from the generally accepted success factors in highly developed economies (Roztocki and Weistroffer, 2011), because of the contextual differences between Western organizations and Chinese ones, such as cultures, government regulations, environmental turbulence, and organizational readiness for IS (Ping and Grimshaw, 1992; Lu and Heng, 2009; Roztocki and Weistroffer, 2011). It is expected that more research on such Chinese-specific IS management phenomena will be published in the leading IS journals in the near future.

Third, in keeping with the rapid penetration of e-Commerce into society, research interests surged on online consumers, customer services, website design, personalization, and privacy. This finding is in line with Sidorova *et al.* (2008) reporting on quantities of publications on e-Commerce during 2002 and 2006. However, this stream is still understudied, as reflected in the least amount of studies (11 papers only) among the five streams, in light of the booming e-Commerce market and innovative services such as Internet finance in China (*The Economist*, 2014). We particularly lack understanding of the characteristics of the Chinese e-Commerce sector as shaped by local consumer behaviors, and the social and cultural context.

Fourth, research themes related to social media, digital collaborations, and group support evolved around IT and groups, with a relatively small number of publications (13 papers). This observation is consistent with the finding that themes on IT and groups have become less prominent in IS research (Sidorova *et al.*, 2008). However, the collaboration and communication theme received increasing attention in 2005–2013.

Last, with regard to industrial and societal issues in IS, research on the theme of IT and culture is thin, with only two papers in the sample (Martinsons, 2008; Fang *et al.*, 2011). However, this does not mean there is a lack of interest in the cultural and organizational context. In fact, several papers in the other 21 themes investigated Chinese contextual factors either as independent variables (e.g., Chan and Lai, 2011) or moderating variables (e.g., Sia *et al.*, 2009), or as a subject of rich description through qualitative research (e.g., Liang and Xue, 2004).

A comparison with two other reviews

Here we contrast our findings with two comparable reviews published in Chinese journals. Specifically, Lu *et al.* (2009) reviewed 36 IS international journals and four major international conferences published in English between 1998 and 2007. Zheng *et al.* (2006) reviewed publications in leading Chinese journals, including 20 'key journals' designated by the Department of Management Sciences, National Natural Science Foundation of China, and five additional journals that were key IS publication outlets during 2003–2004. Table 7 lists the top 12 themes in each review. These two reviews' coverage of journals, sample of research, and time frame are different from ours. Nevertheless, a comparison may lead to useful insights into the trends of research and publications on IT in China.

Some of our observations are corroborated by these reviews to some extent. For example, knowledge management consistently

Table 7 Comparison of top 12 research themes in the three previous reviews

Order	<i>This study</i>		<i>Lu et al. (2009)</i>		<i>Zheng et al. (2006)</i>	
1	IT acceptance, adoption and use	20.0%	Internet-related	27.2%	e-Commerce	12.6%
2	IS implementation and assimilation	7.8%	Enterprise systems	15.4%	Web technologies	6.6%
3	IS development and project management	7.0%	IT management	12.4%	ERP	6.3%
4	Supply chain management	7.0%	IS design and development	8.6%	Data storage, retrieval, and transmission	5.3%
5	Collaboration and communication	6.1%	ICT adoption	7.4%	DSS/GDSS	4.7%
6	Personalization and web site design	5.2%	Mobile IT-related	6.8%	Knowledge management	4.5%
7	Ethics	5.2%	Social and cultural	4.3%	IS value and assessment	3.8%
8	Knowledge management	4.3%	IS discipline	3.1%	Supply chain management	3.3%
9	IT outsourcing	4.3%	Knowledge management	2.5%	e-Government	3.3%
10	Economics and value of IS	4.3%	IT personnel	2.5%	IS development	3%
11	e-Commerce	4.3%	e-Government	1.2%	Business process reengineering	3%
12	Industry and standards	4.3%	IT outsourcing	1.2%	N/A	

appears in the top 6–10 themes. Moreover, ERP-related research is among the most popular themes in the reviews. The IS implementation and assimilation, and IS development and project management themes roughly correspond to enterprise systems, and IS design and development in Lu *et al.* (2009) and ERP and IS development in Zheng *et al.* (2006), respectively. However, inconsistencies in the three reviews are more intriguing and worth noting. First, e-Commerce and Internet-related research are at the top of both lists by Zheng *et al.* (2006) and Lu *et al.* (2009), but it does not make the top five in our sample. This difference supports our belief that research on e-Commerce in China has significant growth potential for publications in high quality IS journals. Second, both the decision support system and group decision support systems (DSS/GDSS) theme and business process re-engineering theme only appear in Chinese journals reviewed by Zheng *et al.* (2006). This suggests that these themes are no longer pursued by leading IS scholars, and are out of favor in high quality IS journals, as found by Sidorova *et al.* (2008). Last, social and culture analysis and IT personnel appear only in Lu *et al.* (2009), which covers a much broader sample of 36 journals and four conferences whereas similar themes of IT and culture, and the role of top management did not appear in the top 10 themes. This discrepancy means that these topics are interesting to researchers of IT in China, but existing studies have not reached the quality standards of top journals.

Contextualization in research of IT in China

According to Tsui, 'contextualization means incorporating the context in describing, understanding, and theorizing about phenomena within it' (2006: 2). It is central to the understanding of organizational phenomena (Johns, 2006; Whetten, 2009), and has been a key factor in conducting indigenous research in China (Tsui, 2006). In IS research, the need to account for contextual effects in non-Western countries (especially in China) has been recognized by several scholars in recent years (Walsham *et al.*, 2007; Davison *et al.*, 2008;

Davison, 2010). In this section, we analyze the 115 papers from two perspectives: what contextual factors were investigated in relation to IT in China, at the national and social, organizational, and individual and interpersonal levels and, how was contextualized research conducted?

Contextual factors related to IT in China

National and social context

The distinct national and social contexts of China have been taken into consideration in research on IT in China. Some studies adopted Hofstede's cultural framework (2001) to evaluate the impact of the Chinese cultural context on IS. For example, individualism/collectivism was used as an independent variable for examining differences in majority influence between a highly collective culture in China and a highly individualistic culture in the USA, in the scenario of IT-facilitated group decision-making (Zhang *et al.*, 2007). Highly collectivist Chinese users frequently used the Internet for social communication, in contrast to highly individualist Americans who used the Internet for information searches (Cyr, 2008). According to Xue *et al.* (2011), Chinese people have low uncertainty avoidance, and thus need a high degree of justice to be motivated to action. Fang *et al.* (2011) explored the influence of national culture on IT changes in a cross-culture comparison between China and the USA. Lowry *et al.* (2011) explored the influence of culture on information privacy concerns and the desire for online interpersonal awareness, which in turn affected self-disclosure behavior in instant messaging use. In addition to Hofstede's framework (2001), the influence of Confucian ideology on management has also been examined. Confucian ideology emphasizes personal responsibility, duty, encouraging docile behaviors, and avoidance of challenging one's superiors. The effect of such an ideology on IT professionals' ethics was examined (Davison *et al.*, 2009).

Second, government policies and regulation concerning IT diffusion and strong government involvement in IT are considered in studies on IT in China. For example, due to the

Table 8 Approaches to contextualization

<i>Approaches</i>	<i>Number of papers</i>	<i>Typically contextualized papers</i>
Rich description	32	Abbott <i>et al.</i> (2013), Gao (2005, 2007), Gao and Lyytinen (2005), Heikkilä (2013), Hsiao (2003), Jarvenpaa and Mao (2008), Lee and Oh (2006), Liang and Xue (2004), Pykäläinen <i>et al.</i> (2009), Su (2013), Westrup and Liu (2008), Young <i>et al.</i> (2012)
Direct observation and analysis of contextual effects	8	Chan and Lai (2011), Chang <i>et al.</i> (2008), Huang <i>et al.</i> (2011), Ke <i>et al.</i> (2012–13)
Comparative studies	12	Bajwa <i>et al.</i> (2005), Cyr (2008), Davison <i>et al.</i> (2009), Fang <i>et al.</i> (2011), Lowry <i>et al.</i> (2010), Lowry <i>et al.</i> (2011), Sia <i>et al.</i> (2009)
Total	52	

centralized power structure and the legacy of a central-planning economy, government at different levels often mandates the adoption of ERP systems (Liang *et al.*, 2007). The weak legal system for protecting intellectual property led to a software piracy rate as high as 80% in 2008 (Chan and Lai, 2011), which presents a unique research opportunity for IS scholars (e.g., Moores and Chang, 2006; Pykäläinen *et al.*, 2009; Chan and Lai, 2011). Moreover, for political reasons, Wikipedia is often blocked in China and Google search is censored by the government. The operation of these two technologies depends on the collaboration between the IT service users and suppliers residing in mainland China and overseas, respectively (Zhang and Wang, 2012). These two cases are ideal for us to understand the influence of the political context on IT business models.

Third, institutional factors play significant roles in shaping Chinese IS practices. As pointed out by Heikkilä (2013), several aspects of the Chinese institutional environment has had an effect on the adoption and use of e-HRM systems, including the dramatically changing regulatory context, a strongly hierarchical structure as part of the institutional environment, and the normative institutional context. A theoretical framework was proposed for electronic markets in China, influenced by the lack of a universal set of rules, and *guanxi* and relationship-based commerce in China (Martinsons, 2008). External uncertainty also influences the business-IT fit (Chang *et al.*, 2008).

Fourth, prior research has paid close attention to the transitional characteristics of China. These contextual factors include ongoing reform, a market structure in transition, the catching up in technology etc. For example, studies of the telecommunications market in China often focus on the effect of China’s accession to the WTO, changes in relevant industry standards, industrial evolution, and the reform of the regulatory system (Gao, 2005; Gao and Lyytinen, 2005; Lee and Oh, 2006; Gao, 2007). China’s unique market structures determine Chinese firms’ strategy for offshore IT outsourcing. As late-comers in the developed market overseas, Chinese vendors usually undertake a sub-contractor’s role (Jarvenpaa and Mao, 2008). On the other hand, in the onshore outsourcing market embedded in an emerging economy, many client firms are in the stage of developing large-scale complex IT systems from scratch, and thus often adopt a full life-cycle outsourcing model including consultancy, business analysis, design, implementation, testing, support, and maintenance (Su, 2013).

Last, with offshore IT sourcing as a study subject, the Chinese market is challenging to Western clients due to language barriers and cultural issues, but Chinese vendors enjoy significant advantages in working with Japanese clients because of the similarity in their written languages, geographic proximity, and a greater degree of cultural compatibility (Qu and Brocklehurst, 2003). A distinct feature of the China–Japan outsourcing market is a mediated offshore development model, in which a Japanese IT firm becomes the top tier vendor taking the contract and outsourcing low value-added work to Chinese vendors (Jarvenpaa and Mao, 2008; Su, 2013).

Organizational level

Only a small number of papers in our sample investigated the effect of organizational-level contextual factors on IT in China. Information is often seen as a personal asset rather than an organizational resource (Martinsons and Westwood, 1997), and thus IT investment tends to be directed to infrastructure for monitoring and control and for selective dissemination of management guidance. Under such an organizational condition, CEOs and CIOs are likely to have different cognitive views of IT (Tai and Phelps, 2000). Knowledge management is conducted in informal ways and through personal contact as opposed to formal documentation (Teo and Men, 2008). Chinese firms often do not have a CIO or CIO equivalent position in the top management team, and the IT function is usually managed by middle-level managers or executives with other primary responsibilities (Liang *et al.*, 2007). Imported from the West, ERP systems face challenges for their usage in Chinese firms. Research on ERP implementation gives explicit recognition to the Chinese organizational context (Liang and Xue, 2004).

Individual and interpersonal context

Several aspects of individual and interpersonal-level factors were identified, such as *guanxi*, face, and high-context communication (e.g., Zhang *et al.*, 2008). *Guanxi* in particular is a widely existing special form of interpersonal interaction among Chinese, emphasizing family ties, reciprocity, and face. It is generally believed that in a *guanxi*-oriented society, people tend to adapt to the environment rather than attempt to change it. Business is influenced by paternalism, personalism, and high-context communications, whereas individualism, impersonalism, and formal communications were highlighted as characteristics of Western culture (Liang and

Xue, 2004). From a guanxi perspective, Hsiao (2003) explored technology fears arising from mistrust, which is rooted in how a society's socio-cultural structure affects economic activities. Moreover, face is one's situated identity, reflecting a Chinese person's deep psychological structure. In a highly collectivistic culture as China, face is not only personal but also collective. The concept of face has been applied to analyzing IS practices in China, for example, intention to share knowledge in knowledge management research (Huang *et al.*, 2011; Young *et al.*, 2012). Both guanxi and face are considered important in China's IT outsourcing industry and client management literature (Abbott *et al.*, 2013).

Approaches to contextualization

According to Rousseau and Fried (2001), there are three approaches to examining a contextual effect, including (1) rich description, that is, to discover the effect of the context on the definition of variables, extent of variation, and relationship between variables, (2) direct observation and analysis of contextual effects, which can directly explore the effect of context on actors, and actors' influence on other actors and groups, and the firm, and (3) comparative studies, that is, contrasting significant institutional and cultural differences of phenomena. On the basis of Rousseau and Fried's framework, we analyzed all 115 papers, and identified 32 papers that were contextualized through rich description, eight papers through direct observation and analysis of contextual effects, and 12 through comparative studies. Some representative ones are shown in Table 8.

First, rich description informs reflection on the role that context plays in influencing the meaning, variation, and relationship among the variables under study (Rousseau and Fried, 2001). Researchers can provide detailed descriptions by focusing on the setting of IT practices, which include describing the organizations under study, their geographic location, history, organizational structure, and other contextual factors relevant to the phenomena. For example, Liang and Xue (2004) employed a single-case approach to explore how vendor activities can improve ERP implementation success in the context of China's ERP market. They described the unique setting of UFSOFT, a Chinese domestic ERP vendor, in great detail, such as its growth history, market share, major products, and target customers.

Second, when contextual factors are an integral part of the theory, researchers can directly address the impact of the setting on IS practices. For example, Huang *et al.* (2011) examined the impact of some China-specific constructs, such as guanxi orientation, face gaining, and face saving, on employees' intention to share knowledge in Chinese firms.

Third, researchers can contextualize their study by examining phenomena across settings that have powerful

institutional and cultural differences (Rousseau and Fried, 2001). For example, Sia *et al.* (2009) conducted a cross-cultural study in Hong Kong (collectivistic culture) and Australia (individualistic culture), and found that website designers should take into consideration the cultural characteristics of prospective customers to increase trust, as different trust-building web strategies have different cost implications.

By examining the approaches to contextualization, we find that most of the studies in our sample (63 out of 115 papers) tend to be under-contextualized. They aim to extend or generalize theories developed in the West, without any attention to Chinese contextual factors. We believe that contextualized research on IT in China is increasingly important, at the national, organizational, and individual levels. Greater contributions can be made by conducting contextualized research starting from research design, selection of research phenomena, theory development, instrument validation, and selection of research methods.

Conclusions and discussion

Trends of research on IT in China

Overall, our findings show that over the past 4 years, research on IT in China has received far greater attention than in the first decade of the new millennium, and Chinese scholars (especially those in mainland China) have established a major presence in the international IS community. Our findings also highlight key issues about IT in the Chinese context. For example, some themes such as IT acceptance, adoption, and use lag behind mainstream IS research overseas, whereas other themes (e.g., electronic commerce) are understudied. The general patterns of Chinese IS research themes provide references for identifying areas for future research.

In particular, we identify three levels of China-specific contextual factors and three approaches to contextualization in research of IT in China. The national and social-level contexts, such as national culture, policies and regulations, and institutional and transitional characteristics, have received the most attention. The inclusion of contextual factors such as guanxi and face in research suggests that Chinese IS phenomena can be better understood in their local context, for example, with the help of indigenous constructs. However, most of the research in our sample was not contextualized. Researchers adopted existing constructs, arguments, or theories directly applied to China without any attempt at contextualization or related theoretical modification.

Further directions – a call for greater contextualization

To facilitate contextualized research on IT in China, we propose a research framework as shown in Figure 1, which

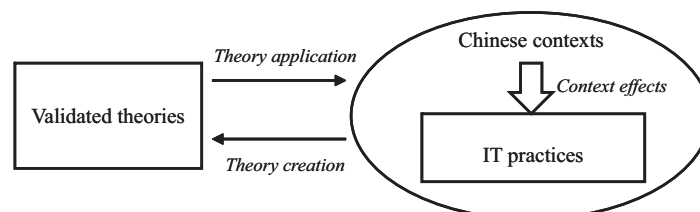


Figure 1 A framework for contextualized research on IT in China.

we hope may serve as guidance for future research. It considers two forms of contextualization, theory application and theory creation. This framework is inspired by prior literature on contextualization in Chinese management research (Whetten, 2009). Whetten (2009) classifies two ways to make cross-context theoretical contributions: contributions *of* theory and contributions *to* theory. The former involves the use of accepted theory to guide a scholarly investigation, and the latter includes formulations of new theory as well as improvements in existing theory (Whetten, 2009). Our framework follows this argument. The method of theory application corresponds to Whetten's (2009) contributions of theory, and the method of theory creation corresponds to contributions *to* theory. Next we will elaborate these two approaches in detail.

Applying validated theories to understanding IT practices in China

As shown in the sections 'Overview of research on IT in China' and 'IT themes in China research', the majority of prior studies on IT in China did not involve any Chinese contextual variables. They aim to contribute to IS research by reinforcing the generalizability of existing theories or extending the theories' boundaries. However, Western theories may not be appropriate, and it will not be sufficient for researchers merely to replicate Western studies in China (Davison *et al.*, 2008; Barney and Zhang, 2009). Future research on IT in China should embrace distinct Chinese contextual factors when applying existing theories to develop research models. As shown in our framework, contextual effects are central to the understanding of Chinese IT practices. A set of Chinese contextual factors surrounding IT practices will exert direct or indirect influence and act 'as explanatory factors associated with higher levels of analysis than those expressly under investigation' (Whetten, 2009: 31). To investigate such influences, researchers may examine context effects in the following two ways when applying existing theories to understanding IT practices in China.

First, contextual factors can be used to explain why a particular IT practice takes place, and which contextual factors lead to observed differences in IT practice between China and the West. With this approach, contextual factors are adopted as antecedent variables. Through identifying contextual variables that may provide meaningful predictions of certain IT practices, researchers may make theoretical contributions by 'theorizing about context' to create context-effects theories (Tsui, 2009; Whetten, 2009). Exemplary research in our sample of papers includes Chan and Lai (2011), Huang *et al.* (2011), Lowry *et al.* (2011), and Davison *et al.* (2013).

Second, contextual factors can be used to reveal under what conditions a certain effect would occur, and in what ways. With this approach, contextual factors are adopted as moderators. Particularly, the use of the distinct Chinese context as a moderating variable helps address whether existing theories' influencing mechanisms have the same effect for IT practices in China as they do in the West. Therefore, through the exploration of differential effects of existing theory in Chinese and Western IT management contexts, the theory is contextualized, and its boundary is extended, resulting in context-embedded theories (Tsui, 2009; Whetten, 2009). One of the examples from the review is Sia *et al.* (2009), who examined the moderating effects of individualism-collectivism, and found that this cultural context alters the relationship between

portal affiliation and trusting beliefs, and peer customer endorsement and trusting beliefs.

When applying an existing theory to Chinese IT practices, researchers can also make the theory more context-sensitive by modifying the measure of related constructs to satisfy the requirement of construct validity (Tsui, 2006). Although the back-translation approach is a well-accepted guide to research on IT in China, more serious attention to contextualization is desirable for valid measurement. Methods for contextualization in measurement include identifying locally meaningful indicators of prevalent constructs and indigenizing the definition of the construct (Tsui, 2006).

Development of new theories based on IT practices in China

Given China's unique national, social, organizational, and interpersonal contexts identified in section 'Contextualization in research of IT in China', there is a need for more theory-building studies and fewer simple applications of Western theories (Tsui, 2006). Theory creation focuses on creating explanations for IT practices that are uniquely Chinese. This approach responds to Davison *et al.*'s call for 'more emic IS research in China' (2008: 329). Such research contributes to IS knowledge by introducing new concepts that are unique to the Chinese context, examining new relationships between indigenous concepts, or elaborating theoretical logics that are developed from or embedded in the Chinese context (Jia *et al.*, 2012). In addition, indigenous theory creation is a superior path to meet the relevance criterion (Tsui, 2009). It would focus on managerial and social prescriptions addressing meaningful local IS-related management problems.

We recommend that IS researchers, especially qualitative ones, take an inductive grounded theory-building approach (Glaser and Strauss, 1967; Strauss and Corbin, 1998) when developing an indigenous theory based on Chinese IT practices. Grounded theory has proved to be highly useful in developing context-based descriptions and explanations of IS phenomena (Urquhart *et al.*, 2010). It allows for the emergence of original and rich findings that are closely tied to the data. Similar to the grounded theory development approach, Cheng *et al.* (2009) also offer a full-cycle indigenous research process for developing a Chinese theory of management, including the following steps: profound knowledge about Chinese traditions, discovery of interesting phenomena, field observation, construction of the theoretical framework via cultural analysis, empirical examination of the theory, and theory refinement. It should be highlighted that, when applying a grounded theory approach, researchers must have enough knowledge of Chinese social and linguistic norms and high levels of cultural sensitivity as the basis for theory-building about Chinese IT practices (Davison, 2010).

Contributions and limitations

This paper makes two contributions to the field. First, our review reveals core research themes, their evolution, and pays attention to the unique contextual factors of China, which provide guidance and reference for future research on IT in China. Second, whereas prior research has discussed the effect of Chinese culture on IS management (e.g., Martinsons and Westwood, 1997), no prior literature review has adopted this perspective to contextualized IS research on China. Therefore, this review is intended to draw broader attention not only to

IS research on China, but also to stimulate contextualized research for greater theoretical contributions. To this end, a research framework is proposed. The main limitation is that our narrow focus on the 'Senior Scholars' Basket of Journals' limited the size of our sample, though it ensured higher quality and representative mainstream research. Moreover, the data analysis involves considerable qualitative judgment. Therefore, it might be desirable to verify our findings through a larger sample including high quality conference proceedings.

As Davison *et al.* (2008: 325) recognized, 'attempting to summarize current research and practice on as broad a topic as IS and in as large and diverse a country as China is an ambitious undertaking.' Nevertheless, this review has moved one step further by showing trends in research on IT in China over the past 14 years, offering a reasonably comprehensive profile and insight into the latest developments. We hope this effort will stimulate and guide future research on IT in China.

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Appendix: The 115 papers in the 'Senior Scholars' Basket of Journals'

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