Communications of the Association for Information Systems

Volume 30 Article 24

6-2012

IT Innovation in China: Industry and Business Capabilities

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Abstract:

China is investing heavily in leading-edge and innovative information technologies to support its continuing economic growth. At the same time, Chinese businesses increasingly need to innovate with IT to create competitive difference and expand internationally. However, to what extent has China developed the capabilities to develop IT innovations and adopt them successfully? This 2011 ICIS panel session built a rich picture of maturity, skills, and management processes concerning IT adoption and innovation, bringing together diverse perspectives from research and practice. By drawing on experience from Europe and the U.S., as well as China itself, it also reflected on distinct aspects of the Chinese business environment and the impact of these on IT.

Keywords: IT innovation, IT strategy, interdisciplinary IS scholarship, practice IS scholarship; international context of study

Editor's Note: The article is based on a panel presentation at the International Conference on Information Systems, held in Shanghai, China, December 2011.

Volume 30, Article 24, pp. 413-422, June 2012

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I. INTRODUCTION

Since the start of its economic reforms in 1979, China has been undergoing a process of rapid economic development, with GDP growth averaging 10 percent per year during this period. This has been supported by its accession to the World Trade Organization and subsequent integration into the world economy. As part of its strategy to drive economic growth, the Chinese government has emphasized the importance of IT through its 'informatization' strategy, investing heavily in IT infrastructure and new information technologies in the process.

In order to develop its economy further and foster higher-value activities, China is aiming to shift its economic focus from manufacturing to services. Chinese businesses are also looking to compete and expand their operations internationally. In this environment, IT will become an increasingly important tool, and the need for effective and innovative use of IT will grow. However, to what extent has China developed the capabilities to develop and adopt IT innovations successfully?

This panel session at ICIS 2011, organized by ICAEW,[1] aimed to share knowledge between the panelists and the audience on an important topic which currently has limited understanding, especially outside China. Taking advantage of ICIS's location in Shanghai, the panel brought together a wide range of experience from research and practice to consider China's capabilities for successful innovation with IT in the future and reflect on lessons from China's massive IT investment to date.

Background

It is well established that Information Technology (IT) has become an important contributor to the economic success of a country, as well as individual firms (e.g., Brynjolffson and Hitt, 2003; Jorgenson, 2001; Kohli and Grover, 2008). Accordingly, for many years the Chinese government has recognized the importance of IT and invested heavily to enable the 'informatization' of the economy and government. This has included a variety of important infrastructure projects, often termed *Golden projects,* such as the Golden (Bank) Card project, Golden Customs project, and Golden Bridge project. These projects typically focus on building network infrastructures, implementing systems to protect government revenues, and establishing core systems which support social and economic development (e.g., Liang, 2006). This investment has been reflected in China's climb up the rankings of the World Economic Forum's Network Readiness Index, where it improved from 59th in 2006 to 36th in 2010–2011 [World Economic Forum, 2011].

The government continues its investment strategy in the twelfth five-year plan (2011–2016) where it defines *new generation information technologies,* such as RFID and cloud computing, as one of its seven strategic industries for investment. It plans investment in these seven industries of RMB 11–14 trillion (US$ 1.75–2.2 trillion) over the course of the plan. Furthermore, two of the other key themes of the plan, investment in sustainable technologies and the increasing urbanization of the population, have substantial implications for IT infrastructures and applications.

The government also aims to shift the focus of the economy from manufacturing to services, with Chinese businesses servicing the rapidly increasing consumer market in China, as well as international markets. Increasing domestic innovation is central to these aims.

To support this change, China has greatly increased its focus on research and development activity around technology. Spurred by the implementation of incentives for patent registration, China became the most prolific patent filer in the world in 2011 [Thomson Reuters, 2011]. However, successful innovation goes beyond the development of new pieces of intellectual property or the registration of new patents.

The process of innovation can be divided into three broad phases—the invention of a new product, technology, or process, the translation of the invention into a usable and potentially commercial form and the widespread adoption and diffusion of the innovation. Within each phase, there has been substantial research on the organizational capabilities that can support innovation as well as external and institutional factors which can contribute to success (e.g., Rogers, 1995; Zhu et al., 2006; King et al., 1994).

[1] Institute of Chartered Accountants in England and Wales

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As a result, the panel session considered two distinct but related sets of capabilities concerning IT innovation:

- Innovation within the supplier sector, and the extent to which software and IT services businesses are developing new products and services. Therefore, the panel session firstly assessed the innovation capabilities of the Chinese software industry.
- Innovation within businesses which buy and use software and services. Therefore, the panel session went on to explore the IT capabilities of Chinese businesses.

The final part of the discussion considered the extent to which evolving businesses practices and barriers to innovation were unique to China or whether they simply represented the early stages of IT adoption.

This approach enabled the panel to provide an overview of a variety of research areas, while also drawing out some key themes with significant implications for research and practice.

Panel Participants

The panel session was based on a dialogue between research and practice. In order to build a rich picture of innovation in China, panelists were selected to bring diverse perspectives, incorporating geographical and disciplinary differences. Robert Hodgkinson, ICAEW, moderated the session and the five panelists were:

- Professor Anyu Lee, who focused on R&D and innovation in the technology sector in China
- Professor Ji-Ye Mao, who focused on the organizational aspects of IT innovation
- Professor Neale O'Connor, who focused on the broader business environment, based on his research around management controls in multinational businesses in China
- Ning Wright, KPMG, who outlined her experiences of the adoption and management of IT by Chinese businesses and the growth of the IT industry in China
- Jerry Zhang, Shinetech Software Inc, who shared his experiences of growing a technology business in China, competing internationally, and serving the Chinese market.

Brief background statements can be found about each panelist at the end of this article. Although Lee was not able to attend the session in person, we reflect his comments and views in this article.

Each section of discussion was led by comments from an academic and responded to by a business representative.

II. INDUSTRY CAPABILITIES

Existing research suggests that the Chinese software industry is still in the early stages of development (e.g., Lacity et al., 2010). Domestic suppliers are typically fragmented by industry, with high degrees of concentration in each sector. Suppliers tend to focus on hardware and infrastructure services rather than applications [Carmel et al., 2010]. Software companies also typically focus on the domestic market, and there are few businesses that can compete internationally.

This reflects the early emphasis in Chinese growth on manufacturing models, and, as with other sectors of the economy, the government is aiming to grow the IT services sector and increase domestic innovation. But how well-positioned is the software and services sector to respond to this challenge?

The first panel discussion explored the maturity of the software industry in China and the potential for it to deliver innovative products and services to Chinese businesses.

What Are the Capabilities of Chinese Software Suppliers in Developing Innovative Products and Services?

Lee led the comments on the first discussion. He argued that current strategies based on 'copy and follow' would not lead to world-class suppliers, and that innovation, particularly in applications, was crucial for the development of Chinese market leaders. Given the rapid growth in the size of the Chinese software market, Lee suggested that investment by suppliers was necessary in order to build their share of the market.

All panelists made an important distinction between different markets. The B2C consumer market was generally seen to be promising, with significant amounts of innovation already taking place. Given the fast take-up of mobile

technology by Chinese consumers and the potential size of social and business networks, the prospects for Chinese software businesses in this area were generally seen as positive.

By contrast, the B2B market was described as far more challenging. Lee outlined how this market is fragmented, with no world-class suppliers on the horizon. Suppliers typically compete very aggressively on price rather than quality, driving down the quality of products in the process. Furthermore, most customers have low technical capabilities. This creates few incentives for suppliers to develop more innovative or higher-quality products, and, as a result, Lee saw the gap between Chinese suppliers and world-class suppliers actually increasing in some cases.

Despite these challenges, he suggested that there were some encouraging signs, especially around human resources. There are many young software developers who are well-trained, highly motivated to learn, and still relatively cheap by international standards. However, these developers are typically still inexperienced, and Lee highlighted the lack of a technical career path, with the established career path largely managerial in nature.

In response, Zhang agreed with many of Lee's points and outlined the difficulties he faces in finding developers with the appropriate skills for his software business. Based on his experience, young developers typically have a narrow perspective centered on what they had learned in college. They also have limited business understanding and often do not work in a particularly collaborative manner. These factors make it difficult for young developers to work in an innovate manner.

He also highlighted a couple of aspects which could be seen as more cultural and which potentially discourage the growth of innovative software businesses. First, he suggested that it is very common in China for staff to want to be the CEO of their own business rather than be an employee. This makes it particularly hard to manage, retain, and develop talent and thereby grow a business. He also highlighted the strong focus in many Chinese businesses on generating profits. Inevitably, innovation has risks attached to it, and the resulting products or services may not make money. He suggested that this was a further barrier to innovation in the Chinese software sector.

In questions from the audience, it was argued that demand and competition were the core drivers of innovation. If there was little demand from businesses for innovative software, it was hard to see why suppliers would look to innovate.

The panel agreed with this point and highlighted some of the factors which limit business demand. Wright, for example, suggested that most Chinese businesses want simple solutions to meet simple business needs. Even if there is diversity and competition, she believed that many solutions will continue to be over-engineered and unlikely to succeed in the market.

III. BUSINESS CAPABILITIES

The first part of the panel discussion confirmed the link between the maturity of the software industry and the demands of the market. The second part of the session went on to explore the IT capabilities of Chinese businesses in more detail and the way that these shape market demands.

Generating value from IT systems is a long-standing challenge for businesses, as the value from IT systems is not intrinsic but rather comes from their use and integration into business practices [ICAEW, 2008]. Therefore, it is not purely a technical task but requires a wide range of organizational capabilities and resources. Management can develop a variety of governance and general business processes to assist in this task. However, success here is also frequently driven by the skills and knowledge of staff regarding the alignment of IT and the business.

While formal education and training may play an important role in developing skills, learning within the business environment and sharing knowledge across businesses is also likely to be important. Staff working for foreign multinationals may find a range of opportunities for external influence and cross-organizational collaboration within their working environment. They may also be able to rely on experienced foreign nationals or Chinese returning from overseas to fill middle and senior management roles. It may be more challenging for Chinese businesses to develop these skills and build the breadth of experience needed.

What Are the Capabilities of Chinese Businesses in Adopting IT Innovations Successfully?

Mao led the comments on the current IT capabilities of Chinese businesses. He recognized that there was an abundance of motivated software programming resources. Instead, he argued that the weakest set of IT capabilities in businesses were at the level of senior management. However, he made a clear distinction between different types of business.

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He firstly characterized foreign multinational corporations (MNCs) operating in China and the top state-owned enterprises (SOEs) as often highly sophisticated in their use and management of IT. They buy products and services from the top technology companies and consultancies and, therefore, are often world-class in their approach to IT.

By contrast, he described the IT capabilities in the majority of Chinese businesses as typically very low. IT is not highly valued, and it continues to be seen as a passive reporting tool (or 'giant calculator', as Wright put it), rather than as a way to create value or competitive advantage.

As a result, it is easy for Chinese companies to find qualified staff with strong IT skills at the individual level, but difficult to develop IT project and process management capabilities at the firm level due to weak institutional development and ineffective corporate governance. Moreover, alignment between IT and the business is typically lacking, as evidenced by the lack of a real CIO in the great majority of Chinese firms. Senior management usually has not developed awareness of and appreciation for the value and potential of IT.

In her response, Wright agreed with this analysis and characterized the CIO as a 'necessary evil' in many Chinese businesses. She maintained that few businesses have CIOs in place with significant business involvement, and, where CIOs are in place, they largely focus on technology aspects. Linking with Zhang's earlier point, O'Connor observed that Chinese businesses are frequently dominated by CEOs, who are often founders of the business. As a result, even senior roles such as the CFO frequently lack influence. This cultural aspect further diminishes the role of the CIO. Zhang added that there are also few IT consultants outside of the large technology practices. As a result, there are few opportunities to educate senior staff about the potential role and value of IT.

While the assessment of existing IT capabilities in most businesses suggested a low level of maturity, the panel did highlight some opportunities for improving capabilities.

Mao highlighted the role of Chinese returnees from overseas. Managers who have worked around the world may have greater experience and understanding of IT systems to bring back to China. However, he cautioned against placing too much reliance on returnees. To date, they have had limited impact, especially in smaller businesses, and it will take time for returnees to change wider business practices and experience.

Wright also suggested that cloud computing could enable smaller businesses to build understanding and awareness of IT. With a payment model based around the services used rather than the acquisition of hardware and software, cash-sensitive businesses may be more open to using new applications. This may improve business knowledge of IT and increase the value that businesses generate through it.

IV. MANAGEMENT PRACTICES AND CULTURAL DIFFERENCES

Underlying the panel discussion was the question: to what extent is the experience in China unique? Many of the challenges outlined, such as low CIO involvement in the business or lack of business skills in software developers, are common around the world. As a result, are we simply seeing the early stages of IT use, and it is to be expected that practices will mature and improve over time? Or are there significant differences in the culture and business environment that require distinct approaches?

There has been substantial research based on the notion of cultural difference, such as Hofstede's framework of national cultures [Hofstede, 1980]. However, thinking in terms of cultural difference may not be the most fruitful approach to understanding distinctions in Chinese management practices. The notion of cultural difference can often be used to describe differences that are deeply rooted in economic, political, and social structures and which may change over time. Indeed, China has been undergoing substantial cultural change alongside its rapid economic growth, and different generations may have strongly divergent perspectives.

How Are Management Processes to Support IT Innovations and Good Client/Supplier Relationships Evolving?

Given the complex and changing economic environment in China, the final part of the panel aimed to identify aspects of IT adoption and innovation which are unique. Therefore, the discussion focused on the wider business and institutional environment and the impact that this has on IT management.

O'Connor led this discussion and suggested that what may be perceived as 'cultural differences' are often driven by the business environment. In particular, the diversity of business activity raises challenges for management.

He argued that many Chinese businesses are characterized by high degrees of diversification, rather than by a focused strategy to excel at a core product or service. He suggested that this approach is driven partly by an

opportunistic focus on cash, taking orders from wherever they may arise. His experience was that Chinese businesses are often happy to enter a completely new market simply because they have the opportunity to do so. Because the economy has been growing rapidly and there have been sales opportunities in every market sector, such diversification has been a common approach. To illustrate this point, O'Connor gave an example of a business which switched virtually overnight from making car-seat mats to making LCD screens because they identified an opportunity and successfully won an order in this new market.

However, this approach is also driven by institutional factors. Through the investment and incentives set down in the five-year plans, the government strongly encourages or discourages particular types of economic activity. Given the planning cycle, this can clearly change every five years, and, therefore, businesses tend to spread their risks by operating in a number of different market sectors. In this way, if the government does change its economic rewards or regulations, a business can more easily adapt and survive.

This diversity of business activity has a significant impact on approaches to management. There tends to be a lack of long-term planning. There is little emphasis on continuous improvement of processes or quality. As a result, there is little need for sophisticated management information or high levels of operational efficiency. Furthermore, labor continues to be very cheap in most cases. These features all work together to discourage significant investment in IT, as the benefits case is likely to be limited in many cases.

Mao added that opportunities for double-digit growth, which Chinese firms are used to, typically arise from changes in external regulation and the environment, instead of internal product innovation or continuous process enhancement. However, IT capabilities are typically seen associated with the latter. This is part of the reason for the weak contribution of IT to business and low maturity of IT in China.

Another important cultural aspect already highlighted is the focus on short-term profits, which may make businesses reluctant to spend money on IT. O'Connor described a common practice of buying one software license to share among all staff members. For example, one manufacturer purchased a single license (instead of five) for the internal-control software, and the single access code was distributed to various departments, which defeated the whole purpose of having a separation of duties in the recording and documentation of transactions in the firm. While there may be a link to attitudes towards intellectual property, he suggested that this approach is typically driven by a cash focus.

Continuing this theme, Zhang and Mao both highlighted the preference of many Chinese businesses to buy IT systems as a single project and transaction, rather than building long-term relationships with suppliers. This inhibited the development of the software and services sector. Indeed, Zhang outlined how he had built his business primarily around American and European clients and had few Chinese clients.

Looking to the future, the panel made a number of suggestions for catalysts for change. Mao, for example, suggested that there was a long way to go for Chinese businesses in changing attitudes and building understanding of the way that IT could transform a business. However, 'evolution not revolution' was needed, with simple practices building business confidence and encouraging greater sophistication. Wright differentiated again between large businesses, with the resources to support large-scale applications, and SME businesses. With large businesses, the challenge was making best use of the systems in place and changing attitudes to IT. With SMEs, she argued that there are far more fundamental challenges with limited funds, resources, and talent in many cases. Cloud-based computing may offer opportunities to overcome some of these challenges.

Finally, O'Connor saw the customer focus of Chinese businesses as a way of changing behavior. Customers may be able to influence businesses to adopt more innovative practices and systems. Therefore, he suggested that software businesses could look to influence the customers of a business, rather than the business itself.

V. DEVELOPING A RESEARCH AGENDA

While China has emerged as the world's largest factory, it has also become the largest and most dynamic field for management research. In addition to size, the two most distinct characteristics of the Chinese economy are the huge disparity between the top tier and the 90 percent of the majority, and fast pace of change in general and IT applications. These offer great opportunities for IT research, especially if the research considers the size and scale of firms and IT requirements.

For example, in 2012, China has over one billion mobile phone users and over half a billion Internet users. The No. 1 C2C auction platform Taobao is set to overtake eBay in the number of transactions. The operation of such businesses requires state of the art IT infrastructure. Moreover, these companies have all accumulated a large

amount of transactional data, which can be used for data mining and other scientific research. Taobao, for example, has also set up its own R&D unit, which collaborates with universities and individual researchers.

Second, the fast pace of change makes China an attractive setting to study the evolution of management capabilities and the development of IT to support and maintain business agility. The workforce, by and large, is strongly motivated and eager to learn. The adoption and adaptation processes to IT innovation in Chinese companies afford unique opportunities for research on IT capability development (e.g., Jarvenpaa and Mao, 2008). Lessons learned from cross-cultural studies in China may have reference values for other developing economies.

Third, it is increasingly feasible to engage in research collaboration with Chinese researchers. Publications in international journals are seen to be of high quality, since local journals are still developing their quality standards and norms. Academic assessments place a heavy weight on publications in international journals and conferences, especially those indexed by citation data bases such as the SCI (Science Citation Index) and SSCI (Social Sciences Citation Index). English language proficiency has been rapidly improving among university faculty and students in China, and communication barriers are disappearing. Furthermore, most universities have faculty members who were either trained overseas or have substantial visiting experience overseas and who can facilitate research collaboration. For example, Shan-Ling Pan of National University of Singapore has collaborated with researchers based on mainland China and gained access to data from many large Chinese companies to study their IT agility and the management of large scale IT projects (e.g., at Haier and the Beijing Capital International Airport).

VI. CONCLUSIONS

In conclusion, the panel painted a mixed picture of current and potential capabilities around IT innovation in China. Industry capabilities in the B2B market appear low, with few software companies able to compete at an international level. There is an abundance of young, motivated, and relatively cheap technical resources. However, innovation requires more than technical skills, and, in many cases, stronger business and communication skills are also needed.

The low maturity of the software industry is also driven in part by low IT capabilities in many businesses. While the top MNCs and SOEs can have sophisticated and world-class systems, this is not the case for the majority of businesses. Smaller private and SOEs face significant challenges with IT innovation, including a lack of resources and skills around IT.

The panel particularly highlighted that senior management are likely to have low levels of awareness of the potential value of IT systems, and even where there are CIOs in place, they are typically low-influence, technical roles. As a result, a key element to improving capabilities is the education of senior management and the development of credible CIO leaders.

While there may be cultural elements which drive distinct Chinese practices, behavior is driven in many cases by the economic structures in place. As this wider environment evolves over time, it is likely that business behavior and practices will also develop. However, the diversity of business activity and short-term focus on profits present significant challenges to successful IT adoption and innovation in China.

By contrast, the panel members all agreed that the consumer market offers strong potential for an innovative software industry, with Chinese consumers rapidly adopting mobile technology and Internet-based applications.

ACKNOWLEDGMENTS

This research is supported by the National Natural Science Foundation of China (Project Number: 70888001).

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Ning Wright holds several key leadership roles at KPMG China, chiefly: Partner in Charge, Outsourcing and Shared Services Advisory, China; Partner in Charge, Information, Communications and Entertainment, China; National Head, Electronics, Software & Services (ESS) and Partner-in-Charge for Performance and Technology Services. She steers a prominent team of specialists with a strong focus on the outsourcing industry to assist both global and regional clients on a broad scope of needs, including China-entry strategy, outsourcing and off-shoring strategy, location and vendor selection, inbound/outbound mergers and acquisitions, and sourcing process improvement. Ning has also been appointed by the Shanghai Municipal Commission of Commerce as an outsourcing advisor for the city of Shanghai. With an extensive international experience, having lived and worked in the U.S., Europe, the Middle East, and regionally in Asia Pacific, Ning is a distinguished thought leader representing China and KPMG at a number of international conferences.

Jerry Zhang is the founder and President of Shinetech Software Inc. He founded Shinetech in August 2001 to actively explore the Euramerican market and made Shinetech one of the early providers for software outsourcing services in China. With ten years' development, Shinetech is now a global leader in providing application outsourcing, systems integration, and solution delivery services from cost competitive, high-skilled operations centers in China. Shinetech has more than 300 employees and has collaborated with over 300 clients from the U.S., UK, Australia, and many other European countries. Prior to founding Shinetech in 2001, Jerry served as a chief editor of *Internet Weekly,* where he was in charge of internal management. Jerry is also a committee member of China Association of Trade in Services.

Communications of the Association for Information Systems

ISSN: 1529-3181

Communications of the Association for Information Systems